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ASSESSMENT-IN-ACTION:

A STUDY OF LECTURERS' AND STUDENTS' CONSTRUCTIONS OF BTEC NATIONAL ASSESSMENT PRACTICE, IN A COLLEGE ENGINEERING PROGRAMME AREA.

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Abstract

This research examines the nature and form of Edexcel's BTEC National assessment policy and practice, as found within a small college Engineering Programme Area. The study investigated the salient influences and considerations underpinning both the explicit and implicit lecturer assessment constructs. The backwash effects of these constructs are considered, and how these impact on lecturers' micro-level classroom practice, and on students' engagement with assessment. This study also considers the effect assessment has on preparing students for progression from BTEC National programmes.

BTEC National qualifications of the 2000s have their origins in the 1970s Technician Education Council's programmes, founded on the recommendations of the Haslegrave Committee's Report (Haslegrave, 1969). Although BTEC programmes have evolved over the past four decades, the central tenets of Haslegrave, that of unitised, teacher-assessed, broken-up summative assessment, still underpin BTEC National assessment of the 2000s. Current BTEC units are criterion-referenced, and employ formative assessment as an integral aspect of the educational ethos of the qualification.

The research design involved a single site case study of assessment-in-action within a small programme area offering BTEC Nationals in Electrical and Electronic Engineering and in Manufacturing Engineering. This study used an interpretative approach, based on semi-structured interviews with seven lecturers and thirteen students during academic years 2006-2008.

Findings suggest BTEC assessment practice relies significantly on the integrity of the lecturers, who construct their assessment practice by accommodating and balancing various external and internal requirements and influences placed upon them. It is through the programme area community of practice that notions of standards evolve, these being significantly influenced by cultural considerations, which impact on all aspects of assessment practice.

This study finds an ethical departmental ethos in which all students should pass, and an assessment regime implicitly designed to aid student retention and achievement, but from which emanates a focus on criteria compliance. This tends to produce assessment constructs encouraging instrumental learning, where students' achievements can be based on incremental improvement of the same assessment through multiple attempts, and where the potential for developing learning is diminished as formative assessment becomes conflated with summative intent. Both the assessment regime and the type of learning implicitly encouraged, has the potential to hamper some students' preparedness for progression from the BTEC National programmes.

Based on the findings of this research, considerations and recommendations are offered, both at the macro level of BTEC policy and at the departmental programme area micro-level of classroom practice, with the intention of enhancing students preparedness for progression from the National programmes. The study concludes that, despite radical changes in technician assessment practice having occurred since instigation of the Haslegrave recommendations, concerns emanating from assessment practice of the 1950s and 60s are still present within modern-day BTEC assessment, a case of *plus ça change*.

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Dedication

This thesis is dedicated to two men sadly no longer with us.....

To Mr O'Sullivan, who passed his primary school, 11-plus exams in the 1940s, studied at grammar school, from where he completed his Engineering-based ONC and HNC qualifications (at the first attempt), finally achieving an MSc. After working in the aerospace industry for five years, he chose a career in academia, ultimately rising to the position of Assistant Dean at an English University. He was a Programme Leader and lecturer on my engineering undergraduate studies at Bristol Polytechnic in the 1980s, becoming a mentor and inspiration to me, and is one of the main influences behind the career path I chose. I much regret not being able to have had the opportunity to discuss this research with him, and hearing his enlightening and constructive criticisms.

To my Uncle Lawrence, who also passed his 11-plus exams in the 1940s, but unfortunately was unable to take up a place at grammar school due to family financial difficulties. He did not have the opportunities at education he deserved and ended his working career as a labourer.

In my opinion, both these men were highly intelligent, but their differing opportunities for education, resulted in differing opportunities for life. I remember and respect them both, and they offer to me an illustration of the importance of educational opportunities for all. I consider myself very privileged, particularly at my aging years, to have had the opportunity to study this very stimulating and highly challenging EdD programme. I realise I have been fortunate to have educational opportunities others have not had. I hope I have proved worthy of them.

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List of Acronyms & Definitions

AQA	-	Assessment and Qualifications Alliance
ARG	-	Assessment Reform Group
AVCE	-	Advanced Vocational Certificate of Education
BEC	-	Business Education Council
BERA	-	British Educational Research Association
BTEC	-	Business and Technician Education Council (1984-1989)
BTEC	-	Business and Technology Education Council (post-1989)
C&G	-	City and Guilds (Awarding Body)
CAD	-	Computer-Aided Design
CPD	-	Continued Professional Development
DoS	-	Director of Studies
DTI	-	Department of Trade and Industry
EdD	-	Educational Doctorate
Edexcel	-	BTEC Awarding Body since 1996
EngC	-	Engineering Council
EV	-	External Verifier
FE	-	Further Education
GCE	-	General Certificate of Education
GCSE	-	General Certificate of Secondary Education
GNVQ	-	General National Vocational Qualification
HE	-	Higher Education
HNC	-	Higher National Certificate (Part-time study)
HNC/D	-	Higher National Certificate or Higher National Diploma
HND	-	Higher National Diploma (Full-time study)
IMechE	-	Institution of Mechanical Engineers
IV	-	Internal Verifier
JC	-	Joint Committee (Examining body of National Courses, 1920s to 1984)
LSS	-	Learning and Skills Sector
NC	-	National Certificate (Part-time study)
NC/D	-	National Certificate or National Diploma

List of Acronyms & Definitions (continued)

NCVQ	-	National Council for Vocational Qualifications
ND	-	National Diploma (Full-time study)
NQF	-	National Qualifications Framework
NSS	-	National Standards Sampling (Edexcel auditing procedure)
NVQ	-	National Vocational Qualification (competence-based qualification related to employment)
QCF	-	Qualifications and Credit Framework
Sophwort-on-Sea College	-	Pseudonym for location of case study (shortened to 'Sophwort College' in text)
SVS	-	Standards Verification Sampling (previously termed NSS)
TEC	-	Technician Education Council
TGAT	-	Task Group on Assessment and Testing
UCAS	-	Universities and Colleges Admissions Service
VET	-	Vocational Education and Training

1. Introduction

This research relates to the education and training of technician engineers studying the Edexcel Level 3 BTEC National Diploma at a remote UK College. The study is primarily concerned with assessment practice in this vocational context. The aim of this study is to illuminate the nature and form of BTEC National assessment occurring at the micro-level of classroom practice using a single site case study, located within a small Engineering Programme Area. The study explores 'assessment-in-action' through the perceptions, experiences and constructions of a small cohort of National Diploma students and lecturing staff associated with delivery of a two-year programme. It attempts to uncover the salient influences and considerations underpinning both the explicit and implicit assessment constructs; how these impact on students' approach to, and engagement with, assessment practice; and on their preparedness for progression after successful completion of the course.

1.1 My professional background

This study is both of a professional and personal interest to me based on my current engineering lecturing position and also my education, training and practising engineering career, which spanned twenty years from leaving school. Like the students in the study, I too studied the National programme (although on a part-time basis) as the first stage of becoming an engineer.

Having left a comprehensive school at the age of sixteen in 1978 with the equivalent of seven O-levels, I served a four-year Mechanical Draughtsman's apprenticeship at an electric motor manufacturer. During this time I studied part-time for the National Certificate (then called the Technician Education Certificate) and Higher National Certificate (Higher Technician Certificate) at a local technical college. On completion of my apprenticeship, I joined a nearby structural steelwork/fabrication company as a Junior Detail Design Draughtsman, during which time I studied part-time over four years for a Mechanical Engineering degree at a local polytechnic. After graduating, I worked in the aerospace industry for ten years as a Stress Engineer. In 1992, I completed an Open University course in Fracture Mechanics and from 1992 to 1996, studied part-time for an MSc in Total Technology (Aerospace) through a consortium of

universities. Since 1986, I had been occasionally applying for part-time lecturing positions and in 1997 found part-time evening employment at Sophwort-on Sea College (two hours a week) as a part-time lecturer teaching National Certificate Engineering Science to five students. Concurrently, I commenced the City and Guilds T730/7 Teacher Training programme and the following year was offered full-time employment at Sophwort as a Lecturer in Engineering - after almost exactly twenty years of working as an Engineer. As a lecturer, I have taught primarily on BTEC National and Higher National programmes, although I have also been involved in externally accredited degree programmes. Between 1999 and 2000, I completed my PGCE and in 2005 enrolled on the EdD programme of study. The Appendix A, commencing on page 201, contains a vignette written in 2008 reflecting on my educational and vocational experiences in an attempt to illustrate how my industrial career, educational experiences and indeed my 'assessment career' have the potential to impact on my research inclinations and perspectives. In essence, I am a *BTEC boy*, researching BTEC assessment practice within a programme area managed by, and predominantly employing, other BTEC boys.

I have found the transition from industry to education challenging and feel my transition from that of an engineer lecturing, to an Engineering Lecturer, is still ongoing. However, I believe the empirical research requirement of the EdD into a salient aspect of my professional practice, is helping to facilitate my transition from Engineer to Engineering Lecturer-cum-Educationalist.

Reflecting on my academic exposure as a lecturer, one long-standing concern relates to the BTEC assessment regime, and its impact on the progress of students through a particular unit of study; on their proficiency achieved, and how this impinges on their progression through the BTEC programme and beyond. Initially my focus of concern pertained purely to facility with engineering mathematics. During my first few weeks of teaching, I was surprised by the lack of exposure that most GCSE students appeared to exhibit with regards to engineering mathematics topics such as algebra, fractions, indices, etc. At the time of this research, all 16 year olds who selected engineering would have followed a GCSE Mathematics course, but not all followed the same one as there were overlapping Mathematics syllabi. 'Only the "top" one would normally be considered appropriate for A level mathematics entry' (Wolf, 1994, p. 2, emphasis in

original). Most students entering College engineering programmes would have studied the GCSE Intermediate level, in which they could achieve a grade C in Mathematics (an entry requirement for the National programme), but having studied very little algebra (Sutherland and Pozzi, 1995, p. 49). However, what concerned me more was how these students progressed through the BTEC Mathematics units, taught by a colleague and myself, but seemingly showing little improvement in their facility with various algebraic methods.

Anecdotal comments from colleagues teaching second year National Mathematics or Higher National Mathematics units clearly indicated that some students' proficiency fell far short of their expectations compared with former students. For example, 'The standard of student is not what is was in the 80s', and 'These National students would have been First Diploma students ten years ago.' Similar comments were made at seminars when talking to lecturers from other colleges who referred to 'notional passes' being achieved in mathematics, and Higher National Certificate (HNC) students 'not being able to transpose Ohm's law'. Ex-Sophwort College students having progressed to university from the National and even Higher National programmes, returned to offer accounts of how they were unprepared for the mathematics study at university, 'It's all proofs ….and algebra using fractions', coupled with comments about being unprepared for the university assessment regime after studying BTEC programmes for at least two years. Also worryingly, in one case, was how a student achieved distinction grades in his HND Mathematics unit, but still had to re-sit his first two years of mathematics study at university. Another student, achieving a National Diploma with very high grades, returned to Sophwort College after unsuccessfully completing his first term at university. When asked how he thought the National Diploma had prepared him for university study he replied, 'I think I was doing so much work to get to university and get the required grades that I did not understand much of what I did'. How could a student achieving such a high award, feel he learnt so little? What does this say about the College's pedagogy, assessment practice and curriculum content?

In 2006, I was informed by a university tutor that he screened undergraduates on entry, including BTEC National students, based on a Level 2 numeracy test (relates to GCSE grades A* to C, Edexcel, 2009b), indicating more general concerns over BTEC standards. This tutor also suggested there was variability in standards associated with

BTEC qualifications, through his comment, 'All National Diplomas are not equal, it all depends on the FE college'. A similar comment was expressed by a university lecturer in Sutherland and Pozzi's (1995) research a decade earlier:

> It's the BTEC that is so very variable …. it depends where it's taught. Our admission tutors here are now picking out [Further Education] colleges and saying OK well they've been to that college, we might only look for merits rather than distinctions, if they've been to that college then they've got to have distinctions or we're not interested in them.
>
> (Sutherland and Pozzi, 1995, p. 25)

Some sources suggested this progression concern from college to university was due to 'curriculum mapping problems', but with regards to Sophwort College, this did not explain problems occurring in-house with National students' progression to Higher National study, where the syllabi were devised by the same awarding body, and lecturers had scope to resolve such problems. Of course, it could call into question the pedagogy, but students were progressing, even achieving high grades. From the comments of the lecturing staff and the students, the problem was more fundamental. The basic use of algebra, indices and fractions was the cause of most students' problems. A question therefore early on in my teaching career was, how could students study a National programme in the Sophwort-on-Sea College Engineering Programme Area, which incorporated a year or even two years of Mathematics, pass or even achieve high grades, but still seemingly lack basic mathematical proficiency on completing the programme? The concern from my perspective pointed to the assessment practice.

1.2 Research into 'vocational assessment practice'

From research in the compulsory sector, much has been learnt about the interaction of assessment, teaching and learning and the impact of assessment on learning:

> What is assessed, and how it is assessed, is hugely influential in determining what is taught and how it is taught. Likewise, with respect to learning, while assessment can motivate learners if they are successful, it can also undermine confidence and capacity to learn if they are unsuccessful...
>
> (Torrance et al., 2005, p. 5)

However, little is known about vocational FE assessment practice at the macro-level of policy making, the meso-level of institutional organisation, or at the micro-level of classroom practice (Ecclestone, 2002, p. 5) and how assessment impacts on learning (Torrance et al., 2005, p. 5). Apart from a small number of in-depth case studies such as Boys' research into the Advanced Business GNVQ (Boys, 2000) and Ecclestone's study into Advanced GNVQ courses in Health and Social Care and Business (Ecclestone, 2002), little research in the FE sector exists. In order to address the gap of the scarcity of studies in FE vocational-based literature, Torrance et al.'s (2005) comprehensive research study into assessment practice in the Learning and Skills Sector was commissioned. More recently, Ecclestone (2010b) has published results of a three-year extensive study into formative assessment practice in vocational educational courses.

From the literature review by Torrance et al. (2005), and also by that of Stasz et al. (2004), limited specific research into BTEC assessment practice was found. However, Torrance et al. did research the BTEC National in Leisure and Recreation and Sport and Fitness through one of their case studies (Torrance et al., 2005), while Ecclestone (2010b) researched the BTEC National Diploma in Public Services taught at two FE colleges.

Another problem Torrance et al. referred to is the 'almost hermetically sealed nature' that exists within the various educational tracks of post-compulsory education (Torrance et al., 2005, p. 5), which has also been found to extend to the micro-level of BTEC assessment practice. In 1995, Sutherland and Pozzi's research into the changing mathematical background of university entrants, found little was known about the vocational environment from which more students now entered undergraduate programmes. This lack of visibility and understanding was attributed to the BTEC internal assessment practice and a perceived reluctance of vocational lecturers to make their assessment instruments available for analysis (Sutherland and Pozzi, 1995, p. 50). Currently, no published research has been found relating specifically to assessment practice in an FE engineering context. This study therefore aims to provide a further contribution to the FE research literature on assessment at the micro-level of practice, but within a BTEC technician engineering context.

1.3 Why a research focus on assessment?

Assessment is a salient aspect of any educational system, whether it is in the compulsory, post-compulsory or tertiary sector, and impacts on all aspects of pedagogy, not least student learning. This 'dominant role of assessment in defining students' perceptions of courses and subjects is widely recognized' (Joughlin, 1999, p. 146) and not a new occurrence. In the late 1970s Rowntree (1977) focused attention on the significant, though often hidden, influence assessment has over the curriculum and over student learning:

> If we wish to discover the truth about an educational system, we must look into its assessment procedures. What student qualities and achievements are actively valued and rewarded by the system? How are its purposes and intentions realized? To what extent are the hopes and ideals, aims and objectives professed by the system ever truly perceived, valued and striven for by those who make their way within it? The answers to such questions are to be found in what the system requires students to do in order to survive and prosper. The spirit and style of student assessment defines the de facto curriculum.
>
> (Rowntree, 1977, p. 1)

Although Rowntree's observations related to Higher Education (HE), some thirty years on they appear to find resonance within modern-day BTEC assessment practice, where lecturers teach and internally assess their own students. Although all BTEC units state learning outcomes in the form of assessment criteria to maintain 'national standards' (Edexcel, 2002b, p. 13; Edexcel, 2007b, p. 10; Edexcel, 2010b, p. 19), in practice, it is often incumbent on lecturers' integrity to interpret them and so set the coverage and standard at which to assess their students.

The above observations relate to assessment in its summative sense, what is sometimes termed *assessment of learning*, but at the end of the 1990s the emphasis on assessment began to take a different focus on its formative benefits or using *assessment for learning* (Black and Wiliam, 1998a; Black and Wiliam, 1998b; Torrance and Pryor, 1998). Once again this emphasis has its roots in 1970s assessment literature, principally with Bloom et al. (1971). However, in the new millennium, formative assessment has now become a focus of both classroom practice and research across the

compulsory sector (ARG, 2002; Black and Wiliam, 2002), the FE sector (Ecclestone, 2002; Ecclestone, 2007; Torrance, 2007) and in HE sector (McDowell, 2004; Taras, 2007; Taras, 2008). Indeed, use of formative assessment is now encouraged as a salient underpinning aspect of BTEC practice that should occur prior to summative assessment (Edexcel, 2006a).

Current research into formative assessment has found it is not well understood and conflation between formative assessment and summative assessment has been found to occur amongst FE lecturers (Boys, 2000; Ecclestone, 2002) and HE lecturers (McDowell, 2004; Taras, 2008); so some of the purported benefits, such as aiding student learning, are not realised in practice. Recently, Taras undertook an empirical, small-scale study into the 'understanding of summative and formative assessment and the relationship between the two' (Taras, 2008, p. 172). This study required lecturers in education (n = 50) at an English university to complete a questionnaire. From analysis of the responses, Taras concluded:

> …lecturers were not clear on their understanding of summative, formative and self-assessment, nor were they clear or consistent when reporting on the relationship between them.
>
> (Taras, 2008, p. 187)

From this illuminative research, she posits the following as a focus for research, the essence of which resonates with the objectives of my study:

> Another important and neglected aspect is learners' involvement and perceptions of assessment processes. Much work needs to be done. However, as individuals, we can examine and question our own understanding of assessment, of our own processes and the implications and impact for ourselves and our students.
>
> (Taras, 2008, p. 189)

The above briefly overviews the prominence and significance assessment has had within an educational context over many decades, and how across all educational sectors and all assessment regimes, the spirit and style of assessment can influence the perspectives and aspirations of both lecturers and students, with regard to curriculum aims and values. It is also clear from the literature that despite its significant influence over pedagogy, assessment is not well understood by teachers, with summative and formative assessment being problematic in practice. Within the context of a small

Engineering Programme Area, my study seeks to explore some of the above considerations relating to lecturers' and students' perceptions and understandings of assessment practice at the micro-level of classroom practice. The research questions and objectives, which form the basis of this study, are stated below.

1.3.1 Research questions

1) What are the salient influences impacting on the development, implementation and effectiveness of modern-day BTEC National assessment practice in engineering?
2) What is the nature and form of 'BTEC National assessment practice' at the micro-level of classroom engagement?
3) How do the constructions of assessment affect students' preparedness for progression to employment or higher education?
4) What can be learned from this study that will enable assessment to facilitate students' learning and improve their preparedness for progression?

1.3.2 Research objectives

1) To understand lecturers' principal considerations and concerns when conceptualising and developing their assessment practices.
2) To understand lecturers' explicit and implicit constructs of assessment and how these impact on their implementation of assessment in practice.
3) To understand students' perspectives of, and approach to engagement with, assessment practice.
4) To understand the impact that assessment has on students' preparedness for progression from the National course.
5) To offer recommendations to improve assessment practice, encourage deep learning and improve students' preparedness for progression from the BTEC National programme.

Through the above research questions and objectives, my study will offer a contribution to the current and increasingly important educational emphasis placed on assessment practice, but specifically within a context that has received little attention from an educational research perspective, i.e. technician engineering.

1.4 Technician Engineers

This research concerns students studying for a BTEC National Diploma within an Engineering Programme Area at a small college. This is a full-time vocational course related to the education and training of technician engineers. The term 'technician' was first formally used in the electrical engineering context in the 1940s (Haslegrave, 1970, p. 20), and came into prominence at the end of the 1950s to differentiate a category of technical employee, generally positioned between the technologist (i.e. a fully qualified engineer) and the skilled foreman, craftsman or operative (Haslegrave, 1969, pp. 3-4; Ministry of Education, 1961, p. 5). In the 1960s, technicians were considered to have detailed knowledge and skill in a specialist field, or broader knowledge across several fields (Haslegrave, 1969, p. 4). Technicians were involved with a wide range of responsible jobs involving higher level application of scientific and technical knowledge (Ministry of Education, 1961, p. 5). They underwent specialist training combined with practical work and needed a good knowledge of basic Mathematics and Science (Argles, 1964, p. 105). Work undertaken by technicians in the 1950s included the design of plant and equipment (under the direction of a technologist); the supervising of site erection, construction and maintenance of plant; testing, surveying and inspection (Ministry of Education, 1961, p. 5).

In the late 1970s and early 1980s, technicians were usually considered employees holding qualifications at HNC/HND level, whereas degree level qualifications generally confer the status of Graduate Engineer or Professional Engineer. However, it was possible that a technician in one department or company could have greater responsibility and autonomy than a graduate engineer in a different department or company. Technician employment encompassed production engineering, quality control engineering, drawing and design, test engineering, etc. (Moor et al., 1983, p. 34).

Currently within the UK, the Edexcel Level 3 BTEC National Certificate or Diploma (NC/D), is acceptable as part-evidence of the necessary competence requirements for registration as a Technician Engineer (EngC, 2011, p. 10), whilst Higher National qualifications can provide part-evidence for Incorporated Engineer Status (EngC, 2011,

p. 18). The Engineering Council defines a modern-day Technician Engineer as follows:

> Engineering Technicians are concerned with applying proven techniques and procedures to the solution of practical engineering problems. They carry supervisory or technical responsibility, and are competent to exercise creative aptitudes and skills within defined fields of technology. Professional Engineering Technicians contribute to the design, development, manufacture, commissioning, decommissioning, operation or maintenance of products, equipment, processes or services. Professional Engineering Technicians are required to apply safe systems of working.
>
> (EngC, 2005, p. 4; EngC, 2011, p. 8)

Modern-day technicians qualified to NC/D level tend to find employment in practical environments, such as for example, installation technicians, service technicians, sound technicians, engineering technicians. They install, maintain and repair a raft of sophisticated plant and equipment, from manufacturing production lines and measuring equipment, to fire alarms, closed-circuit television systems, computers and photocopiers. Students achieving the HNC/D qualifications aspire to positions such as design engineers, design draughts-people (i.e. Computer-Aided Design (CAD) Operators), stress engineers, project engineers, quality engineers, test engineers, etc. However, boundaries may be blurred.

1.5 BTEC Nationals

BTEC level 3 Nationals are semi-educational, semi-vocational courses (Wolf, 2002, p. 90) offered by the awarding body Edexcel/Pearson. They differ from A-levels in that they are teacher-assessed, and designed to have a more or less specific vocational orientation relating to a range of vocational sectors (Edexcel, 2010b, p. 2). BTEC Nationals are valuable in the labour market (Wolf, 2011, p. 33), and are well-recognised and widely accepted by higher education for entry onto degree courses (Ecclestone, 2010b, p. 125; Pring et al., 2009, p. 154), especially for courses in similar areas (Wolf, 2011, p. 50). The current BTEC National programmes, with their unitised structure and internal assessment format, are founded on recommendations from the Haslegrave Committee (Haslegrave, 1969) related to technician education, which were

introduced in the early 1970s under the auspices of the government-instigated Technician Education Council (TEC). However, technical education has a very long history. The origins of the National qualifications can be traced back to the creation of the Ordinary National Certificate (ONC) and Diploma (OND) after the First World War (Foden, 1951, p. 38), administered by regional Joint Committees (JCs). From inception to the 1960s, the part-time ONC was the predominant mode of study, and was a three-year course aimed at sixteen-year-old students. The National Certificate formed a system of certification for apprentices and other students in Engineering from the 1920s for over fifty years until the formation of TEC in the 1970s and BTEC in the 1980s. Thus the BTEC National Certificate, through its long historical development, still forms an essential element of the education and training of technician engineers. Within the modern engineering apprenticeship programmes, the BTEC Nationals (Edexcel, 2007b, p. 5; Edexcel, 2010b, pp. 4-5; SEMTA, 2010, p. 8) focuses on providing:

> …the knowledge and understanding which underpins the NVQ competencies and additional knowledge to facilitate progression to higher education or higher levels of working.
>
> (SEMTA, 2010, p. 31)

All assessment for BTEC Nationals is criterion-referenced, as opposed to norm-referenced, and based on the achievement of specified learning outcomes (Edexcel, 2002b, p. 10; Edexcel, 2010b, p. 11), stipulated in the form of assessment criteria. Units also contain contextualised grading criteria, individually graded as 'merit' or 'distinction'. The vast majority of units contributing to a National programme are internally assessed, and to achieve a pass grade for a unit, learners must meet the assessment criteria stated in the specifications (Edexcel, 2002a, p. 10; Edexcel, 2010b, p. 11).

1.6 The College context

This case study was located within the Engineering Programme Area at Sophwort-on-Sea College, which supports the educational needs of a small, isolated coastal community. The College co-exists alongside five local comprehensive schools offering post-16 provision concentrated on the academic curriculum, aimed largely at GCE A-

level work. In contrast, Sophwort College concentrates on vocational education, providing a wide range of educational opportunities from non-vocational leisure and specialist interest classes, to Further Education, undergraduate and post-graduate programmes, the latter offered through association with UK-based universities. During the period of this research, Sophwort College had 817 students enrolled on its full-time courses (Sophwort-on-Sea College, 2008, p. 12), of which 109 were studying engineering courses and of those, 35 students were enrolled on BTEC National programmes.

It should be noted, Sophwort College is not 'incorporated' (see James and Biesta, 2007, pp. 9-10, for definition of incorporation), and so not subject to the same payment by results funding related to annual student retention and achievement rates, as colleges in England and Wales (Wolf, 2011, p. 60). Instead, Sophwort College receives funding based on student numbers enrolled by November of each academic year. Although UK benchmarks for pass and retention rates are available, and are referenced in the Governors' Annual Report (Sophwort-on-Sea College, 2008, p. 115a), they have little visibility amongst engineering lecturers.

1.7 Overview of thesis

This introductory chapter has reviewed the background and focus of the study. The following paragraphs now overview the contents of the other chapters in this thesis.

Chapter 2, **Literature Review**, commences from a historical perspective of assessment, and reviews the considerations, complexities and subjectivity inherent within assessment practice. The chapter also considers the advantages and disadvantages of both criterion-referenced assessment and formative assessment that have pervaded assessment practice across all educational sectors, but are particularly prominent in FE.

Chapter 3, **Evolution of BTEC assessment practice**, researches the historical roots of technical education, and the evolution of the National programmes from their inception in the 1920s to the step change in technician education that occurred in the 1970s. The chapter then reviews the formation of BTEC and the move to criterion referencing during the 1980s, the stagnation of BTEC development in the 1990s, and the re-launch of the 'new' BTEC Nationals in 2002, which form the backdrop to this research.

Chapter 4, **Methodology and Methods**, states my ontological and epistemological perspectives from both my professional engineering standpoint and that of my lecturer-cum-researcher role within this study. I justify the use of my qualitative methodology and methods, and how these enabled me to investigate assessment-in-action at the micro-level of classroom practice, within the programme area in which I lecture. The various data gathering methods and data analysis techniques employed are reviewed, along with associated ethical and validity considerations.

Chapter 5, **Setting the scene for data presentation**, provides a backdrop for the remaining chapters of the thesis. This chapter outlines the structure of BTEC Nationals offered by Sophwort College, the requirements of BTEC assessment, and how assessment practice is organised in the Engineering Programme Area. Background information relating to both the lecturers and students interviewed as part of this study is also stated.

Chapter 6, **How lecturers construct assessment practice**, explores how the engineering lecturers interpret and accommodate the various requirements and influences placed upon them, how this impacts on their constructs of BTEC assessment practices, and how assessment functions at the micro-level of classroom practice. This chapter uses extracts from the lecturers' interview transcripts, to help illuminate their

perceptions of the nature and form of BTEC assessment practice in the engineering programme area.

Chapter 7, **Students engagement with assessment practice**, presents students' perspectives and reactions to the lecturers' constructed assessment practice. This chapter considers students' enculturation into BTEC assessment, their participation with formative assessment activities, and their perceptions of the referral system, again using extracts from interview transcripts.

Chapter 8, **Discussion of data and findings**, commences with an overview of the many potentially positive aspects of BTEC assessment practice. This chapter then discusses the data presented within the previous chapters with reference to themes from the literature review, and describes the nature and form of classroom practice within the Engineering Programme Area at the micro-level of lecturer-student interaction.

In Chapter 9, **Conclusions**, I reflect on the findings of this small-scale case study in relation to the research questions. Firstly, the salient influences impacting on BTEC assessment practice within the Engineering Programme Area are highlighted, from where its resulting nature and form is reviewed, as is the effect assessment has on students' preparedness for progression. Based on the findings of this research, recommendations for both BTEC Policy and departmental practice are proposed, and the chapter concludes with my reflective thoughts on changes in assessment practice since the implementation of the Haslegrave Report (1969), and its radical recommendations for technician education that still resonate today.

2. Literature review

This thesis is concerned with assessment in the vocational FE context, specifically focussing on the BTEC National technician engineering programmes. This chapter offers a review of literature exploring how the nature, purpose and form of vocational assessment has changed from its inception at the time of the industrial revolution, to that found in classroom practice at the beginning of the 21st Century.

2.1 Historical overview of assessment

The origins of assessment have been found documented in China over 2000 years ago (Rowntree, 1977, p. 17), where formal written tests provided a method of selecting people from all backgrounds to enter the civil service (Black, 1998, p. 7). However, in England, it was not until the 19th century that the use of educational assessment became widespread, with the introduction of written tests as an entrance requirement for universities and the professions. In the early nineteenth century, the industrial capitalist economy grew dramatically which placed new pressures on the developing society. There was a demand for a more literate middle-class workforce and more trained occupational professionals and managers.

A significant influence underpinning the need for an increasingly educated and trained workforce related to advances in technology. Prior to 1750, technology had changed little over the preceding centuries such that a new generation could learn from the previous generation through an apprenticeship system (Argles, 1964, p. ix). However, by the time of the great exhibition of 1851, significant changes had occurred in the industrial sector. Technological advancements, the growth of the factory system and complexity of modern production methods, all required technological and managerial techniques (Argles, 1964, p. 1) that could only be accommodated within the workforce by a radical change in the educational system of the day.

Prior to the mid-nineteenth century, entrance into universities and the professional institutions tended to involve oral, informal, haphazard assessment, often based on patronage and nepotism (Argles, 1964, p. 9; Black, 1998, p. 8). However, such methods could not satisfy the demand for an increasingly educated workforce so

society needed to encourage a wider range of individuals to take on these roles (Gipps, 1990, p. 2; Lambert and Lines, 2000, p. 23-24), and the use of written assessment formed an intrinsic part of this move to widen participation. The professions and universities used the written assessment method for three main purposes. Firstly as a method of 'selecting' suitable applicants for training and 'certificating' those deemed competent; second for gate-keeping to 'control access' to their ranks, and thirdly to 'raise the standards' (Black, 1998, p. 8; Gipps, 1990, p. 2). Although some institutes such as the medical and accountants introduced entrance exams in the 1800s (Broadfoot, 1996, p. 248), it was not until 1913 that the Institution of Mechanical Engineers (IMechE) began holding their own entrance examinations. This followed the lead of other Engineering Institutes, as these examinations had proved satisfactory in ensuring the desired standard of scientific knowledge amongst applicants and thereby enhancing the prestige of the Institution (Parsons, 1947, p. 47).

Although the examination systems were instigated with the purposes of selection and quality control mechanisms through setting standards and levels of competence, they also produced some side-effects that have had significant influence and consequences for educational practice (Broadfoot, 1996, p. 31). Firstly, the theoretical written examination itself, used to determine entry into high status institutions, elevated this assessment method to that of a high academic accolade in its own right, which still resonates within current day assessment practice (Lumby and Foskett, 2005, p. 95). The second side-effect was the instigation of the concept of a curriculum, defining a body of knowledge able to be taught and learnt in a classroom, so generating a requirement for formal schooling, what has been termed the 'backwash effect' (Broadfoot, 1996, p. 172). Thirdly, the formal exam induced a trend away from on-the-job apprentice training, towards a preference for what were seen as more portable and adaptable qualifications, available from a variety of formal educational institutions. Fourthly, success in examinations embodied the concept of merit and suggested the accompanying allocation of occupational roles within society (Broadfoot, 1996, pp. 31-32).

Prior to the 1970s, interest in assessment was almost exclusively in the domain of psychologists who pointed to an assessment dichotomy between technical and philosophical considerations (Rowntree, 1977, p. 2). However, around the 1950s, the

use of psychometrics as the basis of assessment began to be questioned (Gipps, 1994b, p. 7) and the debate broadened with the publication of seminal thinking on different theoretical foundations for future assessment practice (Gipps, 1994b, pp. 7-8). Educators articulated a need for assessment to be used for educational purposes and not just selection; this movement became known as 'Educational Measurement' (Wood, 1986, p. 187). Bloom, a psychologist and proponent of the educational measurement philosophy, first came to prominence in the research literature in the 1950s through the publication of his 'Taxonomy of educational objectives: Handbook 1, the cognitive domain' (Bloom et al., 1956). Bloom et al. proposed the idea that cognitive operations can be ordered into six increasingly complex levels, and although this taxonomy has received criticism in some educational circles, it underpins many assessment constructs across educational sectors, and has been particularly influential within the development of BTEC assessment strategies since the 1970s. In the late 1960s, Bloom developed a theory of 'mastery of learning' which aimed to aid student achievement, in part by changing the emphasis of assessment from purely summative intent, to also include diagnostic purposes (informs learners where they are going wrong) and formative purposes (informs learners what to do in order to improve). Bloom based his idea of mastery learning (Bloom, 1974) on an interpretation of Carroll's (1963) proposed 'model of school learning' (Bloom, 1976, p. 4), which addressed 'both theoretical and practical aspects of the time factor in school learning via an appeal to diagnostic-prescriptive teaching' (Hymel, 1993, p. 2). Carroll believed any student could learn anything if allowed enough time to accommodate a learner's characteristics, such as perseverance and aptitude (Black and Wiliam, 1998a, p. 40). Thus accounting for time-factor effects, combined with a focus on goal-attainment, Bloom's mastery learning offered the prospect of virtually all youngsters being able to learn basic principles, concepts and skills (Eisner, 2000, p. 4; Husen, 2001, pp. 86-87).

Although mastery learning has positive ethical underpinnings in its aims to help nearly all students learn excellently and truly master what is taught (Guskey, 1990, p. 34), it is considered behavourist in nature (Torrance, 1993, p. 336) and based on psychological constructs (Wood, 1986, p. 187). It is also not without pragmatic implementation problems such as the additional time requirements, quality and quantity of feedback associated with corrective action, and suffers from limited research evidence to substantiate its purported benefits (Slavin, 1987, p. 205). However, what Bloom's

research did highlight, are two significant developments in assessment emanating from the 1960s that have increasingly been used to underpin much policy and practice over recent decades, in an attempt to aid student learning and achievement.

The first development was a move to *criterion-referenced testing* which was proposed by Robert Glaser (1963) as an alternative to the traditional use of norm-referenced assessment based testing (Bloom et al., 1971, p. 90; Bloom, 1974, p. 684; Linn, 1989; Wood, 1986, p. 187). For at least the previous century, measurements and description of students' academic achievement were expected to conform to a normal distribution curve. This required students' performances to be compared against each other, placing students in competition with each other in ranking their relative achievement (Bloom et al., 1971, p. 44; Eisner, 2000, p. 3). Glaser's proposed alternative of criterion-referenced measures, depended upon an 'absolute standard of quality' as opposed to that of norm-referenced measures, which depended upon a 'relative standard' (Glaser, 1963, p. 519). The second significant development was the use of assessment in the formative sense to aid learning, which was originally defined by Michael Scriven (Dann, 2002, p. 28; Taras, 2005). Bloom's research found that explicit and extensive use of *formative assessment* and associated feedback (Bloom et al., 1971, p. 53) aided awareness of what students had learnt and what still needed to be learnt, which helped most learners achieve the outcomes of instruction (Bloom et al., 1971, p. 16).

From the mid-1970s onwards, research into assessment increasingly focused on sociological considerations relating to the intended and unintended consequences of assessing learners, and epistemological questions such as: does assessment purport to be knowledge about learning, is it objective, and can all learning be assessed (Dearden, 1979, p. 111). In particular, Rowntree's (1977) well respected contribution to the subject of assessment (Ramsden, 1992, p. 181; Elton and Johnston, 2002, p. 11), highlighted the complexity and subjectivity associated with assessment practice. Rowntree also highlighted side-effects of assessment, but this time associated with the micro-level of classroom interaction. For example, Rowntree considered how assessment was influenced by relationships between, and expectations of, assessor and assessed, such as prejudicial use of stereotypes (Rowntree, 1977, p. 36). He also highlighted how assessment can itself change behaviour and attitudes of the assessed,

the so-called Hawthorne effect (Rowntree, 1977, p. 40), and through the 'hidden curriculum' (Snyder, 1971) can influence students' approach to learning (Rowntree, 1977, p. 48).

During the 1980s, the assessment debate widened and deepened across all sectors of education. For example, diagnostic assessment was no longer viewed for use with remedial groups only, and testing did not have to be only at the end of the year. Modular programmes or units of study were assessed with increased frequency of summative tests that covered smaller, discrete syllabus areas at a time, and replaced the need for all at once end of course assessment. Work-based accreditation, profiling of students and records of achievement all became mainstream ideas particularly in vocational education (Black and Dockrell, 1988, p. ix). Black and Dockrell (1988, p. ix), reflecting on what was seen as a marked change in emphasis of assessment in Britain, overview the transition of assessment post-1970s from psychometrics to educational measurement in a positive light:

> The prevailing assumption is that assessment should be offering what is required to satisfy the needs of education and not simply supplying what existing psychometric models dictate. If that means that the education tail has come to wag the assessment dog, progress has probably been made.
>
> (Black and Dockrell, 1988, p. ix)

This short historical overview has shown how technological advances in the 19th century generated a need for an increasingly educated workforce, and how assessment was used in this context as a selection method. Subsequently, and particularly since the 1960s, assessment has evolved into a complex and multifaceted entity that is now also used to aid learning and provide all students with a chance to achieve. The following sections review two of the significant developments underpinning the shift in assessment emphasis which are particularly relevant to this thesis, and which still impact significantly on modern-day practice; that is the move to criterion-referencing and the increased use of formative assessment.

2.2 The rise of criterion-referencing

The shift in theoretical basis of assessment from the psychometric and norm-referenced testing culture, to that of the broader educational measurement and criterion-referencing model, heralded a 'paradigm shift' (Gipps, 1994b, p. 1) to use Kuhnian terminology, in assessment practice. Paradigms are human constructions encompassing and reflecting the values of their human constructors (Guba, 1990, p. 23). They offer a framework for like-minded philosophers or researchers of interrelated concepts pertaining to a problem or activity, through which observation, understanding and possible solutions can be achieved. A paradigm-shift occurs when an old paradigm is unable to deal with an evolving or new activity or problem. In the educational assessment context, norm-referencing limited achievement, which became counter to the requirement for a larger and increasingly educated workforce. The move towards criterion-referencing provided a radical, alternative approach to assessment, which offered all students the opportunity to achieve – hence the paradigm shift. Indeed it has been argued that all developments in educational assessment since Glaser's (1963) seminal paper outlining criterion-referenced measures, have been based on the criterion-referenced model (Wood, 1986, p. 187), which remains the only alternative assessment philosophy to norm-referencing (Gipps, 1994b, p. 8).

During the 1970s, the big debate in the literature was between criterion-referenced assessment and the traditionally used norm-referenced assessment (Rowntree, 1977, p. 178). Psychometric tests compare individuals against defined norms from which grading or categorising of ability can be undertaken. This norm-referenced philosophy produces results such as, 10% of students awarded a grade A, 15% a grade B, 10% a grade C, etc. (Newton, 1997, p. 229), and underpinned A-level examination grades from 1962 until 1986 (AQA, 2003, p. 143). From the 1950s to the 1980s, the proportion of candidates passing A-level did not reduce significantly despite the A-level being opened up to a larger proportion of the age cohort, which illustrates the effect of norm-referencing in examinations (Newton, 1997, p. 229). However, a problem associated with ''[G]rading on the curve', or awarding grades in more-or-less predetermined pro-portions' (Rowntree, 1977, p. 181, emphasis in original), is that individuals cannot control their own grades as their achievement is based on 'the company they keep' (AQA, 2003, p. 143). Indeed, it is argued that norm-referencing

says nothing about what people can do or how proficient they are (Glaser, 1994, p. 7), and consigns half of those assessed to be failures (Wolf, 1993, p. 5).

In contrast, the educational measurement philosophy endeavours to assess *competence* or *achievement* as opposed to *ability*, using a broad range of tests that consider the individual as an individual, as opposed to comparison against other individuals and reference norms (Gipps, 1994b, pp. 5-10). Glaser refers to the underlying concept of criterion referencing as 'achievement measurement' (Glaser, 1963, p. 519), where a student's proficiency or achievement is measured along 'a continuum of knowledge acquisition ranging from no proficiency at all to perfect performance' as 'defined by recognised subject-matter scholars' (Glaser, 1963, p. 519). Popham, another founder developer and proponent of the criterion-referencing fraternity, defined criterion-referenced measures as, 'those which are used to ascertain an individual's status with respect to some criterion, i.e., performance standard' (Popham and Husek, 1971, p. 20). Standards associated with norm-referenced assessment occur after teaching and testing has occurred and relate to a comparison and ranking of students, all of which may be considered negative attributes of this style of testing. In contrast, criterion-referencing set standards before teaching and testing take place, so students' performance relates to the pre-set standards and does not involve competition with their peers, all of which can be considered positive attributes of a system that recognises and promotes individual achievement. Table 1 summarises the characteristics of the different assessment philosophies. However, as will be shown below, in practice both the setting of the predefined standard and the assessing against it can be fraught with pragmatic problems.

Table 1: Comparison of Norm-Referenced and Criterion-Referenced Assessment

	Norm-Referenced	**Criterion-Referenced**
Standards set	**After** teaching & test given	**Before** teaching takes place
Results expressed as	Comparison between students	How well student performance matches set criteria
Results	Dependent on other students	Independent of other students
Judgment based on	People (rank order)	Performance (standards)

(Biggs, 1999, p. 148; Cordon, 2003, p. 3)

2.2.1 Reasons for move to criterion-referencing in FE

In the 1960s, American educator and scholar Ralph Tyler, stated a need for all educational sectors to reach an increasingly larger proportion of the population:

> The changing structure of the labor force, the higher requirements for intelligent citizenship both make this demand. …the task of the college and university is to reach at least 50 per cent of our youth in order that our complex, industrial society can continue to develop.
>
> (Tyler, 1967, p. 15)

Tyler's quote highlights how the socio-political demands of a developing society became conflated with the changing structure of a labour force, and these together stimulated a need for increasing and wider access to education. Bloom also argued that due to the complexities of the skills required by the work force in highly developed nations, it was no longer practical for further and higher education to be restricted to a minority (Bloom et al., 1971, p. 44). The backdrop to both Tyler's and Bloom's concerns related to America in the 1960s, however similar concerns were also expressed in Britain. In 1956 the UK government published the white paper 'Technical Education' highlighting the 'rising demand for scientific manpower' and not just at the technologist level, but also at the technician and craft level (Pope, 1998, pp. 106-107). In 1969 the Haslegrave Report further emphasised the increasing demand for technician engineers to accommodate the advances in technology that were occurring at an increasing rate (Haslegrave, 1969, p. 25). Based on this technological backdrop, Bloom argued that 'modern societies cannot any longer be satisfied by making a selection of able students. They must find means of developing able ones' (Husen, 2001, p. 88). As will be discussed in the next Chapter, in the 1970s governments also began to equate a need for more education and training with continuing economic prosperity, which instigated a renewed political dimension into education. The above considerations required new approaches to education and assessment, and the move to criterion-referenced assessment provided a philosophy and practice to help, in part, satisfy the demand for an increasingly educated workforce.

Criterion-referencing has impacted upon teaching, learning and achievement across all educational sectors, but over the past 30 years it is the post-school sector that has seen a huge shift from norm-referenced examinations used for selection, to assessment that encourages more achievement (Ecclestone, 2009, p. 155). In particular, criterion-

referencing, and its sibling of competence assessment, have had a significant impact on vocational education (Torrance et al., 2005, p. 81; Wolf, 1995, p. xiii):

> Criterion-referenced assessment has been heavily promoted in recent years: for its contribution to improving teaching and learning, its ability to make assessment results more comprehensible and useful, and the opportunity it offers for everyone to have their positive achievements recognised.
>
> (Wolf, 1993, p. 15)

Sadler (2005, p. 175) also suggests 'the increasing use of criteria-based approaches to assessment and grading .... is a consequence of its sound theoretical rationale and its educational effectiveness.' Criterion-referenced assessment offers 'a fairer and more accountable assessment regime than norm referencing' (Dunn et al., 2002, p. 1), in which all students can achieve, and where test scores can be 'informative about the nature of the acquired behaviour and competence' (Glaser, 1990, p. 475). Of course the increasing use of criterion-referenced assessment has a political dimension as it helps monitor and raise participation in formal education and training, aids quality assurance activities and facilitates harmonisation of qualifications in a national framework (Ecclestone, 2003, p. 2).

A characteristic of criterion-referenced assessment is the use of *learning outcomes* to define coverage and standards. Learning outcomes (or *competences* in the vocational sector) came to prominence in the mid-1980s as a result of the British Government's requirement with setting of national standards for classroom, and workplace education and training (through the implementation of GCSEs and NVQs). However, the use of learning outcomes now permeates all sectors of education, from the school sector through to the HE sector. As learning outcomes form part of the implementation process of criterion-referenced assessment, they should explicitly define how student achievement is to be measured and reported, focus attention on what is to be learnt instead of the process of learning itself, and relate to such attributes as knowledge, skills and understanding (Melton, 1996, p. 409-410).

Jessup, a more recent but major proponent of the criterion-referenced movement in the vocational sector through workplace, competence-based NVQs, contended 'assessment is being brought into the real world and de-mystified within the new model of education and training' (Jessup, 1991, p. 135). He stated the advantages of criterion-

referenced, outcome-based assessment as being: authentic assessment methods (no need for last minute cramming for exams); fairness, as explicit standards are openly available to all participants; and students can take ownership for their learning (through self-assessment), with all having the chance to achieve (Jessup, 1991, p. 135). However, Jessup's advocacy for outcome-based assessment has been subject to various criticisms (James and Knott, 1994; Smithers, 1993; Wolf, 1997). In particular, as having philosophical underpinnings which are considered conceptually confused, epistemologically ambiguous in treatment of knowledge and understanding, and based on largely discredited behaviourist learning principles (Hyland, 1993, p. 66; Hyland, 1997, p. 501). Researchers also dispute the 'clarity of performance' of criterion-referenced assessment, as purported by the likes of Glaser, Popham and Jessup. In his rebuttal of these criticisms, Jessup (1995a) suggests that lack of understanding of the GNVQ in particular, is partially a problem for 'teachers nurtured on more traditional practices' (Jessup, 1995a, p. 8). However, he appears to accept concern over ensuring 'consistent assessment between assessors, centres and awarding bodies' (Jessup, 1995a, p. 9).

2.2.2 Problems with implementing criterion-referencing

One of the principal problems associated with criterion-referenced assessment is defining explicit and unambiguous criteria (Harlen et al., 1992, p. 217; Harlen, 2007, p. 78; James and Knott, 1994, p. 13). In the early 1990s, Alison Wolf researched assessment in the vocational sector, and became a key figure in influencing the understanding the difficulties of using criterion referencing in practice. Contrary to proponents of the objectivity of criterion-referenced assessment, Wolf found problems with interpretation that led to much subjectivity associated with what were intended to be clear and unambiguous criterion-referenced domains. The more focused and rigorous the attempts to define or specify the domain being tested, the narrower the assessment tended to become (Wolf, 1993, p. 6). Perfect transparency or explicitness (Jessup, 1991, p. 135), however detailed the definition or atomised the objectives, was not a practical possibility (Wolf, 1993, p. 10). When creating assessments, what authors thought were test items of equal difficulty proved to be very different, particularly in view of the skills and competences which people actually and unpredictably required to answer the questions (Wolf, 1993, p. 11). Wolf illustrates this by comparing an explicit numerical-based question of 24 divided by 6, with a

question requiring the same calculation but written in a contextualised format. Whether researching the use of criterion-referenced testing in the school or vocational sector, Wolf's findings showed that specifications provided the minimalistic guidance to test developers as to the level of difficulty and mastery to be assessed (Wolf, 1993, p. 15).

The subjectivity present in criterion-referenced assessment is highlighted within mastery learning, which implies a demand for 100% success rate, but in practice tends to translate into 80% compliance on assessment (Wolf, 1995, p. 70; Bloom, 1976, p. 125). A figure of 70% was stated by Jessup in relation to achievement on external criterion-referenced GNVQ tests in the 1990s, which provides a 'pragmatic interpretation of mastery learning' (Jessup, 1995b, p. 46). Wolf has highlighted concerns associated with a decentralised criterion-referenced assessment system demanding 100% compliance to a written standard, as:

> ...ambiguity or economies with the truth very quickly become institutionalized. What is more, there is no way of knowing whether one centre applies its assessments more accurately or unambiguously or allows more compensation than another, and therefore no control over how much ambiguity has been created, or how much 'slippage' from standards there has been.
>
> (Wolf, 1993, p. 21, emphasis in original)

Thus, in such an assessment system, 'you don't know exactly what the candidate achieved' (Wolf, 1993, p. 21), which is a criticism levelled at norm-referenced assessment.

Wolf found test developers actually drew upon their own holistic judgements obtained from their past experiences, and at a later stage, feedback they obtained from piloting their own tests (Wolf, 1993, p. 15). Implementation of decentralised criterion-referenced specifications rely on 'shared meanings and common understandings' to help develop and implement standards (Wolf, 1993, p. 13). Similar findings were uncovered by Ecclestone (2001), researching how outcomes and criteria used within a franchised degree programme offered clarity to teachers in making reliable grading decisions, where assessors used 'unconscious compensation tactics' (Ecclestone, 2001, p. 308; Wolf, 1993, p. 17). Another small case study undertaken by Price (2005) in a post-1992 university business school, concerned the difficulties of establishing, sharing and applying assessment standards within module teams, and 'how staff 'come to

know' about assessment standards' (Price, 2005, p. 219, emphasis in original). Price found, 'assessment standards can only become meaningful when tacit knowledge, developed within a local community of practice, is effectively shared' (Price, 2005, p. 228). In practice, criterion-referenced assessment is complex, incremental and above all judgmental, with performance observed directly or in the form of artefacts, being intrinsically variable (Wolf, 1993, p. 16). Assessors apply judgements through a compensating model accounting for both contexts of the performance, and of its own characteristics. Subconscious allowances for the degree of difficulty associated with tasks are made when evaluating performance and a holistic perspective transcends judgements, where weaknesses in one area, offset by strengths in another (Wolf, 1993, p. 17). Assessors interpret the actual performance by reference to the context and other aspects known (or thought known) about students (Wolf, 1995, p. 71). However, this subjective and 'covert practice' of accounting or compensating for students ''effort' or 'improvement'' (Rowntree, 1977, p. 179, emphasis in original) is not new, and finds resonance in the compulsory sector (Hyland, 1997, p. 365). The above findings suggest there is a lack of common understanding of 'what criteria-based means or what it implies for practice', and that 'fundamental judgments teachers make about the quality of student work remain subjective and substantially hidden from the students' (Sadler, 2005, p. 175).

In practice, 'criterion referencing requires considerable negotiation to arrive at agreed criteria and standards' (Dunn et al., 2002, p. 2), 'between all participants in the assessment process' (Carlson et al., 2000, p. 115). These findings are counter to originally cited benefits of criterion-referencing and indeed have since been acknowledged by its founding proponents (Popham, 1984 cited in Wolf, 1993, p. 13; Popham, 1994, p. 17). This acceptance poses questions about criterion-referenced assessment and its validity and reliability. Validity meaning 'it measures what it is supposed to measure' and reliability meaning it is 'consistent over time and between different people' (Boys, 2000, p. 29; Wiliam, 1992), which proponents such as Jessup purport as being implicitly contained in the clarity of the criteria (Jessup, 1991, p. 192). In practice, problems of defining and estimating the reliability associated with criterion-referencing are sometimes ignored due to the lack of consensus about how to evaluate it (Gipps, 1994b, p. 85), and difficulties in establishing consistency (Raggatt and Williams, 1999, pp. 113-114). Indeed, endeavouring to ensure validity and

reliability in criterion-referenced assessment can 'distort proper teaching objectives concerning the development of pupil knowledge and understanding' (Davis, 1995, p. 3). Such concerns suggest deficiencies in the use of criterion-referencing to generate valid and useful information and feedback about students' achievements.

2.3 The rise of formative assessment

Another major development spawned out of the 1960s opening-up of the assessment debate, was the formalising of 'formative assessment' practice as distinct from the traditional summative uses of assessment. Originators of formative assessment are acknowledged to be Michael Scriven and Lee Cronbach (Roos and Hamilton, 2005, pp. 7-8). Scriven was initially a proponent of summative assessment, but in his seminal 1967 paper that formally defined the distinction between formative and summative assessment, he acknowledged Cronbach's emphasis and expressed importance of formative assessment (Scriven, 1967, p. 43; Taras, 2005, p. 466). However, it was Benjamin Bloom in conjunction with Thomas Hasting and George Madaus, who first used the term 'formative evaluation' in its generally accepted current meaning (Black and Wiliam, 2003, p. 623). In the early 1970s, Bloom et al. published a Handbook of Formative and Summative Evaluation which reached a wide audience, and contrasted summative and formative assessment (Newton, 2007, p. 151). Bloom et al.'s aim was 'to help teachers become aware of the different purposes of evaluation' and expose them to new methods of assessment to improve teaching and learning (Bloom et al., 1971, preface; Newton, 2007, p. 151). It should be noted that the likes of Scriven and Bloom use the term 'evaluation', as do most US academics, in the sense of 'assessment' (see Taras, 2005, p. 467).

Although acknowledged in the academic literature for its potential benefits for learning, formative assessment also termed 'assessment for learning' (ARG, 2002; Ecclestone and Pryor, 2003, p. 472; Pryor and Crossouard, 2005, p. 1; Hargreaves, 2007, p. 186), did not receive significant formal attention in the UK until the 'highly charged political atmosphere surrounding the introduction of national assessment' in the 1980s (Torrance, 1993, p. 333). During this time a debate arose around the purposes of assessment from both the formative (to assist learning) and summative (to report achievement) perspectives. The Task Group on Assessment and Testing Report

(TGAT, 1988), which reported to the government and established the main features of national assessment at that time, claimed assessment could do both and provide evaluative information on curriculum and teaching provision for school managements (Torrance, 1993, p. 333). The TGAT report brought the terms formative, summative, diagnostic and evaluative into common parlance in the UK (Newton, 2007, p. 154). TGAT, as Bloom previously, stressed the benefits of the formative assessment as an integral part of classroom practice for both pupils and teachers, and the use of a range of testing tools including practical tasks and observations (Green, 2006, p. 5).

However, concerns were expressed that formative assessment could be implemented at best in a fairly mechanistic and behaviouristic way and at worst being essentially summative, taking snapshots of where students have got to, as opposed to what they need to do next (Torrance, 1993, p. 340). Nuttall (cited in, Lambert and Lines, 2000, p. 119) also outlined concerns over TGAT proposals to integrate summative and formative assessment practices. There were pragmatic concerns about applying the well-founded theoretical formative assessment (Torrance, 1993, p. 340), that sounds a straightforward concept at the level of definition (Ecclestone, 2010b, p. 47), in the complexities of the classroom context (Torrance, 1993, p. 341). As will be shown later, researchers have found such concerns to be justified (Ecclestone, 2010b; Torrance et al., 2005). In practice, the TGAT recommendations for increased use of formative assessment in schools evolved over time into summative testing, which was perceived as more rigorous for reporting purposes (Green, 2006, p. 5). However, since its formalisation as a classroom pedagogy in the 1980s, formative assessment has received interest across all educational sectors, although most notably within vocational FE.

2.3.1 Reasons for move to Formative Assessment

Although formative assessment had been promoted by Bloom in the 1970s (Bloom et al., 1971; Bloom, 1976, p. 173) as an aid to students' learning and achievement, albeit as a 'behaviourist activity in the mastery learning tradition' (Torrance, 1993, p. 336), it only began to reach prominence within classroom practice following Black and Wiliam's (1998a) 'extensive' (Dann, 2002, p. 45) and 'seminal study' (Dunn and Mulvenon, 2009, p. 1; Stobart, 2006, p. 235; Tierney, 2006, p. 239; Watson, 2006, p. 290). Black and Wiliam's meta-analysis of initially nearly 700 articles written between 1987 and 1997, focused on 'ecological validity' (Black and Wiliam, 1998a, p. 10),

which relates to deriving theories from settings in which they are to be applied (Cohen et al., 2000, pp. 110-111; Entwistle, 2005, p. 11), and considered evidence of formative assessment practice used by teachers in their school or college classrooms. This 'substantial literature review' (Boud and Falchikov, 2007, p. 4) is considered to have made a significant contribution to the assessment debate (see Hargreaves (2005, p. 213), Ecclestone and Pryor (2003, p. 472), Boud (2000, p. 156)), as Black and Wiliam's study clearly showed how formative assessment has a positive impact on student learning (Sadler, 1998, p. 84). Indeed this is one of the few academic ideas to have had major influence on policy and practice in the UK and beyond (Ecclestone, 2010b, p. 32). However, twenty years on from the TGAT recommendations and a decade after Black and Wiliam's work, concerns over instrumentalism are still voiced by researchers as assessment instruments have come to dominate content, process and outcomes of education (Ecclestone, 2010b, p. 1; Torrance, 2007, p. 2) with formative and summative assessment classroom practices almost indistinguishable from each other (Ecclestone, 2010b, p. 2).

2.3.2 Problems with implementing formative assessment

Although Black and Wiliam's study has found almost unanimous recognition for its rigour and ethical underpinnings, there has been concern that their lack of acknowledgement of the positive effect that summative assessment can also have on learning. In reviewing the Black and Wiliam article, Biggs (1998) argues that there is a powerful interaction between formative and summative assessment and that a conceptualised framework incorporating both modes could provide enhancement to learning (Biggs, 1998, p. 106). Taras (2007) also suggests that separating formative and summative assessment can impinge on the implementation of formative assessment itself as, making reference to Scriven's original definition, formative assessment cannot occur unless a summative assessment is first undertaken (Taras, 2007, p. 370).

Although formative assessment is accepted as basic to good teaching (Biggs, 1999, p. 160; Yorke, 2003, p. 483), it does not have a 'tightly defined and widely accepted meaning' (Black and Wiliam, 1998a, p. 7; Ecclestone, 2002, p. 41; Ecclestone, 2010b, p. 33), which has hampered classroom implementation. Black and William's definition of formative assessment is:

> Assessment for learning is any assessment for which the first priority in its design and practice is to serve the purpose of promoting students' learning. It thus differs from assessment designed primarily to serve the purposes of accountability, or of ranking, or of certifying competence. An assessment activity can help learning if it provides information to be used as feedback, by teachers, and by their students, in assessing themselves and each other, to modify the teaching and learning activities in which they are engaged. Such assessment becomes 'formative assessment' when the evidence is actually used to adapt the teaching work to meet learning needs.
>
> (Black and Wiliam, 2002)

This definition states formative assessment pertains to all tasks creating *feedback* to students about their learning achievements, from where both students and teachers can take steps to improve classroom learning and teaching (Biggs, 1999, p. 142; Black and Wiliam, 1998b, p. 2; Cowan, 2003; Harlen and James, 1997, p. 369; Huddleston and Unwin, 2002, p. 143; QAA, 2006, p. 35). In Black and Wiliam's definition, summative assessment appears considered a terminal event used for accounting, ranking and certifying purposes, suggesting that formative assessment opportunities have ended.

However, based on Scriven's definition, summative assessment is a 'judgement according to weighted standards, goals and criteria' (Taras, 2007, p. 364). If 'feedback is information about the gap between the actual level and the reference level of a system parameter which is used to alter the gap in some way' (Ramaprasad, 1983, p. 4), it cannot be generated until a summary judgement is made against a set standard, be that a formally stated criterion-referenced or ipsative based one. Thus, with such 'a fuzzy distinction' between summative and formative assessment (Knight and Yorke, 2003, p. 34) present within the literature, it is not difficult to see why teachers in the pressurised and time-constrained environment of the classroom may struggle to understand and implement formative assessment, and tend towards the more traditional and better understood summative practices. Black and Wiliam's work suggests that few teachers, whether in schools or FE, are likely to be confident about the differences between formative, diagnostic and summative assessment (see Ecclestone, 2002, p. 41; Harlen and James, 1997, p. 367). This has been found from research into the compulsory sector (Neesom, 2000, p. 4) and perhaps more surprisingly, was found amongst university lecturers in education (Taras, 2008). In Taras' small-scale study of

the Education Department of an English university, only 28% of participants (n = 49) stated the term 'feedback' within their definition of formative assessment (Taras, 2008, p.184). Knight and Yorke suggest assessors 'typically do not have any substantial grounding in the theory (limited as it is) and practice of assessment' (Knight and Yorke, 2003, p. 38, emphasis in original), as within engineering for example (McDowell, 2004, p. 179), which is a cause for concern when implementing formative assessment practices. Indeed, assessment design and instrumentation is often ad hoc and lacking in a theoretical base (Knight and Yorke, 2003, p. 38; Torrance, 1993, p. 334); with limited dissemination of assessment work between colleagues, and teachers not trusting or using their own assessment results (Cizek, et al., 1995 ; Hall et al., 1997 cited in Black and Wiliam, 1998a, p. 18).

Ecclestone suggests that although there is widespread acceptance amongst researchers, policy-makers and teachers about the ideas of formative assessment, perceptions of learning can vary. For example, formative assessment can be seen as teacher-centred activities related to attaining objectives where knowledge is fixed, externally defined and 'transmitted', and where assessment practice involves continuous feedback to monitor and record a summative task. Alternatively formative assessment can encompass learning as 'transaction' between teacher and student, involving a 'construction of knowledge' (Ecclestone, 2007, p. 317). So, does formative assessment find encampment within the behaviourist tradition through such approaches as mastery learning, where what counts is teachers and students' focus on the ultimate behaviour required? Alternatively is formative assessment theoretically underpinned by the social constructivist perspective in cognitive psychology, where the role of teacher-student interaction forms part of the learning process (Torrance, 1993, p. 336)? Torrance and Pryor (1998, p. 10) argued that formative assessment is a 'construct', what Ecclestone and Pryor (2003, p. 472) referred to as an 'interactive pedagogy', based on constructivist ideology. However, if teachers are the central characters in formative assessment (Earl, 2003) and it is they making judgements on feedback to modify the teaching process, then as Dann (2002, p. 29) states, it is 'hardly consistent with constructivist theories of learning'.

Researchers have found the above lack of clarity in the theoretical underpinning of formative assessment has caused confusion between formative and summative

assessment (Taras, 2008, p. 174), which has led to conflation of summative and formative purposes (McDowell, 2004, p. 180) in practice. This 'uneasy conflation of two distinct models of evaluation and assessment' (Roos and Hamilton, 2005, p. 9) is a cause for concern as it inhibits use and effectiveness of formative assessment within classroom practice:

> …a consequence of the conflation of summative and formative purposes may be that either there is little genuine formative assessment (or what there is may not be recognised as such) or that teachers are struggling to meet both requirements and experiencing assessment overload.
>
> (Harlen and James, 1997, p. 365)

2.4 Context, culture & the rise of 'Assessment as learning'

Just as theories of learning cannot be considered devoid of the context of application and the complexity as to how the student, teacher, teaching method, assessment tasks, establishment, etc., interact with each other (Biggs, 1992, p. 1), so assessment practice has been found to be influenced by an array of contextual factors (Boud, 2007, pp. 22-23). As already mentioned in Section 2.2.2 (page 26), researchers have found interpretation and implementation of criterion-referenced specifications significantly depend on tacit, shared meanings and common understandings of the *community of practice* within which it is located. Research into formative assessment within communities of practice in the post-compulsory sector has also found it to be affected by an array of complex political, social, institutional and individual factors (Ecclestone and Pryor, 2003, p. 472). Wenger defines a community of practice as a group of people (such as teachers and learners) who share a concern or passion for something they do, and who learn how to do it better through regular interaction (Wenger, 2006). Communities of practice in the post-compulsory sector have been found in part to be shaped by the material conditions and discursive contexts in which teachers and learners are placed (Avis et al., 2002, p. 45), and which help shape the 'sociocultural practices of a community' (Lave and Wenger, 1999, p. 83). Research studies in the vocational FE sector have found it is the teachers and learners who construct jointly notions of the required standard of achievement (Ecclestone, 2002, p. 3; Ecclestone, 2003, p. 471). It is through these local communities of practice that standards are

interpreted and defined, and through which all meaningful judgements about standards are made (Torrance et al., 2005, p. 3).

However, such contextual considerations and concerns are not new, Rowntree (1977) acknowledged the effect of teachers' and students' interpreting and construing aims of learning and translating them into action through relationships and behaviours expected of each other (Rowntree, 1977, p. 91). This forms a compromise between what the system requires, what the students want to learn and what the teacher feels capable of teaching (Rowntree, 1977, p. 91), which still resonates with findings from current practice (Ecclestone, 2002, p. 142; Ecclestone and Pryor, 2003, p. 479). The above research highlights how evaluation of assessment practice, particularly in the localised vocational FE sector, is influenced by powerful, contextual factors that underlie beliefs and values, and what is considered as good and worthwhile educational purposes (Ecclestone, 2010b, p. 52).

Ecclestone states the necessity of developing the cultural understanding to illuminate the learning opportunities and assessment systems encountered by all participants in a learning site. She highlights the need to determine both the implicit and explicit values and beliefs that teachers, students, institutional managers, inspectors and awarding bodies hold for the purposes of a course or qualification and about students' abilities and motivation. Ecclestone also highlights how, 'students are far from passive in how they engage with formal expectations', and how their relationships with teachers, other students, the resources available during the course and their lives outside college, also impact on the learning culture (Ecclestone, 2007, p. 323). Indeed Ecclestone argues that even within a framework of particularly detailed and prescriptive elements that regulate teachers' assessment judgements and impose constraints and procedures, students and teachers have scope for 'enactment and reproduction of social relations' (Hodkinson et al., 2007; cited in Ecclestone, 2007, page 323).

Recent research in the FE sector has considered learning from the socio-cultural perspective, within what are termed 'learning cultures' (James and Biesta, 2007). Learning cultures are considered 'complex and multifaceted entities' that 'exist through the actions, dispositions and interpretations of the participants' (James and Biesta, 2007, p. 4), and impact on the individual as much as the individual impacts on the

learning culture. This theory considers the key characteristics of learning cultures as being 'not the contexts in which people learn, but the social practices through which people learn' (James and Biesta, 2007, p. 28). James et al.'s research proposes such cultures can permit and encourage certain types of learning, or discourage and preclude others, thus enabling or disabling different learning possibilities for individuals that encounter them (James and Biesta, 2007, p. 28). This suggests for example, an engineering programme area in two different colleges may offer the same course, encompassing the same units and content, using similar assessment strategies and methods. However, the similarities could end there, as implicitly very different learning goals and beliefs about students' dispositions and abilities may be present with different meanings of learning communicated to students (Ecclestone, 2010b, p. 48); and students (and others) in this context will also influence those practices (Ecclestone, 2010b, p. 54). Thus the way in which students learn and what they learn, has the potential to be in total contrast due to the learning cultures within different localised learning sites and the interactions of participants.

2.4.1 A move to 'Assessment *as* Learning'?

The foregoing discussion has highlighted the immense complexity and subjectivity associated with educational assessment in the modern-day vocational FE context. In part, this is attributable to the increasing emphasis on the use of criterion-referencing and formative assessment, which has muddied teachers' assessment practice. Also, as has been found, assessment is significantly influenced by contextual considerations associated with socio-cultural and socio-political factors, all of which 'affect students' and teachers' expectations, attitudes and practices in particular ways' (Ecclestone, 2007, p. 316).

Although the much-espoused benefits of assessment for learning are often related to the use of formative assessment, without a standard against which to assess summatively, feedback to aid learning cannot be generated. Thus in the vocational FE sector, it is the interaction of formative assessment and criterion-referenced assessment that underpins 'assessment for learning' as a classroom practice. This forms a teacher-student, 'interactive pedagogy' (Ecclestone and Pryor, 2003, p. 472) that is influenced by the vagaries and subjectivity of the culture, context and community of practice that form the local learning culture. Government driven emphasis on accountability and

portrayal of achievements has also been found to have had significant explicit and implicit effect on classroom practice, with learning and the necessary assessment processes [i.e. formative assessment] pushed into the background (Boud, 2000, p. 155); something uncovered in recent research by Torrance et al. (2005) into the post-compulsory sector of education in England.

Torrance et al. (2005, p. 2 & p. 56; Torrance, 2007, p. 281) argue that the above influences have resulted in a shift in assessment practice that has extended its hitherto dichotomy of the traditional 'assessment of learning' and the recent emphasis on 'assessment for learning', to a trichotomy which now includes what he terms 'assessment as learning'. This practice, commonly if perhaps unwittingly, is found within the vocational sector where:

> …assessment procedures and practices come completely to dominate the learning experience, and 'criteria compliance' comes to replace 'learning'.
>
> (Torrance, 2007, p. 282, emphasis in original)

It should be noted that Earl (2003), in the context of compulsory education, also proposes a trichotomy of assessment philosophies, but 'assessment as learning' in her context suggests a more structured focus on student self-assessment (see also Dann, 2002, p. 142), where students are not just contributors to, but are the 'critical connectors' between the assessment and learning process. It could be argued that assessment as learning in the Earl and Dann context relates to a shift from behaviourist theories of learning to humanist theories, promoting student-centred education and evolving active discovery. In this context students are highly self-motivated; taking responsibility for their learning towards the satisfaction of their own personal needs and goals in relation to external standards, thus resulting in a process that enhances student learning. A similar perspective on student involvement in the 'learning-loop' is stated by Davies and Le Mahieu (2003), although they still refer to this focus on student involvement in the assessment process as 'assessment for learning'. However, Torrance's description of assessment as learning in the vocational FE context takes a less deferential perspective, describing it as:

> …a process in which displacement of learning (i.e. understanding) by procedural compliance: i.e. achievement without understanding.
>
> (Torrance, 2007, p. 293)

Here achievement is often defined in 'fairly narrow and instrumental terms' (Torrance, 2007, p. 284) with an emphasis on criteria compliance. Torrance appears now to have uncovered evidence to support the concerns he raised about the use of formative assessment in classroom practice (Torrance, 1993, p. 340), as achievement is often related to students securing evidence or the expected grades but which are 'not necessarily the highest grades available or even directly related to competent practice' (Torrance, 2007, p. 284). These findings resonate with Ecclestone's GNVQ study where detailed GNVQ specifications and performance criteria, 'both offered security and set boundaries to engagement' (Ecclestone, 2002, p. 152). This tended to cause students, and indeed lecturers, to operate within a comfort zone, where discrete tasks for pass grade were devised, enabling more students to pass, but limiting the expectations for higher-grade awards (Ecclestone, 2002, p. 152; Ecclestone, 2007, p. 326). This emphasis aimed at achieving the criteria, was underpinned by various instrumental methods such as:

> Detailed tutor and assessor support, in the form of exam coaching and practice, drafting and redrafting of assignments, asking 'leading questions' during workplace observations, and identifying appropriate evidence to record in portfolios.
>
> (Torrance, 2007, p. 282, emphasis in original)

Failure in this context related to non-completion of a course, for example by not completing a portfolio of evidence, however provided the work was eventually completed, the award could be achieved (Ecclestone, 2007, p. 326; Torrance, 2007, p. 284). Torrance et al. found a culture of widespread support for students (Torrance, 2007, p. 285), with tutors providing one-to-one verbal feedback to students in relation to the achievement of the criteria. Multiple opportunities to re-submit assessment drafts are allowed, even further attempts at summative assessments (written tasks that respond to a specific question and a set of criteria) are permitted to improve grades (Torrance, 2007, p. 286). In essence, where 'assessment as learning' is present in classroom practice, learning is disadvantaged.

2.5 Researching assessment in Further Education

Academic research relating specifically to vocational assessment practice in the FE sector appears very limited (Ecclestone, 2007, p. 317; James and Biesta, 2007, p. xiii).

In this section, the few case studies related to assessment practice in the vocational FE sector that have relevance to my research are reviewed, and their salient findings considered.

Boys (2000) undertook research at one college, which focused on the Advanced GNVQ Business Studies course (the most popular), and researched the programme's autonomy, format of learning outcomes and vocational nature; and in addition reviewed the standards achieved by GNVQ students (Boys, 2000, p. 1). The philosophy of the GNVQ was founded on 'learning outcomes' being defined for students as well as staff, and so provided for individual responsibility for learning and coursework assessment. This was in contrast to traditional classroom-based didactic teaching and assessment predominantly by unseen, closed-book written examinations (Boys, 2000, p. 9).

Ecclestone (2002) also undertook research related to Advanced GNVQ programmes, in Health and Social Care and Business programmes at two colleges. This research in part, evaluated how the GNVQ outcome-based assessment model impacted on formative assessment, which was used as a key to promoting motivation and autonomy (Ecclestone, 2002, p. 5). Ecclestone characterised her two-year research as a small sample, confined to one type of qualification, with conclusions written with a view to testing them with a wider audience of policy-makers, researchers and practitioners (Ecclestone, 2002, p. 170).

Torrance et al.'s (2005) recent FE-based research, investigated 'The Impact of Different Modes of Assessment on Achievement and Progress in the Learning and Skills Sector (LSS)'. This research encompassed a series of parallel case studies concurrently undertaken across settings in school sixth forms, further education colleges, workplaces and adult learning environments. It included BTEC programmes in both Sport and Business Studies, as well as ACVE and Motor Vehicle trainees involved with competence-based NVQs. The aims of the study were to explore learner experiences of assessment in the LSS, compare and contrast assessment experiences of learners in different settings, and identify how learners can best be supported in engaging with different demands of different assessment methods.

In 2010 Ecclestone published results of in-depth fieldwork undertaken during 2006 to 2008, which confirms many of the findings from her earlier studies of vocational education assessment, but which explains why formative assessment is (a) widely misunderstood and (b) used totally instrumentally(Ecclestone, 2010a). This study researched such questions (amongst others) as; when does formative assessment lead to instrumental compliance and when does it lead to worthwhile learning, and why do what appears to be similar assessment practices have different effects in different FE 'learning cultures' (Ecclestone, 2010b, pp. 7-8). Six case studies were undertaken, one of which specifically related to a Level 3 BTEC National Diploma in Public Services, taught at two different FE Colleges. Within these studies, assessment formed an intrinsic part of the learning process, where characteristics of coaxing and cajoling (Ecclestone, 2002, p. 36); coaching (Boys, 2000, p. 100) drafting and redrafting (Boys, 2000, p. 286; Ecclestone, 2002, p. 150; Torrance et al., 2005, p. 1) of students' work were found to be commonplace. Data gathering involved interviewing both teachers and students, although these studies also incorporated other methods such as questionnaires, participant observations, discussion groups and documentary evidence.

During the research for this literature review, only one study was found that specifically encompassed the BTEC National assessment in an 'engineering discipline'. The QCA (2005) undertook a study from December 2004 to April 2005, relating to a 'Comparability study of assessment' in England, Wales and Northern Ireland. This work formed part of the regulatory authorities' ongoing programme of quality assurance monitoring of qualifications. The study compared the consistency and quality of assessment practices associated with the BTEC National qualifications in Business, Media and Engineering, specifically the Certificate and Diploma in Operations and Maintenance Engineering. The QCA study encompassed 122 centres including general FE institutions, inspected assessors' 747 judgements from over 1000 pieces of student (n = 361) evidence, and undertook interviews with students and assessors (QCA, 2005).

2.5.1 Findings from FE research into assessment practice

Boys' GNVQ study found problems noted by Wolf, Ecclestone and Price, in that criterion-referencing lacked 'precision about the standards to be achieved' and how this contributed to a 'failure of internal and external verification to establish high standards'

(Boys, 2000, p. 311). The QCA (2005) study also identified similar weaknesses associated with use of assessment and grading criteria in the BTEC programmes of some centres, such as inconsistent application of merit and distinction criteria; incorrect assessment decisions within engineering programmes, and inconsistent quality of internal and external verification (QCA, 2005, p. 3). Ecclestone's (2002) GNVQ-based research also found criterion-referenced assessment, implemented through the use of assessment and grading criteria or 'bullet points' as they were colloquially termed, had a significant influence on both the teachers' and students' micro-level assessment practice. Ecclestone uncovered a further problem associated with criterion-referencing, which found that lecturers and students' focus on the criteria per se, impacted negatively on perceptions of assessment and achievement. Teachers often referred to the criteria in summative terms such as `tracking', `covering', `listing' and `hitting the bullets' (Ecclestone, 2002, p. 122), and tended to use assignments that were broken into discrete and easily accessible tasks (Ecclestone, 2002, p. 163). The use of bullet points generally caused students, even high achieving ones (Ecclestone, 2002, p. 142), to become minimalistic in some assessment submissions, with teachers and students viewing assessment as `meeting the requirements' and not about deepening learning (Ecclestone, 2002, p. 167). Both students and teachers lost the holistic perspective on assessment, in some instances viewing achievement in a piecemeal fashion through the process of written or oral feedback, resulting in the re-submitting of 'atomised bits of assignments in order to pass' (Ecclestone, 2002, p. 163).

If students did not follow the criteria, teachers had to 'refer work back to fill gaps' (Ecclestone, 2002, p. 162). Indeed the referral situation proved to be common practice, as Ecclestone found in her study that out of fifty assignments assessed across each of the ten units considered, within each unit most students had to repeat parts of the assignments more than once to meet the criteria for pass (Ecclestone, 2002, p. 150). Boys' research found students could re-submit assessment work multiple times although this caused staff authenticity concerns due to the possibility of students 'copying from books' (Boys, 2000, p. 285) or 'someone else' (Boys, 2000, p. 286). However, the QCA study found great inconsistency within the BTEC qualification on access to re-assessment from very limited to unlimited, with some re-submissions occurring ten months after the final deadline (QCA, 2005, p. 17).

Feedback given to students was often aimed at closing gaps in coverage as opposed to enriching learning, which was a response to teachers wanting students to pass but at the same time, being scrutinised for compliance with national standards (Ecclestone, 2002, p. 167). Feedback other than that aimed at filling the gaps to achieve the bullet points was futile in its effect on student performance. The explicit nature and openness of the grading criteria resulted in students overtly resisting any content not relevant to the assignment and would not wait for the bigger picture (Ecclestone, 2002, p. 126). Formative assessment in this context was akin to a 'pre-emptive extension of summative checking, tracking and evidencing' (Ecclestone, 2002, p. 167). There was a lack of professional awareness of different purposes of assessment (Ecclestone, 2002, p. 155), and teachers did not connect assessment with everyday formative and diagnostic activities (Ecclestone, 2002, p. 153). This is compounded by a dominant summative mindset about the goals of assessment (Ecclestone, 2002, p. 44) and 'confusion between formative and summative assessment evidence' (Boys, 2000, p. 311). Within the GNVQ formative and summative became part of the same process (Boys, 2000, p. 14), as students were permitted to draft and redraft assessments. This was also found the case with BTEC Nationals, where formative assessment is 'integral to the educational ethos of the qualification' (Torrance et al., 2005, p. 14), to the extent that:

> 'Unofficial' formative assessment underpinned the course, where oral feedback after giving back assignments, with written comments, was equally important: 'We're giving them verbal feedback all the time'.
>
> (Ecclestone, 2010b, p. 132, emphasis in original)

There is still debate in the literature as to whether it is possible to combine the two purposes of formative and summative assessment. Gipps (1994b) suggests that the bias of an assessment is dependent on the purpose of the assessment, and where the summative and formative purposes are combined, summative purposes always dominate teacher and learner thinking and behaviour (1994b, p. 261). This was found to be the case with regards the recommendations of TGAT (outlined above), and seems replicated in the research findings discussed here. In practice, a summative emphasis may prevail due to a genuine lack of formative assessment. This may be due to work overload, lack of understanding (Ecclestone, 2002, p. 155), or perhaps teachers thinking that a 'series of 'mini' assessments each of which is essentially summative in

character' (Harlen and James, 1997, p. 365, emphasis in original), constitutes formative assessment. Both Boy's and Ecclestone's research has shown how cultural considerations have significant impact on practice and how:

> …engagement within any 'assessment community' occurs within largely tacit boundaries formed by expectations of students' ability, motivation, dispositions to learning and their prospects for progression into jobs or more education.
>
> (Ecclestone, 2002, p. 171)

Ecclestone found in a summative sense, students were able to 'press teachers into reducing their expectations' where they perceived 'boring or irrelevant knowledge and learning activities'. Students' traits such as their aversion to difficult subjects, interpretations of assessment specifications, perceptions of their own abilities, and the 'pragmatic boundaries created by the logistics of their lives', all influenced assessment practice (Ecclestone, 2002, p. 154). There were also many opportunities for 'informal' and 'non-formal' learning within the programme, which had positives in retaining students on the programme; however, due to a lack of a pedagogical strategy, combined with 'ad-hoc' implementation, students were able to 'exert an undue influence on expectations and norms' (Ecclestone, 2002, p. 154). In essence, Ecclestone's research found 'limited meaningful transformations of learning or knowledge' in the assessment activities (Ecclestone, 2002, p. 152), and that both 'teachers and students viewed assessment as 'meeting the requirements' and not about deepening learning' (Ecclestone, 2002, p. 167, emphasis in original).

Many of the above findings from both Ecclestone's and Boys' research were also found by Torrance et al. (2005). Their later study showed how the move to criterion-referenced assessment and competency-based assessment has provided for greater transparency of intended learning outcomes, which has helped to retain learners in the Learning and Skills Sector, and so increased their achievements. This has been due to a combination of clarity in assessment criteria, procedures and processes, underpinned by widespread use of formative feedback (Torrance et al., 2005, p. 1). However, as with Ecclestone's research, Torrance has found that a detrimental side-effect of transparency and clarity of criteria has been *instrumentalism*:

> Transparency of objectives, coupled with extensive use of coaching and practice to help learners meet them, is in danger of removing the challenge of learning and

> reducing the quality and validity of outcomes achieved. We have identified a move from assessment of learning to assessment for learning, to assessment as learning where assessment practices may come to completely dominate the learning experience and criteria compliance comes to replace 'learning'. This is the most significant challenge confronting assessment in the LSS: balancing the explicitness of learning objectives and instructional processes against the validity and worthwhileness of learning outcomes.
>
> (Torrance et al., 2005, p. 2, emphasis in original)

Torrance also found an 'overall orientation towards the pursuit of achievement', with an 'overwhelming culture of support for learners/candidates at every level and across every sub-sector of the LSS' (Torrance, 2007, p. 285). This was in part, attributed to the 'high stakes accountability and financial insecurity' (Torrance, 2007, p. 292) that institutions experience relating to funding.

Although the above comprehensive studies relate to assessment practice in the vocational FE sector, they do not relate specifically to technician engineering. During the research for this literature review, only in the HE sector were specific studies associated with engineering assessment practice found. To provide an insight into engineering lecturers' approach to assessment, these studies and their findings are considered below.

2.6 Specific research into engineering education

Currently there appears to be very limited research literature associated with assessment practice in FE technician engineering programmes, such as the BTEC National. Research into assessment in an engineering context relates to the HE sector, with several studies found that research the use of formative assessment in HE engineering undergraduate programmes, both in the UK and America. Martin and Mitchell's (2005) American-based study researched the use of formative assessment with mechanical engineering (fluid mechanics) undergraduates which emphasised the use of feedback throughout the duration of the course. Formative assessment activities included the use of in-class self-assessment, peer-to-peer interactions, homework, reading assignments on which formative feedback was given, focus group work with continuing feedback, and the opportunity of re-doing exams. Their research suggests

this approach changed students' study habits and focused them on concepts and not just problem solving. From questionnaire comments, students believed they understood the basics of the subject matter although no research data were offered to substantiate this claim. Roselli & Brophy (2006) also developed formative assessment activities with American undergraduates through the use of an electronic 'Classroom Communication System'. This system provided immediate feedback about students' understanding through their active participation in the classroom, which helped lecturers adjust the pace of the course, and informed them of a need for recap, even during classroom sessions.

Within the UK, McDowell et al. (2004) were involved with the Electrical and Electronic Engineering Assessment Network (e^3an) project relating to the development and use of formative objective tests for electrical and electronic engineering in a consortium of southern-based English universities. This study researched the use of closed-book tests that allowed students four attempts to show demonstration of 'threshold mastery level' (McDowell, 2004, p. 180), automated methods for both formative and summative assessment, and a peer-reviewed bank of questions for the Electrical and Electronic Engineering curriculum. Other methods used included, workbooks with answers provided and students' solutions used in group tutorial sessions with lecturer feedback, collaborative student work, and weekly assessment sheets. McDowell's research found that due to changing assessment practices, Electrical Engineering lecturers often wished to combine formative and summative assessment (McDowell, 2004, p. 179). However, as has been found in the FE sector, conflation of summative and formative assessment occurred, as lecturers were not fully aware of complexities of concepts/practice of formative assessment (McDowell, 2004, p. 178).

2.7 Summary

This chapter has shown that since the 1960s, the use of criterion-referenced assessment and formative assessment has been increasingly used with the positive ethical intent of aiding student learning and achievement, through what has become termed *assessment for learning*. During this time within the vocational FE sector, assessment has evolved into a complex and multifaceted entity, being affected by a variety of socio-cultural,

socio-political and localised contextual factors. In practice, these factors have influence on, and are influenced by, communities of practice (teachers and learners) within *localised learning cultures*, which in turn underpins a co-constructed assessment practice at the micro-level of classroom practice. Researchers have found this co-construction can have a detrimental effect on the positive intentions of assessment for learning as it has evolved into *assessment as learning*, in which formative assessment becomes a vehicle to aid instrumental criteria compliance as opposed to contributing to improving teaching and learning. Research studies have found that criterion-compliance is underpinned by assessment constructions between teachers and students where a summative emphasis is prominent, where feedback plugs gaps as opposed to engaging students in learning, and where multiple attempts to submit work and incremental improvement causes *conflation of formative and summative assessment* practices.

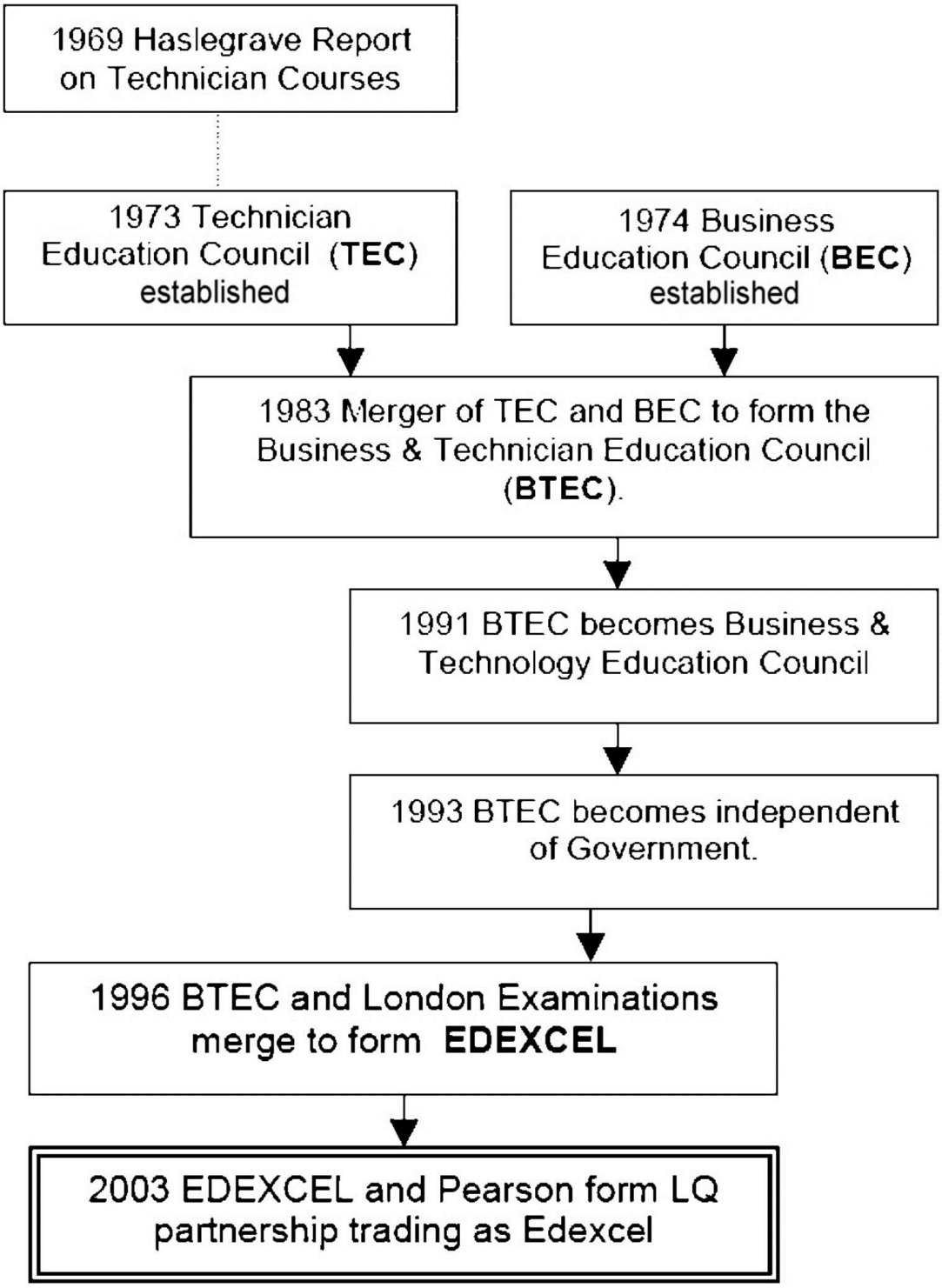
The changes in assessment practice and increasing emphasis on criterion-referenced and formative assessment highlighted within this chapter, are researched in the next chapter within the specific context of technician engineering education. The chapter will outline the historical development of National Certificate/Diploma from its origins at the beginning of the 20th century, through the influential Haslegrave Report in the late 1960s, to the present day BTEC National programmes, which are the focus of this study.

3. Evolution of BTEC assessment practice

This chapter outlines the origins and development of what today is the Qualifications and Credit Framework (QCF) Level 3: BTEC National (Edexcel, 2009a) range of qualifications. The chapter commences with an overview of the original National courses and assessment practice, administered under the auspices of various regional Joint Committees, from their inception in 1918 to the last student intake in the late 1970s. In the 1970s a step-change in vocational FE technician education occurred following the then government implementation of the recommendations of the Haslegrave Report (1969), which still underpin the structure, assessment practice and ethos of modern-day BTEC National programmes.

The previous chapter outlined radical but ethical educational initiatives emanating from the 1960s, which allowed all students the chance to achieve and indeed helped facilitate that achievement. These initiatives were in part, to accommodate the changing socio-economic and technological demands for an increased number of educated and trained people in the workforce. The Haslegrave Report (1969) sought to provide for a more equitable technician qualification, and in particular assessment practice, than had hitherto been available, again with the underlying intention of increasing the number of qualified technicians to satisfy the demands of advancing technology. This chapter will overview how modern BTEC National programmes and assessment practice have evolved since the 1970s, and how both criterion-referencing and formative assessment have become integral to the educational ethos of the 'BTEC way'. Figure 1 below illustrates pictorially the timeline from the implementation of the Haslegrave committee recommendations, to the modern-day Edexcel BTEC programmes.

Figure 1: Development of Technician Education (1969 – 2003)



(Edexcel, 2006c)

Note: prior to the establishment of TEC & BEC in the 1970s,
the National qualifications were administered by regional 'Joint Committees'

3.1 The Joint Committee National qualifications – 1918 to 1960s

Engineering technical education has a long history and took its first steps toward a uniform standard with the invention of the National programmes after the First World War (Foden, 1951, p. 38), with student numbers increasing significantly in twenty years (see Table 2).

Table 2: ONC and HNC Awards 1923-1944

	Year (% increase in Awards)		
	1923	1931	1944
Ordinary Awards	663	2043 (208%)	4070 (514%)
Higher Awards	168	749 (346%)	1405 (736%)

(Argles, 1964, pp. 66-67)

These courses were set up to provide a system of certification for apprentices and other students in engineering (Foden, 1951, p. 38). The Ordinary National Certificate was primarily undertaken on a part-time basis (Bourne, 1984, p. 747) by sixteen year-old students, which could be followed by study of the Higher National Certificate (Lloyd, 1953, p. 269). Full-time Ordinary National Diplomas (ONDs) were also available, but this proved not to be such a popular method of study (Foden, 1951, p. 41). Flexible arrangements were permitted across the country to accommodate the greatly varying needs of industry, with subjects and standards of examinations coordinated by regional 'Joint Committees' (Argles, 1964, pp. 64 & 67) consisting of representatives from industrial, professional and educational interests (Crowther, 1959, p. 325). Although the original emphasis of the Nationals related to mechanical engineering during the early 1920s, other institutes were also involved with developing national courses or grouped examinations. Table 3 states the candidates entered for Mechanical and Electrical Engineering ONCs and the success rates in the academic year 1923-24.

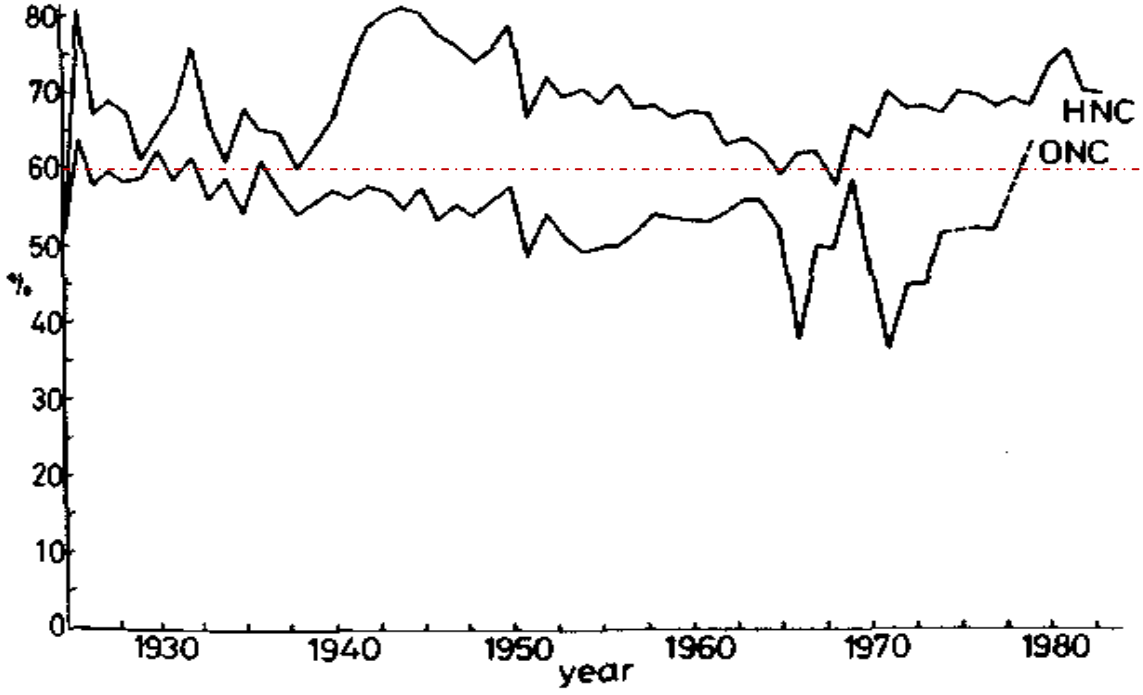
Table 3: Success rate for Joint Committee ONC & HNC Courses in 1923-24

Engineering Course	Candidates entered	Candidates successful (%)
ONC Mechanical	1094	560 (51%)
ONC Electrical	417	282 (68%)
HNC Mechanical	239	166 (69%)

(Foden, 1951, pp. 39 and 41)

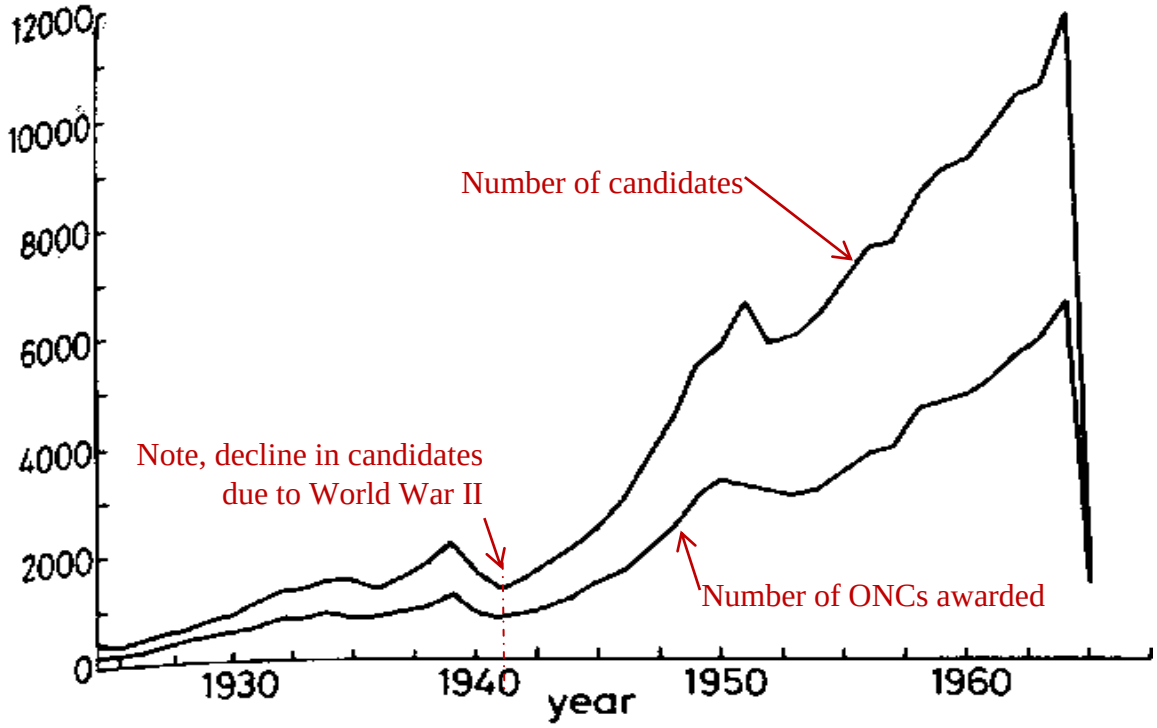
The success rates of these inaugural days of the National courses proved to be a typifying factor when considering the success rate in Electrical Engineering from the 1930s through to the 1970s. Figure 2 shows how the success rate for the ONC hardly ever rose above 60% (see also Argles, 1964, p. 117), and as is discussed later, this proved to be one of the disconcerting and controversial aspects of these courses. However, despite the relatively low success rate and criticisms of their academic nature (Foden, 1951, p. 43), in that they promoted book knowledge over practical competence, the ONC became a popular qualification within Engineering (Foden, 1951, p. 41) as shown in Figure 3 on page 49.

Figure 2: Pass rates for JC ONC & HNC in Electrical (& Electronics) Engineering.



(Bourne, 1984, p. 747)

Figure 3: Number of ONC Electrical Engineering candidates and ONCs awarded



Numbers of candidates, and Joint Committee Ordinary National Certificates in electrical engineering awarded in the United Kingdom.

(Bourne, 1984, p. 747)

Certificates or diplomas were awarded on success of a group of subjects, with assessment primarily based on 'once-for-all end-of-session examinations' (Bourne, 1984, p. 747). Failure in one exam constituted failure-in-all, with the entire year of study repeated. The exams were arranged and supervised by respective colleges or examining union, although the final year exam paper could be scrutinised by an external board of assessors. Marked papers were also subjected to moderation by external assessors (Foden, 1951, p. 42). To achieve a pass, a nominal numerical mark of 50% had to be achieved from coursework and examinations, although there was a significant emphasis on the latter. Distinctions were awarded for a score of over 80% (Foden, 1951, p. 43; Bourne, 1984, p. 745). The ONC evolved to achieve approximate equivalence with advanced level of the General Certificate of Education (Allen, 1965, p. 151) giving the Nationals prestige. However, this attracted students academically unsuited (Lloyd, 1953, p. 269), which was considered to contribute to the 'high mortality rates of candidates' (Foden, 1951, p. 41). The syllabus and standard of the National had a 'professional flavour' (Lloyd, 1953, p. 270) as it was influenced by the

requirements of the professional institutions (IMechE, 1961) and the exemptions they permitted for successful completion of the National. This is a possible explanation of the enduring 'academic aridity' (Foden, 1951, p. 44) of the National, and an explanation for so many failures. It is also an illustration of the backwash and gate-keeping attributes associated with the written examination as outlined in Chapter 2. The above, somewhat muddled nature of the National in its attempt to accommodate academic, professional and vocational influences is probably inevitable for a system that evolved in piece-meal fashion over many years (Foden, 1951, p. 45). Foden questions the underpinning assessment philosophy of the JC Nationals by citing the Ministry of Education's (1948) generalisation that they were designed to 'enable the best young workers to qualify themselves'. Did this mean in practice, exams were used for selection (norm-referencing), or designed to let all candidates achieve where the 'proportion of successes to failures will vary with the quality of the group' (criterion-referenced tendencies)? The purpose of the assessment was also compounded by the fact they were administered by many different groups having different regional emphasis (Foden, 1951, p. 45).

In 1959, a wide-ranging review on education of 15-18 year-olds was undertaken by the Crowther committee, which considered school leavers and apprenticeships, and thus the above National engineering qualifications. The research-based Crowther Report was prompted primarily by a projected demographic bulge, and thus its purpose was to advise the government on post-compulsory education (James and Biesta, 2007, p. 46). With regards to technical education in the post-compulsory sector, Crowther highlighted several defects, which had been stated previously but not in such a formal context. One defect was the *shocking* success rates and wastage rates of part-time students:

> Only one student in 11 succeeds in climbing the National Certificate ladder from bottom to top [i.e. to HNC], and only one in 30 does so in the time for which the course was designed. Against the background of the nation's present and future needs for trained manpower, these wastage rates are shocking.
>
> (Crowther, 1959, p. 367)

This statement illustrates the concern highlighted in the previous chapter that advancing technology required an increasingly educated and trained workforce, and the National courses of the 1950s were unable to satisfy the nations' needs for qualified engineering

technicians. Many reasons were postulated as contributing to the students' unacceptable failure rate (see Argles, 1964, pp. 98 & 108), but of particular concern was the assessment system which caused 'a great deal of repeating courses' (Crowther, 1959, p. 325). In 1961 the government White Paper, Better Opportunities in Technical Education, proposed solutions to address this wastage (Ministry of Education, 1961, p. 3), for example implementing parallel courses to the ONC and improved monitoring of student progress by colleges, employers, parents, etc. (Argles, 1964, p. 114).

3.2 The Haslegrave Report - 1969

In 1967 the Secretary of State for Education and Science instigated the setting up of a committee to review the provision of courses suitable for technicians at all levels, and propose changes to present structure of courses and examinations (Haslegrave, 1970, p. 20). The backdrop to the review was the rapid and radical transformations of the industrial, educational and social landscape of the country. Changing patterns of employment brought a requirement for more specialist courses, refresher courses, and for educating and training in new fields. In 1969 the 'Committee on Technician Courses and Examinations', presented its findings in what is now commonly referred to as the 'Haslegrave Report' (Haslegrave, 1969), and highlighted that increasing developments in production industries were causing products to become more complex, requiring new sophisticated applications of science and technology. This created a demand for technicians to work in broader fields, and a need for more and better qualified technicians (Haslegrave, 1969, p. 25, para. 68).

Despite the implementation of the 1961 White Paper, the Haslegrave Report further reiterated concerns over the large difference (although declining) between the number of student entries and the number of passes on the JC National. Haslegrave questioned the traditional triple function of the National courses: (i) technician course; (ii) preparatory course for higher technician study and (iii) preparation for degree course (Haslegrave, 1969, p. 33, para. 107). The committee also considered the external examination an unsatisfactory way of testing the ability of technicians, and that an 'end-of-course profile' should be produced by reference to a student's academic and industrial ability (Haslegrave, 1969, p. 43; Bourne, 1984, p. 747). Haslegrave not only suggested that the external exam assessment system was exacerbating the wastage and

failure rate, but it also was a 'confining influence on the teaching' (Haslegrave, 1969, p. 23, para. 131). Haslegrave proposed a move away from extensive dependence on formal examinations as a main or only measure of a student's performance as a technician, and instead suggested a more flexible assessment ethos:

> …any student who fulfils the entry requirements for his course and works reasonably hard and well should be entitled to expect that he [sic] will pass the examination.
>
> (Haslegrave, 1969, p. 79, para. 249),

However, the terms, 'reasonably hard and well', were not clearly defined.

Haslegrave's proposals were wide-ranging, affecting the macro, meso and micro-level of technical education, and indeed providing a total contrast to all that had evolved during the previous fifty years. The proposals involved radical changes to policy-making and administration of the curriculum, to course structure, and not least, assessment practice. At the macro level, Haslegrave proposed the setting up of the Technician Education Council (TEC) and the Business Education Council (BEC); both to be small policy making and coordinating bodies responsible for syllabi, assessment and award of educational qualifications (Haslegrave, 1969, p. 53), in place of the long established JCs. At the meso-level, the committee proposed a more modular and flexible course structure over which colleges had some discretion (Blakey and Stagg, 1978, p. 220). This would involve a credit approach, where the gradual accumulation of passes in subjects studied separately, replaced a grouped course. However, from the perspective of this research, it is the radical changes to assessment practice proposed by Haslegrave which are of particular interest, and which heralded a step change that still resonates with modern-day practices. Haslegrave stated the 'award of technician, whatever level, should never depend solely on the student's performance in a formal examination' (Haslegrave, 1969, p. 75). Indeed Haslegrave suggested:

> …facility at passing external exams ……did not necessarily mean that the technicians concerned did a better job in industry. Technicians should be able to extract information from different sources, analyse it and determine the action to be taken, and adjust the action on the basis of its practical effect.
>
> (Haslegrave, 1969, p. 43)

Haslegrave's suggestion that examinations are very poor predictors of subsequent performance, such as success at work, has been found from later research studies

(Gibbs and Simpson, 2002, p. 3). Instead, Haslegrave emphasised teacher-based internal assessment, proposing changes in frequency, and use of a variety of methods such as, written papers, practical or oral examinations and course and project work (Haslegrave, 1969, p. 42).

3.3 The TEC revolution – 1970s

Following the release of the Haslegrave Report, the Department of Education and Science (DES) set up the TEC in April 1973 (Birbeck, 1980, p. 293; Edexcel, 2006b; Moor et al., 1983, p. 1), from where the 'greatest change to have ever taken place in technician education' (Bourne, 1984, p. 747) was implemented. The concept of a 'course' of study in the JC National structure consisting of 'subjects' was replaced in TEC terminology by a 'programme' of study comprising of self-contained 'units' (Birbeck, 1980, p. 294). No longer was a group of subjects to be successfully passed under examination conditions in one year for progression (Birbeck, 1980, p. 296), but each unit was standalone and could be passed in its own right. The aim of the TEC was 'to protect standards by defining appropriate entry qualifications and by the quality of the course material, not by a high failure rate' (Blakey and Stagg, 1978, p. 221). An emphasis was placed on teacher-based assessment, and students having worked reasonably hard had the right to expect an award (Blakey and Stagg, 1978, p. 221; Halliday, 1981, p. 176). TEC *assessment models* were developed that encouraged broken-up summative assessment through use of end of unit tests, phase tests (given at the end of a section of study), practical work, projects and assignments (Halliday, 1981, p. 172), which were weighted appropriately (see Appendix C on page 222). In addition, students' work throughout the year was given adequate recognition and a balance struck between formal examinations and more informal methods of assessment (Moor et al., 1983, p. 12). There were three possible results, 'Pass (typically greater than 50%), Pass with merit (typically greater than 65%), and Unit Not Completed' (Birbeck, 1980, p. 295). The award of 'Distinction grade was not available for work completed prior to September 1981' (TEC, 1983).

A traditional JC National syllabus rarely contained more information than a list of topics, requiring both students and lecturers to refer to past examination questions and papers for content and level (Blakey and Stagg, 1978, p. 225). In contrast, TEC units

defined the syllabus through *learning objectives* (Moor et al., 1983, p. 10) using *general objectives* to state teaching goals, and *specific objectives* to show how students were to demonstrate attainment of the general objectives (see Appendix B, page 219 for illustrations). The aim was to provide clarity of depth of coverage of each topic for lecturers, students and employers (Blakey and Stagg, 1978, p. 222). Learning objectives were classified under skills required, which were similar to those advocated in Bloom et al.'s (1956) Taxonomy of Educational Objectives (Halliday, 1981, p. 172) (see Appendix B, Figure 8 on page 221 for illustrations). However, Halliday, in his review of TEC assessment in the context of a physics syllabus, disputes TEC's original protestations that the objectives approach provided unambiguous information, which makes clear what is to be achieved. He questions, for example, what does 'solves simple problems' mean in an electrical circuit context (Halliday, 1981, p. 174)? Halliday also questions TEC's assertions that their approach leads to greater clarity of student performance, if only 50% of a lecturer composed assessment (with lecturer weighted test items) had to be achieved for a pass. This highlights the compromise and subjectivity associated with assessment based on the specific objectives (Halliday, 1981, pp. 175-176). Halliday speculates that if TEC had opted for 'criterion-referenced' assessment, the criteria would be stated with more precision, and a mastery of all objectives would be required for a pass (Halliday, 1981, p. 176). However, as outlined in the previous chapter (see Section 2.2.2, commencing page 24), research into criterion-referenced assessment has found it is also fraught with ambiguity and subjectivity. Another radical feature of the TEC assessment regime related to the use of referment if a student failed a test. TEC guidance stated a 'further opportunity should be given to the student to show that he/she has reached the appropriate standard' (TEC 1979, Guidance notes 8, cited in Halliday, 1981, p. 176), which usually occurred after remedial study (Soundwell Technical College, 1980, T.E.C. Students 'Code of Conduct'). To ensure its standards were being maintained, TEC used external moderators to check the level of work being achieved and the methods of assessment used at colleges (Blakey and Stagg, 1978, p. 222; Moor et al., 1983, p. 12).

3.4 Development of BTEC 1980s & 1990s

A salient speech in 1976 by the Labour Prime Minister Jim Callahan, now referred to as the Ruskin speech, opened what was termed the 'great debate' (Chitty, 1996; James

and Biesta, 2007, p. 53; Lumby and Foskett, 2005, p. 20) and initiated a new political consensus around more centralised control of a vocationally relevant educational curriculum (Cockett, 1996, p. 34; James and Biesta, 2007, p. 88). Although concerns expressed within the speech, such as school leavers lacking basic skills on entry to employment (AQA, 2003, p. 16), were primarily focused on schools and universities (Evans, 2007, p. 44), the same concerns were directed at the FE sector (James and Biesta, 2007, p. 53). Callahan's speech endorsed a differing perspective on vocationalism by a new political notion of 'strong functional links between education and economy' (Raggatt and Williams, 1999, p. 24), where a 'skilled and educated workforce would facilitate economic growth' (Chitty, 1996). This political focus was to have significant influence over educational practice for the next two decades (Raggatt and Williams, 1999, p. 24), and continues into the 21st century (Stasz and Wright, 2004, p. 11; Wolf, 2011, p. 6). Emanating from this political intervention was the government's national policy in the late 1980s - early 1990s, to promote NVQs and GNVQs as a replacement for BTEC qualifications (see Section 3.5, page 57).

In 1983, BEC merged with TEC to form the 'Business & Technician Education Council' (BTEC), something Haslegrave had proposed (Haslegrave, 1969, p. 52, para. 164). The merger was facilitated due to the changing demands of both industry and education (BTEC, 1984, p. 19), and also there was a need for broader-based studies for the 16 to 19 age group. The BTEC merger created an organisation with around half a million students having the potential to become hugely influential in the VET arena (Fisher, 2004, p. 244). The BTEC ethos of the time again reiterated the importance of educational objectives with the national interest (BTEC, 1984). In their 1984 policy document, BTEC stipulated that 'assessment is part of the learning process .... confirms the outcome of learning and is the professional responsibility of the teacher' (BTEC, 1984, p. 19). This suggests assessments have the dual purpose of facilitating and checking learning. However, BTEC recommended regular checks to be made on the 'balance between assessment and learning, so as to prevent assessment from dominating learning' (BTEC, 1984, p. 19), and thus avoid what has recently been termed 'assessment as learning' (see Chapter 2, page 34).

3.4.1 Move to criterion referencing and formative assessment

After the merger to form BTEC, criterion-referencing became mandatory for the entire organisation to allow for profiling of students' performance, and thus overall grading across a unit. Following on from BTEC's policy statements of 1984, it released a series of publications in 1986 that appear, with hindsight, still to underpin BTEC's assessment philosophy into the new millennium, as the ramifications of these publications still reverberate within modern-day BTEC National assessment practice. Yates and Hall (in Black and Dockrell, 1988), although specifically commenting on the National programmes in Scotland following the formation of Scottish Vocational Education Council (SCOTVEC), an analogous merger to BTEC in England (Connelly, 2003), describe the then assessment practice as continuous, internal and dichotomous criterion-referenced, where students are assessed on whether they can or cannot perform a stated task. They describe a major emphasis placed upon formative assessment with:

> …a clear expectation that staff and students will utilise the assessments for diagnostic purposes which might assist in determining the need for remedial instruction should a student fail to achieve a particular learning outcome.
>
> (Yates and Hall, 1988, in Black and Dockrell, p. 69)

Two BTEC documents from 1986, of particular interest to this research, were entitled 'Assessment and Grading' (BTEC, 1986a) and 'Assignments Help Students to Learn' (BTEC, 1986b). However, unlike the preceding policy document of 1984, these BTEC publications now made reference to the use of *formative assessment*, *feedback*, *criterion-referencing* and assessment of *product* and *process*.

Criterion-referencing introduced a new philosophy to assessment where a pass grade required students to demonstrate 'satisfactory performance in all major areas of a unit, as defined by Principal Objectives or skill areas' (BTEC, 1986a, p. 5), which was a departure from the original TEC assessment practice of the 1970s and early 1980s, which apportioned marks to solution points and awarded grades at prescribed levels of numerical scores. TEC's practice of sectionalisation of assessment and the inherent averaging, obscured failure within an individual objective area, something the non-numerical criterion-referencing proposed to rectify (Edexcel, 1996). A merit grade was awarded for 'significantly better performance', and a distinction for 'outstanding

performance' by a student, where interpretation of the terms satisfactory, significantly better and outstanding, was the responsibility of course teams (BTEC, 1986a, pp. 5-6).

Another aspect of assessment practice instigated in 1986, continuing thereafter, related to the use of assignments as both an assessment vehicle as part of an assessment strategy, and as a learning method (BTEC, 1986b, p. 2). Assignments were not a new assessment method (see TEC Assessment Models, Table 10 on page 222), but the emphasis on their diagnostic and formative purposes as mainstream ideas were (Black and Dockrell, 1988, p. ix). Thus, BTEC's 1986 statement essentially set-the-scene for what was promoted some two decades later as the 'BTEC way', being defined as a 'pedagogy of learning that is assignment based, project and research driven, cognitive and applied and 'student centred'' (Edexcel, 2006b, emphasis in original).

3.5 The effect of the GNVQ on the BTEC National – 1990s to 2000s

Following the publication of the White Paper 'Working together – Education and Training' (Department of Employment, 1986), the government established the National Council for Vocational Qualifications (NCVQ) in autumn 1986. This provided for greater government influence within the VET sector. The NCVQ was tasked with reforming the then present heterogeneous pattern of vocational qualifications in England and Wales (Raggatt and Williams, 1999, p. 11), which included BTECs established qualifications, by promoting NVQ competence-based assessment. However in 1991, a government White Paper announced the intention to develop a broader-based general NVQ (Department of Education and Science, 1991, p. 16) and between 1991-92 the NCVQ worked with the then current national awarding bodies, including BTEC, to develop this new qualification, to be known as the General National Vocational Qualification (GNVQ) (Raggatt and Williams, 1999, p. 15).

Although BTEC had revised its popular range of vocational qualifications in the mid-1980s, over the next decade it came under significant pressure to abandon them in preference of GNVQs, which offered much similarity with BTECs, as both were alternatives to A-levels and provided education for employment. Furthermore, GNVQs were also unit-based, criterion-referenced, with syllabi listing performance criteria

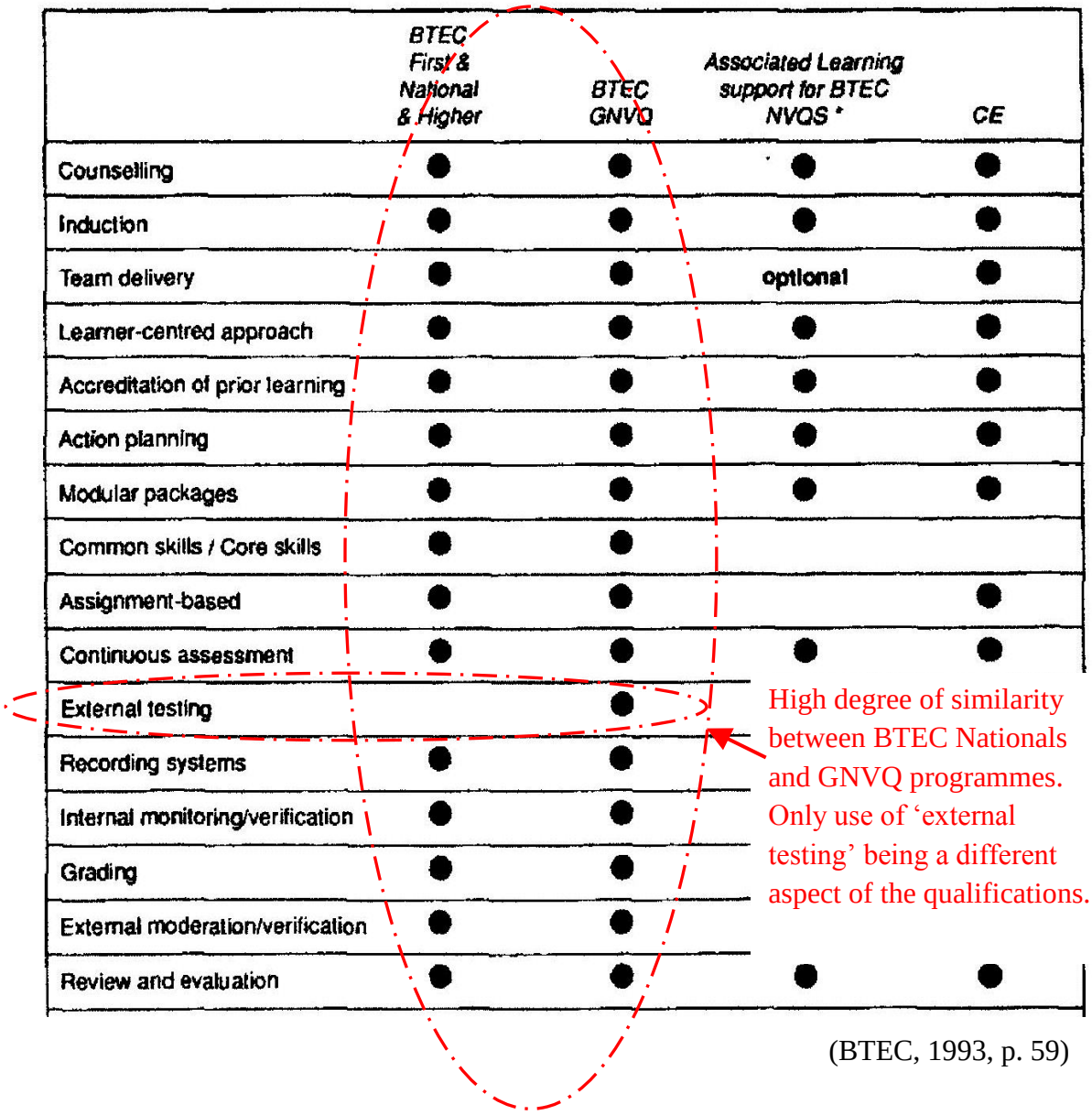
stating the standards students must achieve. Learning was demonstrated through students providing a portfolio of evidence that all criteria had been met with assignments used as the method of internal assessment (external tests were also used) (Capey, 1995, p. 11). GNVQ students were expected to cover more of the syllabus content than traditional syllabus based examinations, with its sampled questions from which students were offered a choice. Also the GNVQ assessment format was considered to simulate more the way information might be applied in later life and work (Boys, 2000, p. 13). In essence, the GNVQ implied a 'mastery approach to assessment' (Boys, 2000, p. 14) as an alternative to the statistical A-level model used to aggregate marks and to allocate grades, where there is a possibility of compensation of poor performance in one topic area to be offset by good performance in another (Boys, 2000, p. 14). The above attributes of the GNVQ offered strong similarities with BTEC's National assessment practice. In the GNVQ, formative assessment and summative assessment should be intertwined, as the formative function, checking students' progress and providing feedback to facilitate further learning, also contributed to the accumulation of summative evidence (Jessup, 1995a, p. 11).

Raggatt and Williams (1999) provide a very enlightening, insightful and indeed compelling review of the development of the national vocational framework and NVQs and GNVQs qualifications. Within their review, they outline the prominent political imperatives and ensuing political pressures; the differing educational ethos (BTEC did not directly write assessments unlike other awarding bodies) and aspirations of interested parties; and the pragmatic implementation problems encountered by this process from its inception in 1986. However, BTEC was somewhat reluctant in developing the GNVQ, which is understandable as it had well established products, ever increasing student numbers (National Diplomas increased from 17,700 in 1983 to 24,500 in 1989), with increasing numbers of students choosing BTECS as an alternative to A-level entry into HE (Alan Smithers (1991), cited in Sharp, 1998, p. 295). In 1993, BTEC undertook a mapping exercise to show the commonality of BTEC First/National programmes with the BTEC GNVQs, as shown in Figure 4 on page 60. With the exception of the use of external testing, there was a high degree of commonality between the two awards (BTEC, 1993, p. 59), again illustrating why BTEC was reluctant to see the demise of its own popular brand. Although the GNVQ became seen as a future replacement for BTEC Nationals by the Engineering Council

and the government (Education Select Committee, 1995, p. 48), it was also recognised as a well established product (Education Minister, cited in Raggatt and Williams, 1999, p. 132), 'still being taken in colleges of further education' (Dearing, 1996a, p. 27). In 1995, BTEC announced the halting of its National 'Diploma phaseout' with the Advanced GNVQ, by that time relabelled Vocational A-levels (Wolf, 2002, p. 97). Essentially BTEC made the case that its existing qualification portfolio filled a void between the GNVQ, which had become largely preparation for young people to enter higher education, and the job-specific NVQ, which failed to provide the kind of underpinning knowledge demanded by employers (Tysome, 1995 ; Dearing, 1996b, pp. 9 and 37). Indeed, during the mid-1990s several reports highlighted the deficiencies associated with the GNVQs, particularly the assessment and grading requirements that had been difficult to manage in practice, with reliability of assessment and grading being problematic and difficult to consistently apply (refer to Raggatt and Williams (1999, p. 17) for further references).

From the above discussion, the national policy promoting the GNVQs effectively stunted development of the BTEC Nationals from the late-1980s until the new millennium, which is something noted from my teaching experience. I became a Lecturer at Sophwort College in September 1998 and until June 2002 was involved with teaching BTEC National Engineering Mathematics unit 14166H and Science unit 1668C (Edexcel, 1999). The 1668C unit (shown in Appendix E on page 224), although not dated, was headed 'Business and Technician Education Council', which dates it pre-1991, when the word Technician was replaced by Technology (Fisher, 2004, p. 245). This anecdotal evidence suggests BTEC National syllabi were not revised from the mid-1980s until the new Nationals of 2002.

Figure 4: Comparison of 'BTEC National' with 'BTEC GNVQ'



	BTEC First & National & Higher	BTEC GNVQ	Associated Learning support for BTEC NVQS *	CE
Counselling	●	●	●	●
Induction	●	●	●	●
Team delivery	●	●	optional	●
Learner-centred approach	●	●	●	●
Accreditation of prior learning	●	●	●	●
Action planning	●	●	●	●
Modular packages	●	●	●	●
Common skills / Core skills	●	●		
Assignment-based	●	●		●
Continuous assessment	●	●	●	●
External testing		●		
Recording systems	●	●		
Internal monitoring/verification	●	●		
Grading	●	●		
External moderation/verification	●	●		
Review and evaluation	●	●	●	●

(BTEC, 1993, p. 59)

3.5.1 From BTEC to Edexcel and the 'new' National

On the 1st October 1993, BTEC was given a new constitution as it transferred from a non-departmental public body, to being a (technically) independent body operating within the private sector (Fisher, 2004, p. 249). In 1996, BTEC merged with the University of London Examinations & Assessment Council (ULEAC) to form the Edexcel Foundation, a charity, managed by a board of trustees. The title, Edexcel, was formed from Education Excellence. In June 2003 the Edexcel Foundation entered into a partnership arrangement with Pearson PLC (although 75% owned by Pearson), the largest educational services company in the world, to set up a new company, which

traded as Edexcel Ltd from November 2004 (Edexcel, 2006c). In September 2002 Edexcel introduced its *new* BTEC National qualifications (Stasz et al., 2004, p. 25) that formally related to the then National Qualifications Framework (NQF) at Level 3. This framework was implemented following the 1997 Education Act (Hayward et al., 2004), under the auspices of the QCA (an amalgamation of School and Curriculum Assessment Authority and the NCVQ), also formed in 1997 (AQA, 2003, p. 28; Raggatt and Williams, 1999, p. 159). The Diploma was still based on the original TEC structure, in that it consisted of a range of units (18) forming a coherent two-year programme, and still predominantly internally assessed. However, its assessment regime had been adversely influenced by the outcome-based systems of the GNVQ and AVCE, and also by the parallel introduction of target-led accountability systems in FE colleges (Ecclestone, 2010b, p. 125). The BTEC Diploma still had the long-standing attributes of parity with A-levels (equivalent to three, Pring et al., 2009, p. 50), and the tripartite progression paths to employment, higher technician study or university (see Appendix D, page 223). Each new BTEC unit was criterion-referenced stating learning outcomes and content, in which the appropriate delivery methods and assessment strategies were proposed (Edexcel, 2002b). This BTEC 2002 National Diploma programme and associated units forms the backdrop to this research into assessment practice. In 2006, Edexcel issued a guidance document entitled 'Assessment and grading: application of criteria'. This document defined formative and summative assessment; reinforced the need to ensure all work submitted for summative assessment is assessed using only the assessment and grading criteria stated in a unit, and emphasised the use of formative assessment to aid student achievement.

As a final note to the continued evolution of the BTEC National, in 2007, the programme structure was revised with some units being replaced or having content modified. However, this did not affect the assessment practice, which was still internally set and founded on the integrity of the teacher. In 2010 the National was again revised with minimal changes from 2007 other than re-titling and primarily aligning itself with the new QCF (Edexcel, 2009a).

3.6 Summary

This chapter has outlined the over 90 year association of the National programmes with engineering technical education, and how in the 1970s, they were subject to a significant change in structure, assessment practice and ethos, that still has resonance with today's National. Since the 1970s TEC and later BTEC, has shown itself to be highly innovative in technical education and particularly assessment practice.

In the 1970s, TEC moved to teacher-based (externally moderated) assessment of learning aims. Syllabi were based around learning objectives, taught, and assessed around general and specific objectives, with assessment content related to Bloom's cognitive taxonomy. TEC introduced broken-up summative assessment, employing an array of assessment methods including assignments, and using referment opportunities to aid achievement, with an ethos that hard working students should *expect* to achieve. In the early 1980s, BTEC formally acknowledged the use of assessment for formative as well as summative purposes. Learning objectives, defined through general and specific objectives (numerically marked) of the 1970s, evolved into BTEC learning outcomes and criterion-referenced assessment in the mid-1980s, requiring demonstration of performance against the criteria. BTEC placed an emphasis on the use of assignments and particularly their formative capabilities to aid learning. All the above occurred before the TGAT recommendations of 1988 related to the compulsory educational sector (see Chapter 2), and the development of the GNVQ.

The new BTEC Nationals issued in 2002 still have many aspects of their vocational predecessors. For example the tripartite progression paths of the 1950-60s JC Nationals; the 1970s TEC unitised structure adopting a broken-up summative assessment practice that allowed for referment, and 1980s BTEC use of criterion-referenced assessment, emphasis on assignments and use of formative assessment. The 1990s GNVQ's development also influenced the new Nationals, with its standards-based, criterion-referenced model, where *outcomes* set learning and assessment objectives, and where formative assessment aids achievement and is an integral part of the ethos of the programme.

Chapter two reviewed how since the 1960s, criterion-referencing and formative assessment had increasingly been used to underpin assessment philosophy, and that despite the ethical basis and purported benefits of each, they had in practice, amalgamated to form what has recently been termed *assessment as learning*, having a negative educational impact on learning. This chapter has shown how BTEC National assessment practice has evolved to be strongly founded on the same two philosophies. The remainder of this thesis now researches what BTEC assessment looks like at the micro-level of teacher-student interaction, within the confines of technician engineering classrooms.

4. Methodology and Methods

This chapter commences with consideration of my ontological and epistemological perspectives from both my professional engineering lecturer standpoint, and that of my educational researcher role within this study. Through these philosophical considerations, I justify the use of my interpretativist methodology and qualitative methods, and how these enabled me to investigate *assessment-in-action* at the micro-level of classroom practice. Also within this chapter, I outline the research design, the development of the various interview schedules used with both students and lecturers, and my evolving, iterative process of data analysis. Finally, I consider the ethical responsibilities inherent within this study, and discuss how I addressed concerns with the concept of validity of research findings.

4.1 Methodological approach

Within this section, I review my ontological and epistemological positioning as a practicing engineering and as an educational researcher. I compare and contrast what seem to opposing philosophical stances and the transition I needed to make from a positivist orientated engineering perspective to an interpretativist one in undertaking this research.

Mason (2002, p. 14) describes what we see as the very nature and essence of things in the social world as our *ontological* position. In other words, is 'reality of an objective nature, or the result of individual cognition? Is it a given 'out there' in the world, or is it created by one's own mind?' (Cohen et al., 2000, pp. 5-6, emphasis in original). *Epistemology* relates to the nature and forms of knowledge, how it can be acquired, codified and transferred to others. Knowledge can be defined as hard, real, having the capability of being transferred in tangible form, or softer, more subjective, spiritual or even transcendental, based on insight and related to personal experience (Mason, 2002, p. 16).

Researchers are often considered to work within different paradigms (Pring, 2004, p. 44), which consist of varying philosophical standpoints that 'permeates every aspect of a research inquiry' (Lincoln, 1990, cited in Morgan, 2007, p. 52). Denzin and Lincoln

(2000) propose an array of inquiry paradigms stating a 'tripartite linkage of ontology, epistemology, and methodology' (Morgan, 2007, p. 58), which represent 'belief systems that attach the user to a particular worldview' (Denzin and Lincoln, 1994, p. 2). A respective paradigm tends towards a preference for quantitative or qualitative data gathering methods, although these method-level terms in themselves do not define paradigms (Guba, 1990, p. 22). Although paradigms may oversimplify the complex and often disordered reality of research, they provide frames of reference (Brannen, 2005, p. 7) that 'serve as lenses' (Phillips cited in Guba, 1990, p. 41) through which the nature of reality, and so the constructs of knowledge are viewed. Guba and Lincoln (1994) consider there is an obligation on researchers to state their philosophical stance:

> Paradigm issues are crucial; no inquirer, we maintain, ought to go about the business of inquiry, without being clear about just what paradigm informs and guides his or her approach.
>
> (Guba and Lincoln, 1994, p. 116)

As outlined in the Appendix A (beginning page 201), I worked as a Design Engineer for twenty years before becoming an Engineering Lecturer, and it was only in 2006 that I became involved with educational research. My industrial and engineering educational background orientates me to natural science, 'quantitative tradition' (Borrego et al., 2009, p. 54; Case and Light, 2011, p. 187), where scientific and mathematical analyses relate to physical parameters and measurements with the purpose of seeking verifiable and repeatable procedures (Bruce, 2006, p. 63). Research into practices of HE Electrical Engineering Lecturers, has found their perceptions of engineering centred on hard-pure knowledge, requiring mastery of physical environments through simulated or real-work contexts (McDowell, 2004, p. 177), having resonance with what Becher's ethnographic studies term 'hard applied' (Becher, 1989, p. 14) subject matter. Hard applied knowledge being 'amenable to heuristic, trial-and-error approaches' (Becher, 1989, p. 15; see also Koen, 2003, p. 28).

Scott, et al.'s (2004) research into various types of professional doctorates highlights the fundamental ontological and epistemological differences between disciplines. They found students studying Engineering Doctorates had agreed and settled views regarding ontological and epistemological positioning and what constitutes good practice, with scientific methods as the only way of seeing the world. In contrast, educational

doctoral students were less sure of epistemological foundations and had their knowledge basis disrupted (Scott et al., 2004, pp. 42-51). During my many years of engineering study and practice, my ontological or epistemological positioning has never been questioned, indeed the terms never used.

Engineering is traditionally perceived as being synonymous with science, and to some extent subsumed within it (as applied science); having a deterministic focus on an ultimately knowable reality. With reference to Denzin and Lincoln's (2000) paradigms, engineering research and practice aligns itself with 'Post positivism', where ontology assumes 'reality exists but is never fully apprehended', being 'driven by natural laws only incompletely understood', and an epistemological positioning where 'objectivity remains a regulatory ideal, but it can only be approximated' (Guba, 1990, pp. 20-23).

In contrast, educational research is recognised as being multi-disciplinary having diverse research philosophies (BERA, 2004, pp. 5-6). Ontological considerations include understandings and interpretations, motivations, ideas and perceptions, constructions, experiences, interactions, social or cultural practices (Mason, 2002, p. 15), all of which can impact on the researched and the researcher, and cause concepts such as data, reliability, validity, subjectivity and objectivity to be problematic (BERA, 2004, p. 6). Epistemology is concerned with the principles and rules by which social phenomena can be known and how knowledge can be demonstrated (Mason, 2002, p. 16). Harlen (1994) suggests an educational research epistemology that views knowledge as yielding ideas and theories which are transient, continually changing, evolving endlessly, but which provide no ultimate truth (Harlen, 1994, p. 5).

My research questions aim at illuminating BTEC assessment by endeavouring to uncover the influences on the nature and form of the *socially constructed practices* of both lecturers and students within a localised learning culture. The findings from this research will be created by my engagement with data gathered from lecturer and student interviews, but where implicit filtering due to my background, value system and experiences of the environment in which I teach and research (and so influence), will occur.

Referring again to inquiry paradigm parameters (Denzin and Lincoln, 1994, p. 113), my research focus, associated questions and methods position me philosophically within the constructionist paradigm (Denzin and Lincoln, 1994, p. 113) having a relativist ontology and subjectivist epistemology (Denzin and Lincoln, 1994, pp. 13-14). Constructivist ontology has multiple mental constructions, socially and experientially based, local and specific, which are dependent for form and content on persons holding them; and have an epistemology where findings are the creation of interaction process between the inquirer/inquired (Guba, 1990, p. 27). This would seem a significant shift in philosophical perspective from my twenty years of engineering enculturation, but is it? In the 1960s, Medawar contested that scientific hypotheses were not unbiased, unprejudiced and innocent observations that researchers of scientific papers would conventionally portray, but in contrast such hypotheses appeared in the minds of the researchers first, being imaginative and inspirational adventures of the mind (Medawar, 1963, pp. 377-378).

More recently, Harlen suggested that natural science research should be seen in the same light as educational research, in that its knowledge is transient, constantly updated and never definitive (Harlen, 1994, p. 5). Certainly engineering research and practice exudes similar epistemological traits, with the development of processes and products constantly updated, with new technologies complementing or superseding existing ones. However, even the ontological perspective of engineering can be considered to share subjective attributes of the educational research. Koen, in his philosophical review of the 'Engineering Method', suggests contrasting ontological positions between science and engineering and how engineering endeavours to model perceptions of reality:

> Unlike science, engineering does not seek to model an assumed, external, immutable reality, but society's perception of reality including its myths and prejudices.
>
> (Koen, 2003, p. 18)

Others have philosophised about the subjective nature of engineering. For example, the spirituality of engineering, experienced through human-world interactions and the essential 'unknowability of the world' (Weiser, 1999, p. 360); having to 'constantly act beyond the data, acting on probabilities and possibilities and hunches' (Weiser, 1999, p.

361) - hardly positivist sentiments? Indeed, can engineers remain impersonal and value-free where ethical considerations occur relating to the development of medical equipment to save lives, nuclear power stations or military weapons? As a practicing engineer, although I endeavoured to simulate a reality that was 'out there', I realise that all attempts to do so are futile. Many assumptions have to be made in designing, analysing and researching engineering artefacts that a true representation of reality is impossible. Best solutions became optimum designs; scientific principles became heuristics, and mathematical and computer-based models are often used without being fully understood – in this context, truth cannot be tangible. Solutions to problems are developed knowing others may develop different solutions despite using the same theoretical knowledge base, due to differing vocational and educational experiences. On reflection, an engineering philosophical stance possibly straddles the post-positivist and constructivist paradigms, encompassing both objective and subjective traits.

From neither a post-positivist nor constructivist perspective, do I seek a true reality. In an engineering practitioner context I strive for a simulation of reality using mathematical models and in educational research, an interpretation of reality constructed from engagement with data. Indeed, in an engineering educational research context, Borrego et al. suggest we need a new paradigm, requiring new modes of thinking, and bridging the gap between researcher and practitioner (Borrego et al., 2008), a stance reinforced by Case and Light (2011). On reflection, my philosophical educational research perspective finds empathy with Pring's statement, in that I shall:

> …seek the truth whilst knowing that conclusions would always remain provisional .... without regarding them as beyond criticism or improvement.
>
> (Pring, 2004, p. 116)

The above discussion has shown that to answer my research questions, I have to enter the world of the interpretativist, a move from the objective to the subjective, from a knowable reality to multiple constructions of reality. However, when reflecting on engineering practice, subjectivity, simulations and the potential for multiple solutions to social requirements are the norm. In essence, I have always 'constructed' a reality; the difference in this study is that reality is not associated with inanimate objects involving quantitative methods, but relates to social interactions using qualitative methods. Knowledge generated will not be based on scientific principles and

mathematical models, seeking procedures and solutions that are repeatable by others, but based on an ethical pursuit of generalisable findings developed from explanations and arguments of data (Mason, 2002, p. 8) which are founded on a critical literature review and omnipresent reflexivity. The discussion in this section suggests researchers' philosophical positioning is rarely clear-cut, tends to lie on a continuum, and can sometimes be contradictory (Wellington et al., 2005, p. 99).

4.2 Research design

As outlined in Chapter 1, my longstanding research interest was the effect that BTEC assessment practice in an Engineering Programme Area had on students' progress and proficiency through a National programme, and how it prepared them for progression from it. In the initial stages of my research, I interviewed students from various National Diploma Engineering intakes as well as Higher National students and ex-Sophwort College engineering students who had progressed to university. However, it soon became clear that this was too ambitious as it would generate an excessive amount of data and consume an inordinate amount of time in collection, transcription and analysis, which was not possible given full-time lecturer working pressures and resources available. Following a change of supervisor and a restructuring of research questions, I focused attention on one cohort of National Diploma students over their two-year programme of study. This satisfied the aims of the study and provided convenient access to the cohort, as I was timetabled to teach several units in both years of study. Another benefit of 'researching my own backyard' was the ease of access to lecturing staff and to the programme area 'gatekeepers' such as the National Diploma Course Tutor and Line Management.

During the academic year 2006-07, I was formally tasked to undertake one-to-one tutorials with students, which took place in various available classrooms. The purpose of the College-wide tutorial system was to help students develop skills of self-assessment and planning, through working with their personal tutor during individual tutorials, and encourage them to assess their own progress on their programme of study. The tutorials provided a forum for discussion to help resolve any queries or difficulties students may have with their studies, and required each student to attend three tutorials, one in each of the three College terms. With students' permission, I coupled my

research interview schedule on the back of the last of these sessions, which provided convenience for them and me.

As I was researching assessment practice in a small college programme area in which I was employed, the use of a small-scale, in-depth case study was considered the most appropriate method to help illuminate the 'complex issue' (Flyvbjerg, 2006, p. 219) of this social construction, and uncover the 'reality as defined by the participants' (Pring, 2004, p. 42). Although the case study has received attention as an emerging method of engineering educational research (Case and Light, 2011) to examine in-depth, a single instance of a community of practice, its use in an engineering context can be found as long ago as the 1960s. Jahoda (1963), a social psychologist, undertook a three-year case study at Brunel College, researching a new form of higher education associated with a Diploma in Technology. This was a socio-technical analysis considering the interactions of human relations within organisational structures and technical processes (Jahoda, 1963, p. 191), and involved interviewing the students three times about their educational experiences after different phases of their study, and also the interviewing of college staff and industrial firms (Jahoda, 1963, p. 11).

Within my research, the unit of study is BTEC National assessment practice of the Engineering Programme Area at Sophwort-on-Sea College, which involved the participation of seven lecturers and thirteen students, and spanned September 2006 to July 2008. My relationship to the study is that of a practitioner-researcher, an insider involved with teaching and assessing activities as part of the National course team, whilst having a research interest in the assessment practice. Data collection primarily involved qualitative methods using semi-structured interviews undertaken on a one-to-one basis with both lecturers and students in various College classrooms. The use of qualitative techniques was applicable to the interpretivistic philosophical stance I was adopting within my research into perspectives and constructs of assessment practice (Mason, 2002, p. 15). I also referred to documentary evidence from classroom notes lecturers gave students, and the students' portfolios of assessment material accumulated throughout their two-year study, which provided for a degree of 'triangulation' (Ely et al., 1997, p. 34) with regards certain issues raised from the interviews.

I realise there are concerns associated with case study research that raise philosophical questions calling into doubt the reliability and validity of the method. For example, case studies are a 'study of the particular' (Pring, 2004, p. 41), considered to produce 'context-dependent knowledge' (Flyvbjerg, 2006, p. 221) related to unrepeatable research situations from which generalisations cannot be drawn. Although researchers are assumed to approach their investigation with an open-mind and let the data speak for themselves (Pring, 2004, p. 41), one serious concern related to case studies is their proneness to bias. Due to the uniqueness or the particular instant of the case study (Pring, 2004, p. 40), and so the lack of cross-checking that can take place, there is 'more room for the researcher's subjective and arbitrary judgment than other methods' (Flyvbjerg, 2006, p. 234). This has the potential for researchers to use data to confirm their 'preconceived notions' (Flyvbjerg, 2006, p. 221). There are also concerns about the 'reality which is exposed and the truth of the claims being made', as 'researchers cannot stand aside as though their presence had no effect upon the situation' (Pring, 2004, p. 42), thus calling into question their objectivity.

Flyvbjerg (2006) has reviewed the above concerns, what he terms as misunderstandings about case study methodology, and offered a scholarly and detailed rebuttal of each. For example he states there is a need for context-dependent facts and rules to aid learning and development and so true expertise, and that context-independent knowledge leaves learners (and researchers) at a 'beginners level' of understanding (Flyvbjerg, 2006, pp. 232-233). Flyvbjerg argues that generalisations can be drawn from case studies, citing significant developments in science that have been based on the use of a case study methodology, for example Galileo's rejection of Aristotle's law of gravity based on a case study in the form of a single experiment (Flyvbjerg, 2006, p. 225). Pring also suggests that generalisations are possible through cases studies, stating that all situations are unique in some aspects, yet have something in common between cases in other aspects (Pring, 2004, p. 42). With regards to subjectivism, Flyvbjerg suggests there is no greater bias in case study research than in other methods, such as the choice of categories and variables in a quantitative investigation (Flyvbjerg, 2006, p. 235). As to case study researchers biasing their research to preconceived notions, Flyvbjerg cites researchers of in-depth cases studies who acknowledge how their original preconceived notions were wrong, and how the case study material compelled them to revise their hypotheses or essential points (Flyvbjerg, 2006, p. 235).

To aid validation of my study, I have adopted a reflexive approach and as far as possible made explicit to the reader, how my general stance (background and perceptions) and relationships with other lecturers and students had the potential to influence my collection and interpretation of the data and in so doing endeavoured to reduce the risk of bias. In my study, I approached the research as a former BTEC boy (of the 1970s), having concerns over the assessment practice within which I was involved, and possibly influenced. I had preconceived notions about BTEC assessment philosophy and practice and entered the research with a perception that there was something wrong with what I, and others, did. Thus, I needed to sideline my initial perceptions and endeavour to be systematic and rigorous throughout the research process. I also interviewed my peers, members of the same restricted community of practice, where participants were not anonymous and had a shared norm. I had a history and perceived characteristics to my peers, which might have been directly relevant to the research topic (Platt, 1981, p. 77). For example, some lecturers had formed perceptions of my approach to assessment, having worked with me in developing assessments or having internally verified my assessment material. There was also the 'Hawthorne effect' (Rowntree, 1977, p. 40; Wellington, 2000, p. 197; Wolcott, 1999, p. 195) to consider, where making an intervention into a natural setting can itself affect the data gathered. This might be due to the interest shown in lecturers' approaches to assessment and the interest shown in the perceptions of the students, who may not have been accustomed to being asked for their opinions about the educational practice in which they were engaged.

Due to my practitioner-researcher status and being encultured into the environment researched, I am conscious that not only am I influenced by the departmental culture, practices and procedures, i.e. the programme area's learning culture, but after ten years of employment, I may have a degree of influence on its practices. In an attempt to uncover how I am perceived by my colleagues prior to the research commencing, and thus determine possible data 'contamination' considerations; from September 2006 to March 2007 I undertook a, 'Who am I?' exercise with engineering lecturers. This consisted of formal appraisals with management, one-to-one interviews with colleagues and e-mail correspondence. Although this was not a rigorous analysis and tended towards the anecdotal, it was a further attempt to uncover peer perceptions that might

possibly impact on my study. Five engineering programme staff members in total were consulted for comments (two from Line Management roles), with three eventually being interviewed as participants in this research study into assessment practice.

This was a perturbing exercise, as it was difficult to listen to an array of unfavourable comments from colleagues that dispel the myth of one's self-image. In essence, I was perceived as having a professional and hard working attitude to my lecturing role, with a determination to maintain standards. However, I was also perceived as being only focused on work; too serious and intense with students, with them not seeing me as approachable. My assessment work was seen as having all the i's dotted and t's crossed, leaving very little manoeuvre for students. This was attributed to my previous industrial Stress Engineer employment, where I was responsible for the structural integrity and safety of aircraft components. If my industrial practice was seen as having a significant influence on my work as a lecturing role, this begs the question how it could affect my researcher's role? I was also seen as lacking self-confidence, not a team player, quiet and introverted, and not a big personality within Sophwort College. Although this was not a rigorous or definitive exercise, it was interesting that many of the comments resonated with a similar exercise I had to undertake as part of a Masters Module I studied in 1993, (13 years earlier) whilst working in industry (see Appendix F commencing on page 227).

Moving past a shattered self-image, the main issue here is to consider how these perceived personal traits could vitiate this research. My 'introverted tendencies' and 'unapproachable persona' may cause lecturers to view me with a degree of caution and perhaps be less than forthcoming when interviewed. Alternatively, my quiet nature and lack of social contact with staff members could suggest I have limited influence on them or perhaps even the department's activities, except within delivery of my own BTEC units taught and those I deliver concurrently with other lecturers. I would also like to think that my 'professional approach' to my work would provide the lecturers with a degree of respect for the research I was undertaking and so engage in a positive and serious manner. The remark that students 'found me unapproachable' was of a concern, especially for one group of National Diploma students that only had contact with me during a weekly, one-hour timetabled tutorial in their first year of study. This offered them little opportunity for getting to know me, and so their impressions of me

as ‘unapproachable’ could have affected their participation within the interviews. However, the student research interviews took place on the back of tutorial sessions and I felt this helped to warm up some students and made them more responsive to questioning. In addition, the interviews occurred on the third round of the tutorials, so students were at least familiar with the one-to-one format used, and had experience of studying at Sophwort College for at least six months.

As to generalisability, I am not saying this case study is typical of BTEC assessment practice within other college engineering programme areas, but that it offers a contribution to the knowledge (McNeill, 1990, p. 80) of assessment practice in the vocational FE sector. It is hoped that this in-depth case study could be strongly suggestive of what happens at similar learning sites, and ‘ring bells’ (Pring, 2004, p. 41) with other research such as those reviewed in Chapter 2.

4.3 Interviewing students

The National Diploma engineering programme had the stereotypical student intake, being predominantly male (James and Biesta, 2007, p. 78), which at commencement of the course in September 2006 numbered eighteen students. However, five students withdrew from the programme before the interviews for this research took place and so none of these students formed part of the research group. In their first academic year, the students were interviewed following one of their formal College, one-to-one tutorial interviews. For most students, this was the third tutorial they had attended so they were familiar with the format and protocol of the interview, and aware that what was discussed was confidential, would be transcribed and given to them for their comments, amendments and signing. This batch of interviews with students (n = 13) commenced in March 2007, six months into their studies as it was then considered they could offer reflections on their experiences of BTEC assessment practice. Of the ten students that returned to Sophwort College for the second year, five chose to study the Electrical programme and five the Manufacturing programme, and this formed the basis of the two groups for second year study.

To determine if student perspectives had changed at the end of their two-year National study, all remaining students (n = 10) on the National in June 2008 (their last month of

study) were again interviewed, but this time unconnected with the tutorial process. These one-to-one interviews, undertaken in a small classroom, varied in length from thirty minutes to one hour. As the interview schedule used was very similar to that of the first year, it helped eliminate concerns over time-dependent questioning, that is, did a very similar interview schedule used nominally a year after the previous interviews, yield any significantly different findings with regards the students' perspectives?

4.4 Interviewing lecturers

During the 10th to 12th July 2007, the final week before Sophwort College's summer recess, I undertook semi-structured interviews with six of the seven engineering lecturing staff involved with the BTEC National programmes. One lecturer was unavailable during this period, but was interviewed at the beginning of September. The interview durations ranged from one to one and a half hours, and all but one of the interviews was undertaken in the same electronics laboratory. This small classroom was deemed comfortable and accessible to all lecturers and chosen to avoid interruptions, although several interviews did suffer an interruption. All lecturers interviewed taught on the two-year BTEC National from 2006-2008, although not all taught on the first year of the programme and one lecturer did not teach on the second year.

4.5 Developing the students' interview schedules

The first students' interview schedule used (2007) was developed from my and other lecturers' concerns that had evolved over several years prior to my commencing the EdD programme, and also from discussions with lecturers during my first year of EdD study whilst formulating a research focus. This interview schedule, shown in Table 4 on page 77, was piggybacked on the formal College tutorial interview schedule and undertaken with the students' permission.

The first two questions of this schedule required students to reflect on their previous educational experiences, in comparison with that of their first year National study. This was an attempt to determine any significant differences between the academic and vocational programmes that might influence their approach to their National study, what has been referred to as 'learning careers' (Ecclestone and Pryor, 2003). Questions

3 to 5 required students to compare their previous 'assessment careers' (Ecclestone and Pryor, 2003) with that of the National assessment practice. These questions sought their perspectives on the various assessment methods used by lecturers, such as open-book tests and open-assignments (see Section 5.3.1 on page 97), and on the referral system used to support students if not successful on their first attempt at an assessment (see Section 5.3.2 on page 99). Question 6 related to Question 5, as the referral system was a necessity due to the BTEC requirements for students to show mastery of the stated unit criteria. This contrasted with the GCSE and A-level assessments marked in percentage terms and indeed the original TEC programmes, where an averaged 50% represented a pass in any unit (see Section 3.3, page 53). Question 7, based on a TEC student attitude questionnaire (Moor et al., 1983, p. 101), was used to determine if relevance of the course material affected students' approach to their studies. Questions 8 and 9 emanated from lecturers' anecdotal comments that students did not prepare themselves well for tests. Question 10 related to students' perceptions as to the quantity of assessment they received, with Question 11 endeavouring to determine the impact the referral process had on students' dispositions to their studies, as did Question 14. Question 12 was peculiar to this cohort relating to a poor success rate in one science assessment, and arose from anecdotal comments from both lecturers and students (this assessment is reviewed in detail in Section 6.4.1, page 128. Question 13, again based on lecturers' observations, related to the seeming reluctance of students to undertake College work outside of the classroom environment. Questions 15 focused on the quality and quantity of feedback students received, with Question 16 seeking student perceptions on improvements to the National assessment practice. Although many questions are written in a closed format, I always asked for elaboration and justification for 'Yes or No' responses, to provide richer data. On reflection, this interview schedule was too wide-ranging but at this time, my research did not have the clarity of focus it should have had (see Section 4.7, page 82 for further discussion). However, the schedule had sufficient questions related to my final research questions (Section 1.3.1, page 8) to yield useful data.

Table 4: Student Interview Schedule 1 – used March to May 2007

	Questions
1.	What do you think of your college studies so far?
2.	How do you find college study (as compared to school)?
3.	How does Sophwort-on-Sea College assessment practice compare with school?
4.	What do you think of the different *modes** of assessment- which do you prefer?
5.	What do you think of the referral system? Good points and bad points?
6.	Would you prefer to be marked in percentages?
7.	Do you see this course as training or see yourself as being educated?
8.	Do you do any revision before a test?
9.	What does revision mean to you?
10.	Do you think you have too many assessments?
11.	Do you think referrals can 'knock' self-confidence?
12.	Why do you think only the two of you passed the science on time?
13.	How much time do you spend on college work outside of college
14.	Do you feel overloaded by the assessment system?
15.	Do receive enough feedback on your work?
16.	Are there any improvements you would like to see to the assessment practice?

*should have stated 'methods' not 'modes'

For the second set of student interviews (June 2008), eight of the interview questions from the 2007 schedule were re-used. The only changes related to the original introductory questions, comparing college with school; replaced with questions asking students to compare second year National study with first year, and the additions of Questions 13-16 relating to a then research question concerning students' progress, proficiency and progression. However, this latter emphasis was removed in 2010, as to answer this question fully would have required follow-up interviews with students when on their chosen progression path, and this was deemed not practical within the timescale of this study. Table 5 on page 78 shows the modified interview schedule.

Table 5: Student Interview Schedule 2 – used June 2008

	Question
1.	How do you compare the second college year to the first?
2.	How does the assessment practice this year compare to the first year; are there any differences?
3.	What do you think about the modes [methods] of assessment?
4.	What about the referral system, any good and bad points about it?
5.	Would you rather be marked in percentage terms as at school, or in the way we mark at College with these passes, merits and distinctions?
6.	Do you see this course as 'educating' you or 'training' you?
7.	Do you undertake revision before a test?
8.	Do you think you get too many assessments?
9.	Do you think when you are referred it can affect your self-confidence?
10.	How much time do you spend on college work outside of college per week?
11.	Why do students not do any homework?
12.	In what way do you get feedback?
13.	Are you aiming for higher-grades?
14.	How do you judge your 'progress' through the course?
15.	How do you judge your 'proficiency'?
16.	What is your preferred 'progression' route?
17.	Are there any improvements you would like to see to the assessment practice?

4.6 Developing the lecturers' interview schedule

A supervisory change with regards my Director of Studies occurred in May 2007 (discussed in Section 4.7 page 82), and induced a rigorous six-week re-assessment of the emphasis of the study, its research questions and objectives. This re-assessment, combined with a limited window of opportunity to undertake the interviews with lecturers before the end of term, impacted on the development of the interview schedule. Towards the end of the previous academic year (May to July 2006), I undertook 'exploratory interviews' (Cohen et al., 2000, p. 270) with five of the seven lecturers (two since retired and two joined Sophwort College) in this study relating to

their general perceptions and issues associated with BTEC assessment practice. The findings from these interviews, coupled with the literature review, helped me develop the initial lecturers' interview schedule. The following discussion outlines how the schedule underwent a three-stage development process.

The first draft of the interview schedule (Refer to Appendix G, Figure 12 on page 229), developed prior to the change in supervisor, placed an emphasis on 'formative assessment' practice, related to my understanding of the concept at the time. This move away from assessment practice in general was due to a combination of supervision direction, current literature reviewed, and the then recent BTEC assessment policy emphasising the use of formative assessment practice (Edexcel, 2006a). However, anecdotal evidence following brief and informal discussions with engineering lecturing staff, suggested the concept of formative assessment was not well understood, and so asking questions about ipsative and diagnostic assessment would have been unlikely to prove fruitful. Indeed, it is only through the EdD study that such terms and definitions became familiar to me. Following discussions with, and suggestions from, the new supervisor, it was decided the interviews should focus on assessment practice per se, and only associated with National programmes. On reviewing the schedule again, several questions could be associated 'Yes/No' test-type responses and may have curtailed more open discussion.

The second draft (see Figure 13, page 230) reverted to a more holistic perspective on assessment practice. This schedule commenced with questions used during the exploratory data gathering interviews a year earlier, although significantly reduced in quantity. To help me consider the likely data gathered from the schedule, I outlined the anticipated responses that might be forthcoming from each question in the schedule. However, after further discussion with my new supervisor, several problems were highlighted such as 'loaded questions', that is coaching, and ill-defined questions such as, 'How much support and guidance do you provide within the written assessment itself?' One of the major criticisms was the lack of alignment between the research questions and the interview questions, as the schedule did not address the research questions concerning students' progress, proficiency and progression through the programme. Figure 14 on page 233 shows further development of the interview schedule.

The final draft of the interview schedule (Table 6, page 81) differs from the second draft by a rewording of certain questions and a slight restructuring of the order of the questions. In this version, questions 1 to 4 were associated with 'summative assessment'; questions 6 to 8 related to 'formative assessment' and 9 to 13 were primarily concerned 'with progression and proficiency' considerations (although as stated above, this research emphasis was reduced due to time constraints). The schedule now encompassed the research questions and required open-ended responses to all.

There was no time to pilot the schedule and indeed no one to pilot it with, but I did discuss the schedule questions and likely interpretations and responses with a critical friend, an experienced teacher from a secondary school although having no experience of FE. The very last question related to approaches to learning which I was beginning to consider within the literature, but with hindsight realised it was outside the possibilities of one thesis as it involved engaging with another literature review. Although further discussion and comments were forthcoming from my supervisor, due to the short window of opportunity at the end of term, these were not incorporated as interviewing had already commenced.

Table 6: Lecturer Interview Schedule - used July 2007

Questions relating to 'summative assessment'	
i)	Could you outline the way you plan, deliver and assess a particular BTEC National unit?
ii)	What do you see as the functions and purpose of assessment within the BTEC programme or your unit of study?
iii)	What are the considerations influencing your general approach to assessment practice?
iv)	What are your main considerations when you draft an individual assessment?
v)	In your opinion, what characteristics underpin a Pass grade, Merit grade and a Distinction grade student?
Questions relating to 'formative assessment'	
vi)	In what ways do you assess and give students feedback on their progress prior to formal (summative) assessment?
vii)	Do you encourage students to treat assessments as learning opportunities?
viii)	In what ways do you offer feedback to students and how often?
ix)	In what ways do you assist students within your assessment practice?
x)	How do you currently use the referral system within your assessment practice?
Questions relating to student 'progress, proficiency and progression'	
xi)	• In what ways do you use assessment to evaluate students' progress? • What does progress look like; what does it mean for you when a student makes progress? • Is it about proficiency and what does proficiency mean in your subject area (examples)? • How do students know they are making progress?
xii)	• Where do you expect students to move to at the end of the National course? • Do you see your assessment practices as preparing students for progression and in what ways?
xiii)	Do you generally endeavour to develop 'surface', 'deep' or 'procedural learning'?

4.6.1 Transcription of interviews

All interviews were digitally recorded and the contents manually typed using Microsoft Word. Although I produced partial transcriptions of first year student tutorial interviews (14 000 words), my wife, a former touch typist, kindly transcribed second-year student interviews (34 000 words). My wife also typed the lecturers' transcripts (78 000 words), with her transcription time estimated at 50 hours for all interviews. Although there may have been benefit in my transcribing the recordings to ensure accuracy, my wife highlighted segments of the recordings where she had problems understanding dialogue or terminology used, from where I revisited the recordings to add or correct the transcripts as required. On reading the typed transcripts, I occasionally found passages of text that were incoherent or out of context, and again on revisiting the recordings, amended the scripts.

In order to mechanically manipulate the raw transcripts and facilitate data analysis, I chose to use word-processing files as opposed to using a paper-based/card system, or using computer packages designed for qualitative analysis such as 'NVivo'. I felt this would help automate the process of data analysis, allow large files to be easily searched for keywords or strings, but allow me greater control over the analysis than if I used a professional package, which would also need to be learnt. I had three word-processed files, one containing all lecturer transcripts, one containing the 2007 students' transcripts and one containing the 2008 transcripts. In these files, I parsed the data into a very long table, which placed every transcribed sentence in its own line, then inserted an additional column on the right hand side of the data column to allow me to add comments as the analysis unfolded. Colour text was used to highlight themes and aid readability.

4.7 The evolving data analysis process

The educational research process is 'rarely neat, linear, coherent or straightforward' (Wellington et al., 2005, p. 95), and can be 'messy, frustrating and unpredictable' (Wellington, 2000, p. 3). My research experiences proved no exception, and indeed, I could extend this descriptive envelope with the terms, ad-hoc, post-hoc, iterative and very challenging. Appendix I (commencing page 242), overviews the progression path

of my study. My research process was slightly disrupted by a request to change Director of Studies (DoS) six months into my research phase. The initially assigned DoS's area of expertise was the primary school sector and as time elapsed, I considered it would be preferable to have a DoS who was aware of the FE literature with which I was engaging, and could relate to the FE culture within which I worked and was researching. On the 8th March 2007, I attended an EdD seminar presented by Professor Ann-Marie Bathmaker, during which she made the following comment:

> Just to give you a basic example, I am doing a little study at the minute on FE/HE cultures and formative assessment in FE means keep going back, help-help-help; open door; we are never closed; you can ask anybody; that is formative assessment; you can get it back; you can rethink it and try it again. In higher education you might be allowed to have one formative assessment opportunity, but that will be strongly negotiated and will only be for a limited amount of time.
>
> [Bathmaker, 2007, 57th minute of seminar audio recording]

These comments resonated with my experiences of FE assessment practice and at the time, were a reassuring influence on the focus of my research. On the 17th March 2007, I e-mailed Professor Bathmaker asking if she would kindly be involved with my study in some capacity, and on the 21st June 2007, Professor Bathmaker was formally appointed as my DoS.

On reflection, another interruption to development of my thesis was the unusual structure of the EdD programme I was studying, which required the research phase to be supported by formal attendance of four debriefing sessions (spanning February to June 2008), and a further study module 'Debriefing the Research Experience' (spanning November 2008 to January 2009). In theory this was an innovative and positive change in programme structure. However in practice from my perspective, these additional sessions, although well presented and very interesting, tended to stunt, as opposed to support, development of the thesis. Part of the problem related to the programme designer not being available for involvement in the debriefing sessions, and the timing of the sessions themselves. When the debriefing sessions took place, I was on the cusp of beginning data analysis when no other students were. Most were still collecting data, and I lost focus as I became engrossed in philosophical positioning for the almost six months duration of these sessions. I blame no one but myself, as I should have ensured I focused most effort on thesis development (as my new DoS

emphasised I should), but alas I did not. The debriefing sessions were soon followed by the required attendance at an 'Evaluation and Change (Part 2)' Module, which did culminate in a return to data analysis, but this was almost one year after I had tentatively begun my analysis. Due to the above, and also my prevailing lack of focus, the data analysis of my lecturer and student interviews intermittently spanned Jan 2008 to June 2010. Even at times when I had several months working on the data analysis, progress was slow as I tried various approaches to generate codes and themes.

I realise it is rigour in analyzing data that distinguishes qualitative research from anecdotal information (Tonso, 1996, p. 219). When I asked my wife for her synopsis of students' characteristics after listening to, and typing, their interview transcripts, she stated:

> The students enjoy college as more relaxed; they have more freedom in how to act and dress. They are 'damn lazy' and like open-book tests or assignments as they would not work for a closed-book assessment. They like the feedback given and don't care about being referred. They like being able to have continual attempts at assessments, as they know they will pass eventually if they keep going. Students do not do anything outside of the lesson; most lecturers do not ask for homework.
>
> [My wife, 2008]

Obviously, I must aim for much greater rigour within my analysis!

Despite my sporadic nature of progression outlined above, I endeavoured to be systematic in my analysis. In this respect I felt a need to use a structured or procedural framework on which to base my approach, a need probably influenced by my engineering background, where analysis of quantitative data often followed predefined formats or techniques. My first tentative data analysis began in January 2008, and used a framework developed by Colley et al. (2003). This framework was originally proposed to consider characteristics of formal and informal learning, and based on four clusters termed process, location and setting, purposes, and content (Colley et al., 2003, p. 30-31), which they later tentatively proposed for use in analysing assessment (Colley and Jarvis, 2007, p. 300). I initially used a slightly modified version of this framework in a deductive way, to begin to organise student data. I also began reading the lecturer transcripts to familiarise myself with the vast quantity of data gathered. However, as

stated above, due to the structure of my particular EdD programme, this exercise was halted. I concluded this initial and brief excursion into data analysis in Jan 2008 by producing a synopsis of student transcripts in which I listed responses under what were initially broad themes, partially generated from the interview schedule and partially from generic themes arising from the data. It was not until December 2008, as part of the 'Evaluation and Change' module, that I was able to revert back to the data analysis. As part of this module, I returned to the original raw lecturer transcripts, and this time endeavoured to remove discussion that was not pertinent to College assessment practice, reducing the data to a core of around 34,000 words. I tried to do this systematically by collating respective lecturer responses under the thirteen questions of the interview schedule. This required careful consideration as lecturers sometimes commented on earlier questions within responses to later ones, or raised issues in later responses that related to earlier questions, thus comments that may have seen incidental to me at the time, could have had a greater significance as the analysis unfolded and my literature review developed. I realise that throughout my data analysis process, I was using my own 'sensibilities and theoretical perspectives' to interpret and filter in the 'process of making meaning' (Ely et al., 1997, p. 223).

Using an inductive analysis approach outlined during the study block, I revisited the lecturer data with a less prescriptive framework, looking for 'contingency' (how one thing depends on another), 'patterns' (repetition in actions or vocabulary) and contradictions (and their significance). During February and May 2009, I intermittently continued with the data analysis in-between reading literature on assessment and data analysis. In August 2009 I returned to the data analysis of students' 2007 and 2008 tutorial transcripts, searching for descriptive codes, and in September 2009 due to strong similarities between the 2007 and 2008 student transcripts, I merged them into one dataset, again re-reading and looking for descriptive codes. From November to December 2009 data analysis of lecturers' transcripts was again pursued, from where cultural considerations arose as a significant influence on lecturers' constructions of assessment practice. To help explain this occurrence, 'learning culture' theory was read before revisiting the data one more time. From April to October 2010, first drafts of the data presentation and discussion chapters were developed.

4.7.1 Reflections on the data analysis process

My approach to data analysis of the transcripts exhibited similar traits to that outlined by Ely et al. (1997, pp. 206-207). I studied and re-studied the raw data, from where I developed detailed and intimate knowledge, noted first impressions and listed tentative categories, a process that was iterative, and in my case disjointed for reasons stated above. My objective, as for many analytic approaches used by qualitative researchers (Ely et al., 1997, p. 205), was to endeavour to identify 'themes' that 'emerge' from the student transcript data, which need to be developed over time (Ely et al., 1997, p. 207). However, before themes can be generated using an inductive approach, coding has to be undertaken.

Coding is analysis that involves dissecting data while keeping the relationships between the parts intact. It involves data being differentiated, combined and reflected upon (Miles and Huberman, 1994, p. 56). Gipps (2007) defines coding as a way of indexing or categorizing text to help establish a framework of thematic ideas related to it (Gipps, 2007, p. 38). He states three types of codes used to analyse data namely 'descriptive', 'categorisation' and 'analytic', although all such codes are tentative because the analysis remains tentative (Ely et al., 1997, p. 164). Descriptive codes entail little interpretation but attribute a class of phenomena to a segment of text (Miles and Huberman, 1994, p. 57); they tend to take interview statements at face value and repeat respondents' terms in code form. Gipps suggests a move to 'categorisation' coding where for example, activities stated maybe grouped under categories defined by the analysis, so providing a more theoretical level of coding based on an interpretation of the data. He further suggests the analysis should move towards what are termed 'analytic' or 'pattern codes' (Miles and Huberman, 1994, p. 57) where an interpretation to the text is justified by sufficient evidence found in the data. These codes are explanatory or inferential, helping to identify emergent themes, or providing explanations (Miles and Huberman, 1994, p. 69). Gipps considers that within a wide range of types of qualitative analysis, there is a common ground of phenomena that researchers tend to look for in their texts, and that although different researchers have different emphasis, many of the ideas will be useful to any analysis of texts (Gipps, 2007, p. 46). Bogdan and Biklen (1992, cited in Miles and Huberman, 1994, p. 61) also offer a scheme which divides codes into the ten categories, listing general domains in which codes can be developed inductively. To provide a framework for my

inductive approach to data analysis, I used a combination of these listings to generate codes and ultimately themes. These listings are shown in Appendix J on pages 245 and 246 (Table 12 and Table 13).

On reflection, I tended to analyse the lecturer and student data using different approaches. From the literature review, key themes had been identified (see Section 2.7 on page 43), which could be used to undertake a deductive analysis, what Gipps terms, 'concept-driven coding' (Gipps, 2007, p. 44). This was the predominant approach initially taken with lecturers' transcripts, however I considered an inductive, 'data-driven coding' (Gipps, 2007, p. 44) approach should be used with the student transcripts, certainly in the initial stages, as they were on the 'receiving end' of the lecturers' constructions. In essence, I considered that the lecturers' approach to developing and implementing their assessment practice would likely be influenced by the themes emanating from the literature, but the students' perceptions and reactions to the assessment practice might not be so clearly defined.

I am aware there are many themes embedded in data, and that such themes only emerge in the head of the researcher (Ely et al., 1997, pp. 205-206), and so can be influenced from reading of literature, life experiences, educational and vocational background, assumptions, theories of the world, beliefs and stances. I am also conscious that I could be influenced, or indeed misled, by my long-time exposure to the environment in which I am encultured, and concurrently working and researching.

4.8 Ethics

Throughout this research, compliance with all relevant aspects of the British Educational Research Guidelines (BERA, 2004) for all participants have been addressed. This research primarily involved contact with Sophwort-on-Sea College lecturing staff and one National Diploma student cohort, with the prime method of data gathering being semi-structured interviews.

From initiation of this research, I have ensured 'gatekeepers' were fully informed of my aims and objectives and the intended participation of both lecturers and students. Such gatekeepers included the then Deputy Principal of Sophwort who at that time was

overseeing my research progress, and the Manager of the Engineering Programme Area. Confidentiality for both the Engineering Programme Area and the College itself are salient considerations of management, and so upholding the College's reputation and legal position (ESRC, 2005, p. 29), and ensuring they have value for money from my study. The National Diploma Course Tutor was also informed of my intentions to use one particular cohort of his students as the focus of my research, and his help in facilitating access to the students at various times was much appreciated. All gatekeepers were aware of my involvement in the College's tutorial process and the interviewing of students, as directives emanated from the Deputy Principal and formed part of my annual appraisal objectives. At the first departmental meeting (10th September 2006) of the 2006-07 academic year, I announced my intention to commence my educational research, which was expected to be ongoing over the next two-years. I also stated that at some stage, I might ask the assistance of lecturers to aid in my research, if they would be willing.

Within the student cohort that was a focus of this research, I endeavoured to provide a general awareness of my educational research intentions. However, where students were interviewed on a one-to-one basis, I offered verbally explicit information about the research process, its aims, the requirements for confidentiality/anonymity of participants (BERA, 2004, p. 9, Section 23), and outlined the purpose to which any data collected may be used. Where I extended the students' tutorials to include data gathering for the research, verbal voluntary informed consent was requested before any questioning was undertaken (BERA, 2004, p. 7, Sections 10 & 11; ESRC, 2005, p. 1).

To aid confidentiality and anonymity, all lecturers and students were assigned pseudonyms, however I realised if the data were rich, this might not provide the confidentiality guarantee and care needed to be exercised (SRA, 2003, p. 39). This was a particular concern amongst lecturers, who were few in number and all worked in the same, small programme area. This concern tended to limit my discussion of context and content within my presentation and discussion chapters, as on occasions I would like to have related assessment practice to specific unit content, but by stating a BTEC unit of study or the details of the specific assessment process, I would highlight the lecturer involved. Also at the time of this research, two lecturers were Edexcel

External Verifiers, and again where reference is made to this fact, their pseudonyms are omitted.

Within the formalised, timetabled tutorial process, the right to withdraw (BERA, 2004, p. 7, Section 13) was not offered, as College policy requires all students to partake in the tutorial process. However, the right to withdraw from data gathering activities that specifically pertained to my research was offered during the one-to-one tutorials. All data obtained from the students' tutorials were transcribed and returned to them for 'member checking' (Stake, 2004, p. 187), to help validate their responses to both College tutorial questions and also my research questions. It is emphasised to students that they could amend my written notes as they deemed fit and once they were satisfied with the draft, they were requested to sign it and were informed that this was confidential information stored in their record envelope (BERA, 2004, p. 7, Section 11). I further asked students to sign an additional form relating specifically to the research data extracted from the tutorials, explaining how their data would be used. To reduce pressure on them, students were permitted to take this form away to read and submit it a week later, signing 'yes' or 'no' response to my request (see Appendix K on page 247). The intention of this process was to ensure informed consent. Record envelopes were accessible only to engineering staff for College purposes and use covered by The Data Protection Act (BERA, 2004, p. 9, Section 24; ESRC, 2005, p. 18, Section 1.16.3). The National Diploma Course Tutor was issued with copies of all students' tutorial transcripts, as he was ultimately responsible for monitoring his students' progress.

The issue of under eighteen-year-old students (first and possibly some second year Nationals) being classified as vulnerable participants (BERA, 2004, p. 7) was considered with regards to obtaining parental consent (BERA, 2004, p. 8). However, after discussing this issue with the College course tutors and university lecturers, it was decided that as long as all data used was confidential, anonymous and primarily college-related, parental consent was not required.

4.9 Validity of this study

Although often sporadic, iterative and problematic, throughout this thesis I have endeavoured to show the 'warts and all' development of this research, outlining my considerations, concerns and choices along the way. Within Chapter 1, I reflected on my academic and vocational background for scrutiny by the reader (see Section 1.1, page 1 and also Appendix A). Within this current chapter, I discussed my philosophical positioning (Section 4.1, page 64) and the perceptions my peers have about me (see page 72), some of whom were interviewees. Within Chapter 6 (Section 6.4.2, page 129), I refer to my classroom material and assessment instruments related to the BTEC Mechanical Principles unit, to provide an illustration of the considerations that influenced, and impacted on the development of my assessment practice (Section 6.4.2, page 129).

Establishing the validity and reliability of data obtained through the use of qualitative interviews is a long-standing concern (Cohen et al., 2000, p. 120), and particularly in an educational context, when interviewing children and young people. Although in this Sophwort College study, students interviewed were predominantly young adults, the problems associated with interviewing children (Cohen et al., 2000, pp. 124-125) still has resonance. This validity concern could be considered heightened in my study, as I was a lecturer on the students' programme, and so possibly seen by some students as 'an authority spy' (Cohen et al., 2000, p. 125) when undertaking interviews. Furthermore, it was suggested by colleagues that College students perceived me as, 'too serious and intense' and 'unapproachable' (see page 73). For some students, the effect of these perceptions could have had the potential to make them more cautious in their interview responses, and possibly seek to try and tell me what they thought I wanted to hear.

As already stated in Section 4.3 (page 74), the first data gathering interviews were undertaken on the back of College Tutorials, and for most students, was their third, one-to-one tutorial interview with me. Thus, at this time, students were familiar with the format and process of the interviews, and indeed had been studying at Sophwort College for at least six months. Also, a very similar interview schedule was used with the students in the very last month of their second year National study, when they

should have felt less intimidated in their responses, as only two students were planning to return to study Engineering at Sophwort College.

In practice, the data gathered from the second round of interviews yielded similar student perceptions to those of the first interviews. During these second interviews, most students referred back to their first year study, where they had experienced a greater variety of assessment methods; the 2nd year National was predominantly assessed using open-assignments (see Section 5.3.1 on page 97 for discussion of assessment methods). Furthermore, it was clear from the students' responses that they were not telling me what I wanted to hear, as few admitted to undertaking homework, and almost all stated they spent very little time working on their studies outside of the College environment – not what I wanted or expected to hear!

There was also strong correlation between the students' comments, and what was found from reviewing their Programme Area Assessment Portfolios (see Section 5.3.3 on page 100). For example, students persistently commented that assignment submission dates were considered lax and not enforced by lecturers, and that most feedback they received tended to be oral. These assertions were substantiated from the portfolio evidence, as lateness of assignment work (sometimes in terms of months) was noted across most units, with limited lecturer feedback written on students' assessment scripts, indicating the majority of feedback was verbal. From the above considerations and observations, and indeed the consistency of comments received, the data gathered from the students' interviews were considered their honest perceptions of BTEC assessment practice in the Engineering Programme Area.

Finally, although I let the voices of the participants dominate this study, I acknowledge I am omnipresent throughout the research, from purposing initial concerns I had about mine and other lecturers' practice, through to the literature review undertaken, the interview schedules developed, the way I conducted the interviews, presented and analysed the data, to formation of the conclusions and recommendations. As a practitioner-researcher, I have endeavoured to be open and honest, but recognise that my findings are always constructions of my mind, remain tentative and are never definitive.

4.10 Summary

In this Chapter, I have discussed my ontological and epistemological perspectives in a reflexive and pragmatic way, by outlining my educational and professional background and my relationships with peers, and in so doing positioned myself in relation to the context of the study. I have also stated my methodological positioning related to my insider research of lecturers' and students' constructions of assessment practice at the micro-level of classroom engagement within a small Engineering Programme Area. With regards the research design, I have stated characteristics of the research participants; discussed the development of the interview schedules and tried to convey the difficulties and vagaries associated with the evolving research process and in particular, the iterative, fragmented and lengthy data analysis process. Finally, I have shown how I endeavoured to allay concerns over my interpretativist approach to this study.

The next chapter sets the scene for the data presentation chapters, providing an overview of BTEC National Engineering programmes available at Sophwort College, Edexcel's requirements for BTEC assessment, how National assessment is organised and implemented, and lists the lecturers and students interviewed.

5. Setting the scene for data presentation

This chapter provides the backdrop for the next two chapters relating to presentation of interview data gathered from both lecturers (Chapter 6) and students (Chapter 7). These data are used to illuminate assessment practice at the micro-level of the BTEC National Diploma programmes offered by the Engineering Programme Area at Sophwort-on-Sea College. The College has been offering TEC/BTEC Nationals since the late 1970s, and Higher National programmes since the early 1980s. The chapter includes an overview of the BTEC National Diploma offered at Sophwort College, reviews Edexcel's quality assurance requirements, and overviews Sophwort College policies, procedures and variety of assessment methods used by lecturers.

5.1 BTEC National Engineering at Sophwort-on-Sea College

The Engineering Programme Area offers a range of BTEC qualifications for technician students across three QCF levels, intended to support the recruitment requirements of local industry, and to facilitate progression onto undergraduate engineering programmes at Sophwort College, and at other universities. The range of BTEC programmes include the Level 2 First Diploma, the Level 3 National Diploma/Certificate programmes, and the Level 4 Higher National Diploma/Certificate programmes. This research focuses on the Level 3 National Diploma full-time programmes that ran from September 2006 to July 2008 (note these qualifications were re-titled in 2010, see Edexcel (2009a)).

Due to limited student enrolment on the National Diploma in the Engineering Programme Area, and to cater for students being unclear about their intended career choice (Wolf, 1994, p. 1), all National students study a common first year, having a mix of electrical and manufacturing units. However, due to limited classroom resources, during their first year, the cohort of students in this study was split into two small groups known as ND1a (n = 7) and ND1b (n = 6).

The BTEC National Diploma (ND) consists of 18 units, to be studied over the two-year programme. The majority of units were designed to be delivered and assessed by lecturers within '60 guided learning hours' (Edexcel, 2002b, p. 10), however in the

Sophwort Engineering Programme Area, units are often timetabled for 72 hours contact time. This was partly due to Sophwort College being a non-incorporated college with staff still on 'Silver Book' conditions, which does not produce financial pressures to reduce lecturer contact hours per course, as experienced by many colleges in England (Smithers and Robinson, 2000, pp. 9-10). Also at this time, students were paid around £80 per week during their first year by the Department of Trade and Industry as an incentive to study engineering.

On enrolment onto the second year of the National programme, students had the option to study either the National Diploma in Electrical and Electronic or Manufacturing Engineering, again forming two separate groups. A few students found employment during the summer recess between first and second year, and due to the nested nature of BTEC qualifications (Edexcel, 2007b, p. 3), returned to enrol on the National Certificate (NC) programmes, which are 12-unit qualifications (Edexcel, 2002b, p. 9; Edexcel, 2007b, p. 3) designed for part-time study. Appendix H commencing on page 236, contains the students' course timetables stating all units studied over the two-year National programme at Sophwort College.

5.2 Edexcel's definitions and requirements relating to BTEC assessment

As these BTEC National programmes are primarily internally assessed, the vast majority of assessments are devised by colleges (and other assessment centres such as schools), and not Edexcel. Edexcel state all assessments devised should be valid, reliable and fit-for-purpose, with a variety of assessment instruments used, such as assignments, project-based work and time-constrained tests. Assessments should enable students to produce evidence directly related to the specified outcomes (Edexcel, 2002b, p. 11; Edexcel, 2007b, p. 13). In 2006, Edexcel issued a document reiterating their policy, that a learner's evidence must only be assessed against the assessment and grading criteria of a respective unit, and that 'Assessment is carried out in order to make judgements about the learner's performance in relation to national standards' (Edexcel, 2006a). However, this document also stated that assessment may be used as an aid to learning, and students should be allowed the opportunity to improve their

performance through the use of formative assessment prior to summative assessment occurring:

> Centres may provide learners with interim formative assessment stages and feedback from the assessor should allow the learners the opportunity to improve their performance. At a stated time, the summative assessment of the learner's work needs to take place and this is when formative assessment stops.
>
> (Edexcel, 2006a)

Edexcel provide the following definitions of summative and formative assessment, indicating they are separate practices:

> Summative assessment is carried out in order to make final judgements about the learner's performance in relation to the assessment and grading criteria of a unit or part thereof. It is the definitive assessment and recording of the learner's achievement and must be conducted to national standards.
>
> Formative assessment involves both the assessor and the learner in a process of continual review about progress and takes place prior to summative assessment. Learners are provided with formative feedback on their draft evidence and are empowered to act to improve their performance.
>
> (Edexcel, 2006a, my emphasis)

5.2.1 Quality Assurance

As part of the Quality Assurance system at this time of this study, Edexcel required centres to have in operation an Internal Verification system. The purpose of which was to ensure 'reliability' of assessment and so maintain 'national standards':

> [Internal Verification]….each assessor's decisions are reviewed to ensure that they are correctly interpreting and applying the standards set out in the specifications.
>
> (Edexcel, 2002b, p. 13)

The format of the IV system in operation was at the discretion of the individual centres, which Edexcel would accept as long as the system ensures 'robust internal standardisation' (Edexcel, 2002b, p. 13; Edexcel, 2007b, p. 15). Within the Engineering Programme Area, the Programme Manager and the National Diploma Course Tutor undertook internal verification activities for respective units on the National programmes (both lecturers interviewed). All assessments were internally

verified prior to being issued to students, and four students' scripts associated with each assessment were subjected to this verification process. However, in practice, this could mean initially referred students' scripts were verified for the initial assessment decisions, but not any re-submissions, and thus not the final decision of the lecturer. The Internal Verification process commented on content and presentation of the assessment, and endeavoured to ensure the standard of the assessment and the assessment judgement satisfied the unit criteria (or interpretation of the criteria).

A further part of the quality assurance process involved 'External Verification' which was undertaken through what was termed 'National Standards Sampling' (NSS) (Edexcel, 2002b, p. 13; renamed 'Standards Verification Sampling', Edexcel, 2010c). In this process, Edexcel sampled lecturers' decisions of a selection of students' assessment scripts using subject-specialists, termed 'External Verifiers' (EVs) (renamed 'Standards Verifiers', Edexcel, 2010a, p. 21). This was a postal-based system, with all scripts sent to a designated Edexcel external appointed assessor, with no college visits required. Not every lecturer was subject to this external scrutiny in a particular academic year and indeed, over the two-year duration of this research, Engineering Lecturer Neville and I, had no assessment externally verified. During academic years 2006-2007 and 2007-2008, the Engineering Programme Area satisfied all NSS requirements, signifying standards and assessment decisions within the samples presented for external scrutiny were acceptable to Edexcel.

5.3 BTEC assessment practices in the Engineering Programme Area

Within Sophwort-on-Sea College at the time of the study, there were no cross-college policies or quality procedures relating specifically to BTEC National assessment practice, only to BTEC registration and exam entry. Within the Engineering Programme Area, a National Diploma Course Handbook (2006-2007) was produced, outlining the policies and procedures related to BTEC summative assessment practice. The handbook emphasised the use of assignments as the main assessment method, all of which were to state a formal submission date. It also emphasised the students' responsibilities to ensure assignment work was submitted in accordance with these stated dates. The department's policy on late submission of assignments stated that

students' work, 'will not be accepted after the submission date', which had the potential to prevent a student from passing a unit. Students failing to submit more than one assignment on time were required to attend a meeting to discuss strategies to rectify the situation, with continued failure possibly leading to disciplinary action. Extensions to assignment submission dates could be requested, but these would only be granted in 'unusual cases'. However, nowhere within the departmental handbook was there any reference to policies and procedures associated with the use of formative assessment, or for accommodating students re-submitting or re-sitting failed assessments. For example, there was no clarification or guidance over such issues as authority for re-assessment, provision of sufficient and detailed feedback to students, appropriateness of devising new assessment material, and the number of student re-assessments permitted per unit. In essence, within the Engineering Programme Area, what was colloquially known as *referrals*, that is, the process of allowing students to reattempt initially failed assessments, its design and implementation, was the responsibility of individual lecturers.

5.3.1 Methods of assessment

BTEC qualifications have evolved over past decades and developed a 'pedagogy of learning that is assignment based, project and research driven, cognitive and applied and 'student centred' .... branded as the BTEC Way' (Edexcel, 2006b, emphasis in original). Within the BTEC National, learning is often assessed by means of different types of coursework assignments set by lecturers and issued as the course unfolded, and to be submitted on a specified date. Unlike A-levels, there are no formal externally set examinations on BTEC programmes but assessment methods are varied and can include case studies, project work, presentations and time-constrained tests (Edexcel, 2007a, p. 8). The use of assignments is intended to help develop students' skills such as researching information, working with others, managing time in order to cope with multiple assignment work, and to ensure submission of work on time (Edexcel, 2007a, p. 9). In BTEC National programmes students are expected to be in charge of their own learning, such as thinking and planning and working under own initiative (Edexcel, 2007a, p. 7). Within the Engineering Programme Area, a range of assessment methods are used at the lecturers' discretion as outlined below.

5.3.1.1 Open-Assignment

Open-assignments, involving written submissions, are a common assessment method used within the Engineering Programme Area. Such assignments are extensively used within technology-based materials and manufacturing units, although they are also used within some science-based units. Open assignments are vocationally orientated, often requiring research to be undertaken as part of the process of completion, and provide students with the most freedom within an assessment method, as they are the least controlled. Students are issued with an assignment brief stating tasks to be undertaken, incorporating accompanying information as required, and stipulating a formal submission date on the front cover of the assessment. Usually an assignment commenced within a timetabled classroom lesson, from where students are permitted to finish the tasks outside the classroom environment over a period of (typically) four-weeks. However, timescales can range from two to six weeks, depending on the complexity of the tasks. Students are able to spend as little or as much time and effort on the assignment as they require, but need to time-manage their work accordingly in ensuring assignments are submitted on, or before, the stipulated date.

5.3.1.2 Controlled-Assignment

This method relates to assessments undertaken within a controlled environment, for example a practical assessment in a computer room/laboratory/workshop, or a written assessment sat in silence within a classroom, but in all cases is continuous over several weeks, or even ongoing until the student has completed the set tasks. It is often associated with such activities as laboratory experiments, building and testing electrical circuits, machining components, programming equipment and constructing computer models. However, this method is occasionally used within some science-based units, where a written paper is sat relating to vocationally orientated and complex problems. Such controlled assessments may span two hours in one lesson and then two hours in the next lesson, which may be the following week, all related to the same assessment. Students are permitted access to any reference material they choose to bring to the assessment, however all work produced by students must be compiled within the controlled environment, thus offering increased assurance of authenticity.

5.3.1.3 Phase Test

These are classroom-based, time-controlled, closed-book assessments in which students are not permitted access to their notes or any external reference sources, although generally all relevant formulae related to assessment coverage are stated at the rear of the test paper. Phase Test durations tend to range from one to two-hours, often related to duration of a timetabled lesson, and used primarily for assessing Mathematics units through short answer questions. The use of phase tests date back to assessment methods first used by TEC in the late 1970s (see Table 10, page 222), each phase test assessing the portion of the learning objectives covered in the immediately preceding period (Bourne, 1984, p. 747). This assessment method provided for a high degree of authenticity of students' work.

5.3.1.4 Open-book Test

These are similar in structure and characteristics to Phase Tests, in that they are classroom-based, time-controlled assessments. However, students are permitted to access reference sources during the assessment, such as course textbooks, workbooks, classroom notes, as they required. Such assessment methods are predominantly associated with Mathematics and Science-based subject matter, incorporating short answer questions. Test durations range from one to two hours, with test questions similar to that of phase tests in complexity, but formulae sheets tend not to be provided, as students have access to their notes.

5.3.1.5 Examinations

Traditional end-of-year examinations, requiring coverage of an entire year's syllabus and often formally scheduled to be sat in large rooms, with rigidly arranged rows of seating, were not used within any unit.

5.3.2 Referrals

Due to the BTEC requirement for students to achieve all assessment criteria to pass a unit, lecturers found it necessary to accommodate re-submissions of assignments or allow students to retake open-book tests, sometimes multiple times, and so entering the 'referral process'. Despite Edexcel not stating the word referral within its BTEC National Guidance notes (2002b), the term was in common parlance within the

Engineering Programme Area, and is stated in BTEC Circular 17 (BTEC, 1986d; cited in BTEC, 1986a) where the grades Distinction, Merit, Pass, Referred and Failure were defined in relation to criterion-referenced assessment. However the term referral can be traced further back, to the origins of BEC (1977; cited in Fisher, 2003, p. 263), where it related to a compensation grade. Neither the BTEC National guidance notes (Edexcel, 2002b; Edexcel, 2007b) or the 'Edexcel Assessment and grading: application of criteria' (Edexcel, 2006a) contain reference to the use of 'referrals' across internally assessed units. In July 2010, I contacted Edexcel in an attempt to clarify the term referral, but the first response asked me to 'advise the context of the word referral', from where no further response was received.

5.3.3 Student assessment portfolios

At the time of this research, as part of departmental practice, all National students were required to store their assessment submissions in portfolios stored in locked cupboard. These portfolios contained all assessment evidence related to students' two-year National study, and were accessible to all lecturing staff and the respective students. Students' end-of-year reports and BTEC Student Registration Forms (SRFs) were completed based on the evidence contained in these portfolios.

5.4 Lecturers interviewed

At the time of this study there were seven, male engineering lecturers teaching on the BTEC programmes, all of whom were interviewed as part of the data gathering process. Table 7 on page 101 provides an overview of the lecturers' backgrounds and their involvement in the BTEC National programmes, the focus of this research. Curtis, Neville and Dominick had each worked at Sophwort College for ten years or more; York and Marvin had worked at the College for fewer than ten years, and Boris and Bernard were relatively new to the College. Curtis, York, Boris and Bernard had all held lecturing positions at other colleges, with only Bernard not having taught on BTEC programmes prior to 2006. Marvin and Neville were graduates, having studied the traditional A-level route to university. Dominick and York were graduates having studied the vocational route, and Curtis, Boris and Bernard were non-graduates having studied various vocational qualifications. In the context of this research Dominick,

York and Boris (and I) were *BTEC boys* having studied BTEC Nationals or Higher Nationals.

Table 7: Profile of Sophwort-on-Sea College's Engineering Lecturers (n = 7)
(Taught on National Diploma programmes between Sept 2006 to June 2008)

Lecturer Information/Background				BTEC units taught per year	
Pseudonym	Qualifications[α]	Length of employment at Sophwort College	Teaching experience prior to Sophwort College	2006-07	2007-08
Curtis	FTC, HNC	10 years	Yes	Taught 1 unit	Taught 2 units
Marvin	A-levels, BTech	7 years	No	Taught 1 unit	Taught 3 units
Neville	A-levels, BEng	>10 years	Yes	Taught BTEC*	Taught 2 units
Dominick	BTEC, BEng	>10 years	No	Taught 4 units	Taught 3 units
York	BTEC, BSc	5 years	Yes	Taught BTEC*	Taught 1 unit
Boris	BTEC HND	1 year	Yes	Taught 2 units	Taught BTEC*
Bernard	C&G courses	1 year	Yes	Taught BTEC*	Taught 3 units

*Taught BTEC units, but not with research cohort.
[α]Sophwort-on-Sea College (2008, p. 111)

It should further be noted that two of the Engineering Lecturers in this study were Edexcel EVs, but they cannot be highlighted due to confidentiality concerns. One of these lecturers had been an Edexcel EV for three years and was typically assigned three colleges in England to verify, one in the north and two in the south. The other lecturer had been an EV for two years and was responsible for five colleges and eight schools. Both lecturers were interviewed separately during July 2008 for their perspectives as an EV and on the NSS process. These lecturers stated that their focus when externally verifying, was on ensuring the assessments they received related to the respective unit assessment/grading criteria and had been assessed in line with those requirements. Furthermore, the lecturers stated they had no formal influence over any other aspect of the assessment process, for example the assessment method used, time durations or the number of criteria stated within an assessment. From these interviews, it was interesting that one lecturer thought the Sophwort Engineering Programme Area undertook more testing than the colleges he assessed, whilst the other lecturer had formed the opposite viewpoint.

5.5 Students interviewed

During academic years 2006-2008, thirteen male students all aged 16 to 19 (except for one mature student aged 28), were enrolled on the National Diploma programme. Nine students were direct entry from local schools, although two had studied A-levels. Three other students had studied vocational courses at Sophwort College; two the BTEC First Diploma (Level 2 entry to National) the previous academic year and one the BTEC Pre-First Diploma (Level 1 entry to First Diploma). Table 8 on page 103 lists students in the ND1a group, and Table 9 on page 104 lists students in ND1b group during their first year study. These tables provide an overview of the students' backgrounds and progress by listing their age, entry qualifications, reasons for studying the Diploma, second year study options, achievements and their ultimate progression paths from the National.

Table 8: Profile of Sophwort College's National Diploma Group A (ND1a, n = 7)

	1st year study 2006-07		2nd year study 2007-08		
Student's *Pseudonym* (age on entry)	Entry Qualifications	Reason for BTEC study	Study options ND/NC Electrical or Manufacturing	Grade achieved[Ω] (A-level equivalent[β])	Progression route
Harry (19)	No GCSEs, but studied 'Pre-First Diploma' at Sophwort[α]	Looking for a 2nd chance at education	National Diploma in Manufacturing	ND with 'MMP' (3 A-level 'CCE')	Mechanical HND (2-years) at Sophwort College then studied Mechanical Engineering at English university.
Hector* (18)	GCSEs and 3-A-levels	To join RAF	National Diploma in Manufacturing	ND with 'MPP' (3 A-level 'CEE')	Studied politics at an English university.
Mario (19)	GCSEs and 3 A-levels	To study more practical course	National Certificate in Manufacturing (found employment)	NC with 'PP' (2 A-level 'EE').	Studied Mechanical HNC (2 year) at Sophwort College but not completed.
Stu (16)	4 GCSEs[α]	To study Marine Eng and thought he would not do well in A-level exams	National Diploma in Manufacturing	ND with 'PPP' (3 A-level 'EEE')	Studied Maths & English GCSEs at Sophwort College as required for Merchant Navy entrance.
Wayne (17)	4+ GCSEs	To study specialised HND at an English college requiring BTEC ND	National Diploma in Electrical	ND with 'PPP' (3 A-level 'EEE')	Working for family company. Studied HND on block release basis at an English college.
Morris (17)	Studied First Diploma at Sophwort	To become an electronics engineer	National Certificate in Electrical (found ND difficult)	**Did not complete** (found NC academically difficult)	Found employment and returned to Sophwort College to study a Craft course.
Rick (18)	Studied First Diploma at Sophwort	To become an electronics engineer	Not studied	**Did not complete** (personal reasons)	Unknown

All 1st year interviews undertaken between March 2007 and April 2007

All 2nd year student interviews undertaken in June 2008

* Hector was unavailable for interview in academic year 2006-2007

[α] Did not have GCSE Mathematics Grade C or above (National prerequisite entry requirement)

[Ω] BTEC Qualification overall grade achieved by student (Edexcel, 2002b, p. 12)

[β] A-level grades related to UCAS Tariff points (UCAS, 2011)

Table 9: Profile of Sophwort College's National Diploma Group B (ND1b, n = 6)

	1st year study 2006-07		2nd year study 2007-08		
Student's *Pseudonym* (age on entry)	Entry Qualifications	Reason for BTEC study	Study options ND/NC Electrical or Manufacturing	Grade achieved[Ω] (A-level equivalent[β])	Progression route
Glen (28)	Mature student, not satisfying entry level[α]	Wanted change in career	National Certificate in Electrical (found employment)	NC with 'MP' (2 A-level 'CE').	Returned to Sophwort to study IT course.
Steve (16)	4+ GCSEs	Did not like school, wanted to learn subjects relevant to career	National Diploma in Electrical	ND 'PPP' (3 A-level 'EEE')	Apprenticeship as Alarm System Fitter. Left job to study HNC at Sophwort College.
Cameron (16)	4 GCSEs[α]	Possibly become a Design Engineer	National Certificate in Electrical (did not study ND for personal reasons)	**Did not complete** (personal reasons)	Unknown
Colin (17)	4 GCSEs[α]	Interested in Design Engineering and CAD	Not studied	**Did not complete** (found Mathematics unit difficult)	Returned to study Craft course and later restudied NC at Sophwort College
Harold (16)	4 GCSEs	Preferred to study school 6th form but did not achieve 5 Grade C (or above) GCSEs	National Diploma in Manufacturing	**Did not complete** (personal reasons)	Unknown
Lesley (16)	4 GCSEs[α]	Wanted to study engineering but school not offered option	Not studied	**Did not complete** (reasons unknown)	Unknown

All 1st year interviews undertaken between March 2007 and May 2007

All 2nd year student interviews undertaken in June 2008

[α]Did not have GCSE Mathematics Grade C or above (National prerequisite entry requirement)

[Ω] BTEC Qualification overall grade achieved by student (Edexcel, 2002b, p. 12)

[β] A-level grades related to UCAS Tariff points (UCAS, 2011)

5.6 Summary

This chapter has set the context of the study, which took place within the Engineering Programme Area at Sophwort-on-Sea College. The chapter outlined Awarding Body requirements and departmental practices, and profiled the lecturers and students who are central participants in this study. The next two data presentation chapters use extracts of the lecturers' and students' interview transcripts, to illuminate *their* perspectives of BTEC assessment at the micro-level of classroom practice.

6. How lecturers construct assessment practice

This chapter considers the salient influences and constraints on lecturers as they devise and implement BTEC assessment, and illuminates how assessment functions at the micro-level of classroom practice. The chapter presents lecturers' perspectives on summative assessment, formative assessment and the referral system. Lecturers use the referral system to provide students with further attempts to achieve, if not successful on their first attempt at an assessment.

6.1 Assessment culture in the Engineering Department

This section shows how cultural perceptions influence lecturers' considerations and expectations of assessment, and how this affects the aspirations and development of their practice.

6.1.1 Lecturers summative perspective on assessment

Within the Engineering Programme Area, lecturers displayed views of assessment that emphasised its summative intent. When lecturers were asked, 'What is the purpose of assessment?', they perceived it as justifying achievement of students and ensuring quality assurance. Assessment was described as 'discrete' [Dominick], and used to provide written evidence [Dominick, York] to aid the 'checking' and 'demonstration' of students' level of knowledge, skill or competence:

> I would think that the purposes of assessment are for you to gain evidence that the student is at an appropriate level.
>
> [Boris]

> Demonstrating knowledge and skills.
>
> [Marvin]

> …checking the students' fundamental understanding of a topic ...
>
> [Bernard, similar Curtis]

> ...met the level of competency. [York]

> Check that the students have developed appropriate knowledge and or skills....the main purpose is that the student is competent through knowledge and application.
>
> [Neville]

> Will the assignment get the student to generate the evidence that is what you are really looking at?
>
> [Marvin]

This is not to say lecturers did not use assessment for formative purposes, even if this had an implicit emphasis, but primarily lecturers viewed assessment as having summative purposes.

6.1.2 Assessment practice founded on the assessment criteria

In developing their summative assessments, a salient influence was the BTEC assessment and grading criteria specified within respective National units. This emphasis was reinforced by comments from two lecturers who, at the time of this study, were External Verifiers and involved with applying Edexcel's quality assurance procedures when auditing other colleges:

> ...you must follow what is laid down in the grading criteria, followed now by the assessment strategy [Ref. to newly issued 2007 specs.], because as an External Verifier I am taught to look at the grading criteria, look at the syllabus to ensure full coverage and go down to the assessment strategy.
>
> [Lecturer and BTEC External Verifier, 2007
>
> Pseudonym withheld to maintain anonymity]

Appendix L, page 248 shows an extract from an external report from one Sophwort National assessment, illustrating the requirement for lecturers' assessment to comply with unit stated assessment and grading criteria. York also commented how assessment practice was shaped by 'leading influences' of syllabus content, assessment strategies and the need to show how learning outcomes were being met in order to satisfy external verification:

> Well I think these days the leading influences, what is written, certainly at [BTEC] National and First level, is what is written into the syllabus and the delivery of assessment strategy, is very clear on what you have got to follow. If you deviate from that you are just going to get yourselves in deep shit with the External Verifier if it goes for an NSS and it should be picked up at Internal Verification. …….. Yeah, these days the External Verifiers are far more focused on have you met those outcomes?
>
> [York]

Boris and Bernard both used the assessment and grading criteria as the starting point of their assessment practice, from where delivery strategy was developed that would enable the students to succeed at the assessment:

> The grading criteria, again you go back to that, whatever the bullet points say the students should be able to do, is what you design it [the assessment] around. …. Then once I have looked at the assessment it is then trying to build up the delivery and think what task do the students need to do in order for them to get to the stage where they should be able to do the assessment on their own.
>
> [Boris]

Curtis and York also adopted a similar approach, suggesting the upfront emphasis on assessment was in contrast to their approach to assessment development within BTEC programmes of the 1980s and 1990s:

> [York] I would say over the past couple of years I have changed the traditional approach from planning the syllabus and planning the assessment at the end of that, with all the units from [BTEC] First, National and Highers now, I've turned that around and basically start with the assessment of the grading criteria or outcomes on the highers, through the assessment method and write the assignment in most cases and then look at the teaching.
>
> [Interviewer] That's a change?
>
> [York] Yeah I mean at one time I would, certainly back over my 20 odd years, you would start with the syllabus and plan that and then do the assessment, but these days certainly over the last couple of years you do the assessment first and then look at how the teaching will end up with that, so it is more backwards planning than forwards planning I would say.
>
> [York]

However, both Curtis and Neville found the initial focus on compliance with assessment criteria a restriction on their teaching and undermining their role as a lecturer:

> There could be lots of stuff we could do, but why do it when they only have to meet the pass criteria?
>
> [Curtis]
>
> Well your assessment criteria are laid down by the examining authorities, so you are constricted.
>
> [Neville]

6.1.3 Striving for fairness in setting the standard of assessment

Due to the predominant emphasis on internal assessment within BTEC programmes, assessment was essentially the responsibility of lecturers and despite the use of Internal and External Verification, the setting of standards was reliant on lecturers' integrity, as Boris highlights:

> I feel there is a bit of responsibility on me to maintain a standard, because nobody is going to disagree with it, so I could let people through that I felt were weak, or I could fail people being pedantic, saying well that's not the correct line type for that job. So there is [sic] some grey areas, I don't think that the assessment as such is exact, …
>
> [Boris]

Although the assessment criteria were considered pedagogically restrictive by some lecturers as it limited what and how they could teach, within what was taught the criteria allowed flexibility to adjust the academic rigour, content coverage and intellectual demands of an assessment. Lecturers used this flexibility to accommodate their perceptions of students' academic backgrounds and abilities and study traits, whilst still satisfying their interpretation of the criteria. Dominick illustrates what he terms a 'difficult' balancing act in ensuring he sets a question that will pass Internal Verification, and so satisfy the assessment criteria, but is a 'fair question' for the students:

> I look for questions that fit the performance [assessment] criteria that is probably my prime objective, because if I don't then the IV is going to get you out. I then have to balance what I feel is a fair question. Now this is where your national standard comes. We all know, I can ask a quadratic question, or I could ask a circuit question of these students, that there is no hope in hell that they will ever answer. …. I have to get a balance there and that is probably in my mind maybe one of the more difficult things to do.
>
> [Dominick]

Dominick initially states his standards are set in relation to national standards (the assessment criteria), but latterly tempers this by suggesting his standards accommodates perceptions of the students' abilities. York acknowledged the perceived disparities in abilities of cohorts and how, 'some cohorts of students need less guidance than others.' Curtis accounted for perceived disparities in cohort capabilities by using

the ambiguity of the assessment criteria, to limit content coverage and the academic level:

> [Curtis] …, I think you are always looking at your cohort and think I can stretch these lads a bit, because everyone of them they are coming through with this ability, so we will do an assignment which is deeper in-depth. You might get a cohort who just scrape through and come to you and you might change your philosophy on it.
>
> [Interviewer] But it is still hitting the same grading criteria?
>
> [Curtis] You're still describing 3 manufacturing processes, but you might choose different ones, you might choose higher tech ones for a group, or lower tech ones for another group. You're still meeting 3 criteria.
>
> [Curtis]

Bernard offered an insightful view of his deliberations in arriving at his *fair standard*, initially suggesting he would like his assessment questions to require students to go 'that little bit further' than classroom-worked examples. However, as with Dominick above, Bernard balanced his aspirations for the level of the assessment question with a need to facilitate student achievement. In essence, his pass grade assessment questions appeared closely related to classroom-worked examples, with higher-grade achievement requiring students to show autonomy and extend their learning:

> I may well ask a question that I have partly answered within the notes, but then I would make the question just that little bit further than they had been given directly, knowing that the information is easily out there to find, research, or whatever, or if it was something that involved a calculation, I would give them a calculation that went just that little bit further than the ones we had practised and worked on together as a group, so it would just require them to do just do that little bit more. Although if a student did just the minimum I would try and write it in such a way that there would be a pass mark there if they didn't do that extra little bit. So I am not trying to stop a student, I am not trying to say I will teach you this, but you have to get all that to pass my course. I want to give them enough to get through with a little bit of, yeah, but if someone put more work in and was prepared to go that little further and learn themselves and educate themselves, they could gain then the merit mark, or the distinction mark. It's a fine balance really. It is difficult.
>
> [Bernard]

During Dominick's interview, he reflected on his assessment practice, suggesting he implicitly set his standard at a level that 9 out of 10 students could achieve without 'going to town':

> [Dominick] ..., let's say I've got 10 students, I need to think how deep is this question, that 9 of them will be able to get it and one of them will have to work quite hard to get it. So you have to say to yourself, pass criteria, who is the weakest student?
>
> [Interviewer] Is that how you would gauge it?
>
> [Dominick] Maybe not on the class you have got, but on the classes that you've had. The more experience you have got the more you get it.
>
> [Interviewer] So your national standard has like evolved over the…?
>
> [Dominick] …Putting me on the point that you have had, I have never really looked at it that way, but when I look back at what I think about, I look at 80 to 90% of my students over the last 5 or 6 years, in this subject area can pass this without really going to town on it.
>
> [Interviewer] When you say not going to town, does that mean doing work outside of the lesson?
>
> [Dominick] No I think maybe to the point of if they haven't just read it, then they will probably get referred and they could do it on a second retake.
>
> [Dominick]

The above lecturers' comments suggest a pass level standard of a summative assessment is constructed around classroom-based worked examples, aimed at allowing the majority of students the chance to pass, without resorting to additional study outside of the classroom. This practice seems to emanate from lecturers' perceptions of a typical pass grade student being one who 'turns up and does what he is told' [Marvin], 'tends to give you back what you have given him' [Curtis] and shows a sustained effort:

> I think that it [pass grade student] is a student who has just slugged his way through; he has probably got more sticking power.
>
> [York]

The lecturers' comments suggest an assessment practice in which all students attending lectures consistently and undertaking classroom tasks set would be expected to pass; what Boris views as BTEC's philosophy:

> I think that is BTEC's philosophy, that if they stick at it they will eventually get through.
>
> [Boris]

The above section illustrates how lecturers perceived assessment as an evidence gathering process with summative emphasis, in which they balanced the requirements of the BTEC unit assessment criteria with their perceptions of a typical pass grade student's academic capabilities and dispositions to study, from where they strove for a standard commensurate with both. However, another important consideration for lecturers in designing their approach to assessment and setting the standard was choosing an appropriate method, and here again students' cultural considerations influenced lecturers' choices.

The wide variety of assessment methods (see Section 5.3.1, page 97) used within the BTEC units were at the discretion of the individual lecturer, and although were reviewed for 'appropriateness' as part of Internal Verification, did not form part of the External Verification scrutiny. For example, some assessment criteria required the use of practical design, build, make and test tasks, suited to lengthy practical assignment work as used by Neville and Dominick. Neville, who taught units with a significant vocational content, preferred to use authentic, practically orientated assessments whenever possible:

> As far as the assessment is concerned, I prefer in my subjects to, as far as possible, be hands on. That is my choice.
>
> [Neville]

Marvin also suggested the use of written open-assignment work, and allowing students to access their notes, related directly to vocational practice, '...as a [subject stated] engineer, I can go and look up information in a book' [Marvin].

During the interviews, four lecturers expressed a preference for written closed-book tests or examinations, because they were 'traditional, unseen, and show understanding' [York]: required preparation, and retention of knowledge over a year [Curtis, Bernard]:

proved authenticity and focused the students: '…exam is the ultimate summative assessment' [Marvin]. However, despite this preference, at the time of this study, no evidence was found of lecturers using closed-book phase tests or end-of-year examinations.

6.1.4 A move away from closed-book testing

Lecturers' reluctance to use closed-book type examinations was founded on concerns over low student achievement rates associated with perceptions of academically weaker students. Dominick chose to use time-constrained, open-book tests in Mathematics and Science-based units, but explained why he did not use closed-book traditional examinations:

> Why have we moved away from end exams, why from formal exams, a lot of it is to deal with the unsuccessfulness of students? Thirty years ago you had students that could do any exams, now we haven't. Is it because the students are weaker, it probably is?
>
> [Dominick]

York did not use exams, as he was 'worried' about a low pass rate, which he attributed to a perception that current students were less interested in their studies than when he commenced teaching in the late 1980s:

> You would not have been worried that ten of these would fail, you would be worried about have I set it hard enough for them to stretch them, whereas these days you just wouldn't think of setting an exam, you would be too worried they would all fail, so I think these days students are not as interested.
>
> [York]

Marvin's concern also related to achievement rates, but based on a perception that students lack the effort to prepare for a test or exam:

> The problem we have very simply, I believe, is that the level of students that we have here will not do the work required to pass an exam. So what they will do is that they will turn up to the exam ill-prepared if at all and fail a lot of them. Some of them will pass on the basis of the knowledge that they already have.
>
> [Marvin]

However, Marvin also suggested difficulty with the use of tests in defining an acceptable pass level, in the BTEC assessment regime that did not use numerical marking and where all assessment criteria had to be achieved:

> …, but you have to say to yourself how do you decide what a pass is and this is where I see a problem with the people who set tests like this, their problem is when has the student passed the criteria, does he have to answer every question 100%? I have seen people saying, 'we have to get half of these' and I am going steady on that doesn't really fit grading criteria.
>
> [Marvin]

Curtis suggested the BTEC ethos of assessment by assignment, 'the BTEC way' (Edexcel, 2006b), had restricted his use of tests:

> I think BTEC have influenced us on that these days, haven't they. They say this subject can be assessed by 3 assignments and your exam philosophy always goes out the window. But I don't know, why not do an exam, if it is allowable, you just don't do you, you just think I will do this by assignments it will be easier, the students have got more time, you can control them a bit better, than give them an exam,…
>
> [Curtis]

In a subsequent interview, Curtis was asked to explain his comment, 'by assignments it will be easier, the students have got more time, you can control them a bit better'. Curtis suggested exams placed increased emphasis on him and the students to undertake preparation (revision) before the assessment, and that the outcomes of exams starkly highlighted both students' and lecturers' achievements and failures. He contrasted this with the limited need for preparation before an assignment, alluding to its seemingly more flexible and translucent characteristics, allowing him to facilitate achievement in a less visible and stressful way than is possible through a formal test:

> As you may or may not know, each year I see both sides of the argument. I take BTEC classes doing assignment work and I also take City and Guilds classes who have to study for internal and external exams. It really does show who is prepared to do serious revision and that is why I think students would prefer to do assignment work!! So we, as lecturers, kind of like this assignment work now because we can control things better, we are not in the spotlight the same as when your group sit an external test which could be stressful (for the lecturer as well as the candidate).
>
> [Curtis, May 2010]

Curtis was further asked to clarify what he meant by ‘control things better’; his response again emphasising assignments allowed for increased student achievement, by being able to accommodate the study traits of modern-day National students:

> By 'control things better' I am probably alluding to the fact that the lecturer can be more confident with the outcome of the students’ results. You have got a better chance of getting students through the course if you deliver it by assignment. Not so if internal or external exams are involved. Many of the BTEC students that pass through the 'assignment' system without a great deal of effort would not stand a cat in hells chance if they found themselves in the 70's 'exam' system.
>
> [Curtis, May 2010]

Throughout Curtis’s responses, there is an implicit notion that students should achieve with seemingly an onus on him to facilitate this, and so influenced his choice of assessment method. Boris was the only lecturer to link academic standards and assessment methods, stating BTEC should be specific about methods used (as in TEC assessment models of the 1970s, see Table 10, page 222), and suggesting achievement through the use of assignments can be undermined due to authenticity concerns:

> There is a standard it’s the interpretation again, BTEC should actually say, they should be assessed by a closed-book assessment. Some of the units it does say this lends itself being an assignment, but where, if you have large groups 12, 20, 30 people, if you have copying, would you be able to pick it up?
>
> [Boris]

Marvin and York also expressed concerns over authenticity of students’ work when using written assignments, and the potential for students to copy from other students or from sources on the internet:

> What we have got now is [sic] systems open to just plagiarism and copying, students go straight onto the internet, Mr. Google, type it in. It does show that they have met competence, in writing it does, but verbally it doesn’t.
>
> [York]

However, despite a preference for traditional testing and reservations over authenticity, the open assignment was the most extensively used method relating to written assessments within the National Diploma programme at this time.

6.2 How assessment functions at the micro-level

As stated within Section 5.2 (page 94), Edexcel's assessment guidance (Edexcel, 2006a) recommends students should be offered formative feedback to allow them to improve their performance prior to a stipulated date, 'when formative assessment stops and summative assessment takes place' (see page 95). So how was this assessment strategy implemented within the Engineering Programme Area?

6.2.1 Implementing Edexcel's assessment guidance

In practice, the implementation Edexcel's assessment strategy appeared to fit well with practically orientated assessment work, but not with written assessment work. Marvin did not think his assessment practice conformed to Edexcel's guidance, as he offered formative assessment 'after' summative assessment. Marvin referred to Edexcel's NSS Reports and the requirement for EV's to 'identify opportunities for improving performance' (illustration shown on page 248), which he suggests can only occur after summative assessment has taken place:

> It's not my interpretation of how it [assessment in engineering] works. My comment would be if that was the case, students would not get work back, given back to them with constructive criticism on and given opportunity to improve their performance and yet the NSS report actually has a box for that, what does it say, 'opportunities for improving performance identified, yes/no'. Now that is there, now to my mind, that is formative assessment, I don't care what you say. Because what you are doing is the students have had a go at a summative assessment, but the minute you give it them back, that's formative.
>
> [Marvin]

Marvin's comments refer to written, open assignments, typically of a four-week duration, requiring submission on or before a specified date, and assessed against the criteria stated on the assessment. If a student's script satisfied the criteria it was *signed-off*, if not, it was *referred* and offered back to the student with feedback, to be re-worked and re-submitted.

In contrast, Dominick considered he did comply with the assessment guidance within a unit he taught that had a significant practical content involving students building artefacts within the classroom environment:

> I see what you just read out [extract from Edexcel (2006a)] as my workbook and then at the end of my workbook, now I am all hands-on with the workbook yeah, then they get the assessment. So they get to assessment point in the workbook…this will cover P1, P3, P5a, D1, whatever…ask your assessor for that piece of work. Go to a cupboard, get an assessment, hand it over and that's what you do. It's open-book, there's your book, use whatever you've done, all your notes…. So they have done [built classroom artefacts prior to assessment], but not this [artefact]. Now I see that as being what BTEC is saying, it is not formative assessment, what they have done with me they have worked through a workbook and there has no assessment taken place.
>
> [Dominick]

Dominick's comments suggest a misunderstanding of formative assessment, but his view of summative assessment aligns itself with Edexcel's definition, as written evidence of summative assessment occurred after formative assessment finished. The following sections review these two contrasting approaches to the use and interaction of formative and summative assessment.

6.2.2 Ongoing formative assessment through practical assessments

When assessing practical work such as making computer models, building circuits or programming equipment, Boris, Curtis, Dominick and Neville often designed assignments to span several timetabled lectures. These lecturers provided ongoing, verbal feedback to students prior to issuing an assessment, as the students developed their 'hands on' skills [Neville], with feedback ongoing during the assessment itself:

> You are almost like a patrol inspector going round making sure that the [student's assessment work] is progressing correctly.
>
> [Curtis]

Neville outlined how he designed his practical build and test assignments, with the specific intention to develop students' skills and knowledge beyond what he had taught in the classroom:

> …now they will have done two exercises before they proceed onto the assessment, which is their third exercise, but a more complex one which is applying prior learnt skills… My assessments are, almost without exceptions,

> they are learning processes themselves during which the students will demonstrate that they have taken their learning to the appropriate level.
>
> [Neville]

Neville also monitored students' problems as the assessment unfolded through ongoing checking:

> Well you are conscious of how the students are getting on. You have got ongoing checking of individual progress… Yes, one is conscious of any student who is struggling for any reason and normally these sorts of problems I iron out.
>
> [Neville]

On reviewing one of Neville's practical assessments, spanning five-weeks, it was found he monitored students' progress by splitting each assessment criterion into two or three discrete tasks, and used these as stepping-stones to achievement of the respective criterion. It is assumed formative assessment opportunities evolved prior to and after these summative events, associated with verbal feedback, as there was no evidence of written formative feedback, only an assessment record sheet containing signatures indicating each task was complete. Neville also appeared to draw a distinction between assistance offered within practical assessment tasks as opposed to the written assessment tasks:

> The students also have to do a certain amount of work which involves some research and one has less contact with that aspect of the work, at this stage of the assessment.
>
> [Neville]

Dominick outlined how, within a unit requiring students to build and test electronic circuits, he provided formative feedback to students throughout the assessment until they had successfully completed the tasks, from where he 'signed them off' and informed them:

> …these guys are doing a workbook, working their way through, but when they come to do the test they pull the test out, they do the test, there is a practical part to the test. What I was going to point out is [about unit assessment], there is 3 bits I have to sign off, so what happens if they have not got the first one working, well they keep at it. One day I come over it isn't working, they get it working, they keep doing until they get it right. So it is formative, it is only summative in the way that once they have done it I take that piece of paper off and I transfer those ticks in the middle of it to the pass criteria ticks at the front. …. It is

> formative assessment until I take it in and then it is summative and I tell the students… I will say that I do not do it in everything.
>
> [Dominick]

Curtis also supported students with feedback through practical assessments; however, this was seen as a necessity due to curriculum time constraints curtailing his use of formative assessment prior to issue of an assignment. Neville and Dominick saw their approach of support through an assessment as having a positive benefit on learning, but Curtis had reservations about this approach, suggesting concerns as to the depth of learning that takes place:

> I think sometimes with time constraints you do find that you are hoping the assessment develops their learning and sometimes I feel insecure about that sometimes. I am giving them this assignment but I haven't imparted any knowledge to them, I am hoping that they are going to understand by doing this bit of work, looking at this book, looking at that video or whatever, their knowledge will be increased on that.
>
> [Curtis]

This above approach of continual checking students' progress through the assessment until they were 'signed off' without formally being referred, appeared due to the highly practical and visible in-class nature of the assessment tasks. There was no documented evidence as to the detail or quantity of feedback given to students, as the feedback in such assessments was oral.

6.2.3 Limited formative assessment prior to a written summative assessment

In contrast to lecturers' above approach associated with practical assessments, when assessing theoretical knowledge and understanding through written, time-constrained, open-book tests within mathematics and science units, or written, open assignments in technology units, there appeared a lack of formative assessment prior to summative assessment. As with the setting of the academic level and content of an assignment outlined above, lecturers' use of certain types of formative assessment appeared curtailed by an accommodation and acceptance of students' dispositions to their studies. For example, Bernard was the only lecturer to set homework, which he used with formative intent. There were several reasons offered for other lecturers not setting

homework, such as lecturer 'workload considerations' [Boris] or 'bad teaching practice' [York], but most lecturers' experiences of issuing homework suggested it was not often attempted or submitted by students [York, Boris, Bernard]. Boris also highlighted the limited repercussions if students did not submit homework, as it did not form part of the summative assessment criteria, 'Do you penalise students for work that is not required to achieve the unit?'

Bernard was also the only lecturer stating he regularly offered formative assessment opportunities at the end of his classroom delivery through the use of written 'practice questions', to provide a 'toolkit' in preparation for the summative assignment:

> So once I have delivered it I would even at the end of the session throw some questions at them and let them have a go at a few themselves and mix it up a little bit and I may then, say if I have done 2 or 3 topics that naturally would come together in the real world, I may do a first week a few questions on that topic, the second week, but then bring in the first topic together and do a couple of practice questions combining the two. So we are sort of building up in a way so that they have the toolkit ready to answer the assignment question.
>
> [Bernard]

Within his unit, York suggested the explicitness of certain assessment criteria restricted his use of formative assessment prior to issuing an open assignment to avoid duplication of work. However, he contrasted this with his approach to City and Guilds unseen, external, on-line tests, for which he used formative assessment techniques to prepare students:

> In some cases you think that if I give them some formative assessment that I have asked the same question as I am going to ask in the assignment. I know on C & G you are asking the same questions but it is an exam that the marks have got to be taken from, so before putting them in for the test you have to make sure that they are up to speed.
>
> [York, similar views from Curtis]

York's comments suggest the preparation of students before an open assignment does not need to be as rigorous as that undertaken for an external test, resonating with Curtis 'can control them better' using assignments (page 115), and the accommodating nature of an open assignment from both lecturer and student perspective. This further suggests assignments were used to develop students' learning, but possibly due to their

being academically unprepared before commencing the assessment. York further curtailed his use of formative assessment due to what he considered excessive numbers of summative written assessments in the BTEC National, suggesting written formative assessment work would exacerbate this:

> I think what my problem here is that there is too much writing as it is in some of these assessments. You take one unit, four assessments, ten units 40 assessments, the amount of writing we do is horrendous. You put in written formative assessments that could double, triple it.
>
> [York]

Other formative assessment techniques were also limited within classroom practice with only Boris using self-assessment, and only Marvin considering peer assessment, although citing time-constraints making this problematic to implement. York also found the small class sizes, often in which both part-time apprentices and full-time students were mixed for economies of scale, also hampered formative assessment practices:

> I think one of our big difficulties here is our small group sizes, the dynamics that you get in the group. If you had a large group where you could do more teaching and questioning and formative assessment, I use that very loosely, where you could get discussions going,… Because in our small groups some people don't partake in that type of scenario.
>
> [York]

6.3 The purpose and practices of the referral system

As discussed in Section 5.3.2, on page 99, all lecturers recognised students who were unsuccessful on their first attempt at an assessment, required opportunities to improve their work and reattempt the assessment. All students at some time or other engaged with the referral system, which provided opportunities for formative assessment to develop their learning, and continued chances for all students to achieve. All aspects of referrals were at the discretion of lecturers, and this section presents how the process was constructed and implemented at classroom level.

6.3.1 Concerns when providing further opportunities to achieve

To comply with Edexcel's requirement, 'to achieve a pass a learner must have satisfied all the pass assessment criteria' (Edexcel, 2002b, p. 10; Edexcel, 2007b, p. 15; Edexcel, 2010b, p. 11), lecturers acknowledged referred students required further opportunities to re-submit an assignment or re-sit a test, as highlighted by Marvin:

> …you can't really do anything else for the simple reason that if you suddenly turn around and say I will not accept any more from you, the student has failed.
>
> [Marvin]

Boris considered BTEC philosophy only offered him opportunities to 'pass students' and that as long as they maintained effort in their studies, he had no option but to provide them with further opportunities to attempt an assessment:

> But how, or what the actual philosophy for failing people is quite, you know, there seems to be you are given the opportunities to pass people, you are not really given the opportunities to fail people. I think what they are looking at there are people who are generally interested, will stick at it and eventually get through.
>
> [Boris]

Neville, Dominick, York and Boris expressed concern over the number of re-submissions permitted, with Boris suggesting multiple submissions of the same assessment did not demonstrate proficiency of subject matter:

> On the BTEC philosophy of, there are no max retakes, this student has got to pass in a unit, but he couldn't go into a company and do a good job.
>
> [Boris]

Marvin allowed continual attempts at his assignments, but expressed concern over authenticity of the students' work:

> Well in the end you can end up doing it for them and there are times when I say to them, you need to go away and do this and sort it out for yourself. And the problem with that is that if you are not careful, they will just go and copy from somebody else. But in the end, what I might well do is, you need to go and look at this book and find out about that, but I make them go and do it.
>
> [Marvin]

Dominick also expressed concern over students having repeated attempts at assessments, but felt compelled to allow such re-submissions, partly due to his

enculturation into the department and partly to provide fairness in opportunity for student achievement:

> Yeah. I have a real, real hate of the handing back assessment process. But we do it. …. I go with the flow. I got told when arriving here many years ago that that is how we do it now. …. I don't want it to be my unit they always fail. ……is it unfair that someone fails a subject because they could not do one small part?
>
> [Dominick]

Dominick's seemingly disdain for handing work back appeared to relate to the disparity he felt could occur in the amount of assistance some students received over others:

> Little Johnny is over there and he struggling and keep coming back and somebody is over here and they are not struggling, but at the end of the day, they pass and they pass. …. I would like some method of recording input that was given, but I feel that I am useless from my perspective. I would struggle to remember myself to keep recording how much I put into it and then what do I do, do I fail them at the end of the year, because although they have passed the assessments, I felt that 7 out of 8 assessments I had too much input to. How much input is input?
>
> [Dominick]

Although, as stated previously, the predominant assessment methods tended to be assignment-based, some lecturers stated a personal preference for traditional tests or exams, but chose not use them within their assessment strategy. Marvin, not only refrained from using tests due to difficulty in determining what standard to expect, but also the logistical problems in providing ongoing re-sit opportunities:

> [Interviewer] I just wonder why you don't use tests?
>
> [Marvin] I suspect the reason with [unit stated] is that I would have such an issue with having to do re-sits all the time and it is quite tricky.

Marvin's comments suggest he considers the use of assignments as providing an easier method to facilitate student achievement, as Curtis also suggests (see page 115).

6.3.2 Formative assessment through referrals

As outlined above, formative assessment prior to the issue of written assessments within mathematics, science and technology units was limited, with most formative assessment occurring when a student was in a referral situation as stated by York:

> ...you end up giving them a summative assignment and that is where you end up doing your formative assessment in the materials that you do. ...I would say formative assessment is very limited. You end up giving them the assignment, if you wrote like a homework question down they wouldn't do it.
>
> [York]

Bernard also suggested his summative assessments led to formative assessment:

> …there's a summative assessment have a go at that I will mark it for you and we will talk.
>
> [Bernard]

There was potential for prompt feedback when students were referred, with Marvin stating he always provided feedback within two weeks, and sometimes he would assess the work within ten minutes in the classroom environment. Boris commented on how, even within time-constrained, in-class test conditions, he would provide feedback in an attempt to avoid a referral:

> …'What is missing off that answer?' and try to get them to come up with, oh I've not put the flaming units on and then I say right go and do it.
>
> I don't see a problem by saying have you missed anything off there, oh yes it's the unit, and letting them put it in, because they are more likely to remember that, ah its velocity metres per second, but if you don't, do you then refer the paper because they have the number part of it right, but they have not put the units on?
>
> [Boris]

Boris, Dominick and Marvin stated they tended not to provide lengthy written feedback, which was evident when viewing the individual student assessment portfolios, but supported referred students primarily through verbal feedback:

> …on a one-to-one basis I am inclined to actually tell them, you need to do this, this is no good, turn to page 86 in the workbook. I tend to do that I will give them a lot of direction that way.
>
> [Dominick]

Marvin stated this could be a two-way process where students could ask for feedback and clarification or he would approach the students:

> I tend to make a lot of comments in the script, but it is not that lengthy …. not as much as you [the Interviewer] would. I'm quite a one for the cutting little

> comments …. but often I will discuss it with students, or they will come and ask me …. whatever.
>
> [Marvin]

Within a 2006 exploratory interview, Marvin had used the expression 'massaging them through', relating to how some students may achieve a pass grade. During the 2007 interview, he was asked to clarify this comment:

> Well basically giving them feedback and stuff like that, to a point where they have arrived at the answer, because you have effectively nudged them towards the answer all the way through. We could do that.
>
> [Marvin]

6.3.3 The practice of recycling assessments for referrals

Using the original assessment as the basis of further re-submissions was common practice amongst all lecturers, even when a student had referrals on the same assessment multiple times. Boris suggested he would like to issue an alternative assessment if a student was referred, but felt constrained by BTEC philosophy:

> You are not allowed to [issue alternative assessment]. Well it's not in the BTEC philosophy is it? There are provisions in the unit that you could give alternative assessment. I would like to do that but in practice I don't feel that it is line with what they want to do, I think this thing about there is an assessment, the feedback is that you have not achieved because, and you give a load of action points, and you are giving them it back to do again.
>
> [Boris]

Dominick offered several reasons why he did not produce alternative assessments such as 'laziness' and sometimes the assessment criteria were so explicit, 'describe types, applications of...', it was difficult to produce another question. Curtis and Boris, who taught similar subject matter requiring specialist classroom equipment, designed their unit assessment strategy around five in-class assignments each spanning several weeks, restricting opportunities to issue a new assessment to referred students.

Even where the assessment method was a time-constrained, in-class open-book test, the same assessment paper was re-used. Dominick allowed some students to sit the same open-book test three times over a three-month period, providing students with revision

sessions before each re-sit. This test had the same pass and merit grade criteria available on each sitting.

Marvin also allowed students multiple attempts at the assessment criteria, but adopted a less flexible approach towards higher grades, restricting feedback and opportunities to re-submit:

> With pass grade I am pretty reasonable, if people continue doing it I will continue doing it until we run out of time. But I won't with merits and distinctions, I take the view with merits and distinctions that if I provide some guidance and they don't do it, they can't do it and that is where I leave it.
>
> [Marvin]

Dominick appeared to like Marvin's approach not to offer the same degree of support for students attempting the merit and distinction grades as they would for achievement of the pass grade. However, he questioned this approach, suggesting it is unfair not to support students who attempted the higher-grades, and so offer the chance for them to differentiate themselves from students whom 'cannot be bothered' to attempt higher-grades:

> I do like the way that other members of staff have dealt with it, it is a distinction grade, if you cannot do it, you cannot do it. Which is something that I do use, but there again it's still unfair as I have other students that cannot be bothered.
>
> [Dominick]

Boris was asked how he would accommodate a referral situation where students had achieved two out of three assessment criteria on a maths or science test, and offered an insightful view of his detailed considerations. Although the students were not sitting the same test, they only had to attempt the questions not passed, and the changes to the assessment were primarily aesthetic, being numerical changes to the same formulae:

> [Interviewer] Say they have got 3 sections, they get P1 and P2 in this test, what do you do about P3 that they didn't get in the test for whatever reason?
>
> [Boris] Get them to re-submit P3 without doing P1 and P2.
>
> [Interviewer] Does that mean to say that you give them that script back?
>
> [Boris] It could vary. Possibly the same script without their answers being available to them at that assessment opportunity, or what I have done as well is reworded the questions, but different numbers in. The formulas may be the same

> because if they are transposing formulas or using particular formulas the formulas will still be valid….but change the numbers.
>
> [Interviewer] But that will still be done in a controlled environment would it, you wouldn't just say you have only got that section wrong, take it away and finish it off?
>
> [Boris] If they had got 2 right out of 3, it would be more informal, 'Look at that third one, can you correct that?'
>
> [Boris]

Where a student was referred several times York recycled the original assessment tasks, but sometimes changed the method of assessment from a written assignment to verbal questioning, in an attempt to 'tease' out the answer:

> [York] …rather than me give the answers what I try to do I try to tease that out of them.
>
> [Interviewer] So you do sort of assist them through their assessment in a way in that respect?
>
> [York] Yeah without trying to give them the answers. I went to the [library] text book, wrote down the pages and said go and read these and I will verbally question you.
>
> [York]

Marvin and Curtis also used oral questioning to help students complete a written assignment, where they only had 'a few bits missing':

> The other thing I will do sometimes is oral questioning. I have done that with a few students. I have got there and got them to think about it on their feet and give me an answer and sometimes, with a few students, that is how I have dealt with it, where they have got bits of it and a few bits missing, I have actually done it orally and signed it off.
>
> [Marvin, similar from Curtis]

The above variations in referral practices adopted by lecturers were at their discretion, arising out of the interaction between lecturer and student, and was a reaction to individual circumstances. Such practices were unlikely to be subject to either Internal or External Verification.

6.4 Illustrations of engineering assessments

The above presentation of data has illuminated the development and implementation of the lecturers' assessment practice, and referred to the various types of assessment used. During Sutherland and Pozzi's (1995, p. 50) research into the changing mathematical background of university entrants, they found particular difficulties in gaining access to college lecturers' BTEC assessment instruments. However, within this small-scale study, not only was I permitted access to assessment instruments devised by lecturers, but also, with the kind permission of one lecturer (pseudonym omitted to maintain anonymity), I had access to classroom notes used to prepare students for his assessments. Below I present findings from reviewing three first-year assessments; two open-book tests from a science-based unit taught by a colleague, and an open-assignment of mine used within a different science-based unit.

6.4.1 Open-book testing used in the Engineering Science unit

Appendix M (commencing page 250), lists extracts from the first open-book test of this Science unit, used to assess students three weeks into their first year's study. The lecturer developed a series of workbooks (the first one was 100 pages long) to use as the basis of his classroom lessons, which allowed students to progress through the questions in class with support as required, and so prepare them for the open-book assessment. These workbooks placed an emphasis on problem solving, as opposed to derivations of theory or formulae, and contained many worked examples and associated questions. On comparing the classroom workbook-based exercises against the assessment questions (in appendix), it is seen they are very similar problems, primarily differing by the numerical values used. This appendix also includes two scripts from students, one considered at the upper end of the academic ability range for this cohort and highly motivated, the other at the lower academic ability showing limited enthusiasm for his studies. Both students achieved the pass grade, but neither the merit grade.

Appendix N commencing page 256, shows the third open-book test from the same unit related to another workbook (40 pages in length) given to students by the same lecturer. This particular topic proved very difficult for most students, and mentioned anecdotally within the department with respect to lack of student achievement. On reviewing the

coverage and level of classroom questions against the assessment questions there is again seen a strong similarity, with questions primarily differentiated by changes in numerical values and in one question, a change of context. However, on the first attempt at this test, only three students achieved the pass criterion, although four achieved the merit criterion. The lecturer's approach to the referred students allowed them to re-sit the same assessment again around six weeks after the first sitting. This second sitting saw two more students achieve the pass and merit grades, with a third sitting of the identical assessment three weeks later, where seven students passed. Table 14, page 269, lists a breakdown of student achievement in this assessment over the multiple attempts.

6.4.2 Open-assignment used in the Mechanical Principles unit

It was not possible to review other lecturers' correlation of classroom work with assessment questions in such a sustained and detailed way as the formalised workbooks provided. However, as stated above, the transcript data suggest there was a tendency to design assignment tasks such that assessment criteria could be achieved by students reviewing classroom notes or handouts, copying and pasting from internet sources, or reading specifically specified pages from books.

In order to provide for another illustration of BTEC assessment in the Engineering Programme Area, I revisited my handouts and associated assessment related to the first year National unit of Mechanical Principles, and compared alignment of my classroom work with that of the assessment I devised. With reference to Appendix P, page 270, the classroom examples I worked through with the students can be compared to the pass grade question I set in an open-assignment assessment. It should be noted I had no input to my colleague's Science workbooks and associated assessments, although he was the Internal Verifier of my assessments and helped with the development of the context of this assessment, but not the specific calculations.

On reviewing our approaches to assessment writing, it was found we both closely aligned the assessment pass grade questions with class work examples, so allowing students attending the lectures to produce a set of structured solutions to questions, differing in only the numerical values used. We both chose assessment methods that allowed students access to these notes during the assessment, although my colleague's

was an in-class time-constrained test (typically 1.5 hours) and mine an open-assignment (four-week duration). I do not know my colleague's justification for this close alignment between class work and assessment, but I can outline some of my considerations. Firstly, I was very conscious of the weaknesses of most students' mathematical ability, and of the quite complex concepts associated with the Mechanical Principles unit I had to teach. Indeed some of the topics in this unit had been previously taught in the National second year when students generally had developed their mathematical proficiency, accumulated greater scientific knowledge and developed greater confidence. I was aware of difficulties students could have with conceptual understandings and mathematical manipulations. The Mechanical Principles unit was also a content-driven syllabus, allowing limited time per topic. Thus to set what I perceived as a fair standard for students based on these constraints, for the pass grade I chose close alignment of classroom work with the assessment and used an open-assignment method as I could 'control better' students' progress. Unlike a test situation, I could offer individual, verbal feedback to students where I felt they were having difficulties with the assessment during its four-week duration, without the need for documentation, before my formal written summative assessment on their submission. For referred students, I could devise support on an individual basis and allow further attempts at the same assessment to aid achievement.

When comparing my design of the merit grade criteria with that of my colleague, we had differing approaches. My colleague again aligned his open-book test questions around his classroom workbook exercises, whereas my assignment merit question required students to assimilate calculations from different class work exercises, and apply them to a new problem in a different context. In essence, I was looking for a deeper level of understanding, through application of the scientific principles to a variant question to those used in the lessons. I also wanted students to display an advanced level of algebraic transposition. However, this level of manipulation was contained within several class-worked exercises, if students had worked through the in-class questions and could recognise them. On a personal level, I tended to offer less support and feedback with merit grade work and expected a greater degree of student autonomy and motivation to be demonstrated. My approach to merit grades is similar to that expressed by Bernard (page 110) and Marvin (page 126).

Although the assessments outlined here both had high *face* and *content validity*, this did not necessarily mean students passing the assessment understood the material:

> It [written assessment] does show that they have met competence, in writing it does, but verbally it doesn't.
>
> [York]

6.5 Preparing students for progression from the National

Within the BTEC suite of qualifications, progression from the National programmes could lead to enrolment on Higher National programmes. However, York had concerns about all students making this 'natural progression', suggesting the piece-meal approach of BTEC assessment and the methods used did not develop students' cognitive skills, and so hampered their preparedness for Higher National study:

> It goes back to passing that particular bit and forgetting it, so it goes back to your question on progress. So they may have passed but they have not progressed as they cannot put it together. We were probably the same in our day but the effort was more. Some [students] don't put the effort in.
>
> I think the way we set the Nationals it is not helping them to progress to Higher Nationals, it is not trying to develop this thought process, so overall I think that the methods we are using is stymieing.
>
> [York]

However, York suggested students who increased their effort within Higher National study and prepared appropriately for assessments could cope with such progression, but the lack of tests and exams in the BTEC assessment regime did not help students with preparedness for university study:

> ..., but yeah if they progress [to Higher National] then most of them cope with it, what they don't cope with is the effort, they can't just turn up and do the assessments, there is a bit of an increase in what their expectations are, what we expect from them, but the students that want to go to Uni they seem to struggle as they have not had the exam culture.
>
> [York]

Curtis saw progression from the National Diploma as primarily related to employment in a relevant industry, from where students may be stimulated to return to College for further academic study:

> Well you would hope that they would go into a relevant industry, you would hope you had given them a thirst for mechanical or electrical industries, and that you hadn't put them off. And that they went into a relevant industry … and found the need to come back and do further study within that relevant industry.
>
> [Curtis]

Bernard viewed progression from the National as leading to employment or to further study, possibly university. In contrast to York, Bernard considered aspects of BTEC assessment did prepare students for university study, such as report writing and completing assignment work. He saw BTEC assessment as preparing students more generally for progression to higher study, the workplace and life in general.

> So yeah we are in a way not only training them to become electricians or to get the qualification in BTEC, we are hopefully preparing them for life out there and a lot of that is not only the exams, it is the social side of it and the communication skills and all the things that we are trying to develop in them as we see them for the limited time that we have them.
>
> [Bernard]

Dominick saw the primary progression path for National students being into employment, and so orientated his assessment approach to suit this route at the expense of the few students who chose to study at university:

> I do say though that I let my students down dramatically badly if they want to go to uni, as it gives them no insight into uni exams. I think that is a real let down, however I do feel that I am not here for the odd person who goes to uni, I feel that I am here for the 9 out of 10 lads who just progress, get a job locally and crack on with life.
>
> [Dominick]

6.6 Summary

This chapter has used the voices of lecturers to present considerations, influences and constraints, which impact on their perspectives and development of BTEC assessment practice. The resulting constructs are shown to be based on a balancing act between awarding body requirements for national standards against specified unit assessment and grading criteria, and the local cultural considerations such as students' perceived abilities and approaches to their studies. This accommodation filters throughout all

aspects of the assessment practice, as lecturers endeavour for fairness in standards they set, which will allow all students the chance to achieve at least a pass in a unit of study.

The next chapter presents the students' perspectives, reactions and adaptations to the lecturers' constructed assessment practice at the detailed level of classroom engagement.

7. Students' engagement with assessment practice

Following on from the previous chapter of lecturers' perceptions, this chapter now presents the students' perspectives on the nature and form of the constructed assessment practice, and how they adapt and react to its demands.

7.1 Enculturation into BTEC assessment practice

Assessment practice in the Engineering Programme Area was a significant contrast to that students experienced at school through GCSE or A-level study. School assessment appeared highly formal in nature, being centred on predominantly unseen, written, end-of-year examinations [Colin, Harold, Hector, Mario, Rick, Steve], sat on a specific day and time in a school hall, in silence [Colin]. Some students experienced GCSE coursework, which was undertaken within certain subjects, although students' experiences differed, possibly due to school policy or teacher personal preferences. Lesley and Mario were permitted to complete their coursework outside of the classroom and had chances to re-submit, whilst Colin and Steve were restricted to completing coursework in the classroom. In addition, National Diploma class sizes tended to be much smaller than classes at school, which Colin and Steve found beneficial with regards to ease of contact with lecturers.

On entry to the programme, the majority of students appeared not conversant with the BTEC ethos, course structure and procedures, or its terminology such as grading criteria, and summative and formative assessment. Their understanding of the assessment practice evolved, as they were enculturated into the BTEC assessment modes and methods used, and particularly through their exposure to, and interaction with, the referral process.

Students liked the broken-up, summative approach of BTEC assessment, as opposed to the end-of-year, exams in the hall, associated with their school-based assessment [Colin, Steve]. Hector, reflecting on his A-level experiences, favoured the 'steady', discrete approach to summative assessment that did not require the need to 'cram', which he viewed as more conducive to learning:

> [with A-levels] You find yourself trying to cram effectively half a year's work, or whole year's work into 3 or 4 weeks into your mind, then on the day you have got an hour to go in and regurgitate it all. Here I find things were better, they were much more steady and things weren't rushed. Do this, pass this and then go onto the next thing, do this pass this and go onto the next thing. I found it a lot better for learning as well, getting through the year. I really enjoyed that side to it.
>
> [Hector]

Hector's comments of, 'much more steady and things weren't rushed' seemed characterised by Colin and Steve as a 'more laid back environment' and by Glen as a 'relaxed working environment'.

Colin and Cameron commented positively on the variety of assessment methods used across the course, with Colin, Rick and Steve stating how they found assessments, such as open-book tests, 'less stressful' than school based examinations. Steve and Wayne liked what they considered to be defined boundaries that the criterion-referenced system offered and the 'know where you stand' [Wayne], 'know what you have to do' [Steve] to achieve the criteria. Glen and Harold justified the 'having to achieve all assessment criteria' by the vocational nature of the course and the 'things you need to know' to be prepared for careers in industry [Hector offering similar views]. Only Colin and Cameron preferred to be assessed in percentage terms, suggesting it would be 'easier to pass' a unit.

Generally students' contrasting perspectives of school and college assessment practice were encapsulated in Steve's comments relating to the use of time-constrained open-book tests or controlled assignments (see Section 5.3.1, page 97) undertaken in the classroom and where students had access to their notes:

> I was expecting to be sat in a room and you have got your own little table; you got silence and you have got strict time when you have to start I was expecting that – like proper external exams. They're quite laid back…. It made it a lot more relaxed and you did not get nervous. They made it not so stressful. I think it's a lot better.
>
> [Steve]

Steve also contrasted the unseen school assessment and its unknown content, with National assessment where he knew what would be tested and had covered it

thoroughly. This suggests the assessment content and demands have similarity with classroom work, a characteristic on which lecturers Dominick and Bernard based their assessment:

> You know what to expect and you know that you have done the work and have covered it well, instead of saying, oh you have got an exam but we can't tell you what it's on.
>
> [Steve]

Glen and Mario suggested the BTEC assessment methods used such as open-book tests and open-assignments, were more vocationally 'realistic' of industrial practice [Glen, Mario], as in the workplace, 'if you were stuck you would go get a book on it' [Mario].

7.2 Limited engagement with formative assessment activities

As shown in the previous chapter, the majority of lecturers did not set homework, perceiving it unlikely to be attempted by students, which was illustrated through Colin's comments who considered it an optional extra, unlike assignments that had to be passed:

> ...if we were ever set a homework, people would say, 'Oh I have got three assignments going on, I would rather do those and get the pass'.
>
> [Colin]

Rick, Lesley and Steve also stated an unwillingness to undertake homework, a trait from school days, again placing their emphasis on summative assessment over any potential benefits of formative assessment such as consolidation of classroom work and providing lecturers with feedback on their progress:

> If I had already done it in the lesson or if the homework is a recap or if I understand it, then I would shove the homework away. Which is why I never did homework at school. An assignment you got to do it as it is part of the course.
>
> [Rick]

Students undertook limited College work outside of the classroom, with two to four hours a week suggested by several students [Colin, Glen, Harry, Lesley] as being a maximum. Some students admitted to spending hardly any time working on their

studies outside of College [Mario, Morris, Steve], and instead stated they could complete most of their work within their College timetable itself [Mario, Steve].

7.2.1 Lack of revision for tests

The open-book test was popular amongst students, as seen as a less pressurised assessment method, but it had a detrimental influence on students' approach to preparation. When Lesley was asked if he revised before an open-book test he replied:

> Not really. I might look over the book. Maybe five minutes before a test, maybe the night before if I am feeling up to it.
>
> [Lesley]

Rick commented how he did not revise for an open-book test as having access to his notes negated his reason to revise, which he saw as a positive attribute of the assessment method:

> [Rick] I did not actually revise for my Newton's [an open-book test shown in Appendix N, page 256],….unless it's a really big test…like the Key Skills [externally set 'Communications' multiple-choice paper] test last year I revised for that.
>
> [Interviewer] Why did you not revise for Newton's 2nd law test?
>
> [Rick] Well because you have got the book there with you, so if you have anything to recap over you have the book there. That's another thing why it is good at College, you don't need to spend 2 hours a night every night revising before the test comes along.
>
> [Interviewer] Would you revise if you did not have your notes?
>
> [Rick] I would revise if I did not have my notes. Because that way you don't get stressed and I don't like being stressed.
>
> [Rick]

Harold stated assessment methods made a difference to his approach to revision:

> I think you would revise [for a closed-book test] and have to focus on it,…
>
> [Harold]

Rick and Colin also suggested they would be more inclined to revise for a closed-book test however, Lesley, Rick, Steve and Wayne stated they did not revise for their school GCSE examinations, which were closed-book:

> It's something I have never done is revise. I didn't for my GCSEs. I do not see the point in it. If you know it you know it, if you don't you don't.
>
> [Wayne; similar from Steve]

Mario also stated a preference for open-book tests as limiting revision, but further suggested the referral process influenced his approach to preparation:

> I don't like revising so open-book test is better in this respect. I did do some work revising for Newton's 2nd law and Systems [assessment] as I did not understand it, but in general do not do revision. Most of the time I don't have to, then I will get a referral. There is a bit of arrogance thinking I can do it without revising.
>
> [Mario]

Not revising for a test was a trait crossing ability levels as Mario was considered by lecturing staff as a highly intelligent student whilst Lesley an academically weak student, but both did not prepare for tests. This suggests students were lacking motivation to prepare for assessments or perhaps lacking appropriate study skills. Morris was the only student required to re-sit his first year Mathematics unit during his 2nd year study; however, the Mathematics lecturer had changed the assessment method from open-book to closed-book, expecting students to undertake revision. Even with this change in assessment method, Morris still seemed unable to prepare himself by undertaking structured revision:

> [Interviewer] How much time do you spend on revision?
>
> [Morris] The minute before. I have a revision sheet that [lecturer named] gave me yesterday and I am only going to do it on Tuesday. I will have to set a reminder on my phone, cause if I do it any day before I will have other things on my mind, or I will forget it. I did the revision before the [holiday] and I forgot everything.
>
> [Interviewer] Next Tuesday you have a test 6 to 9 pm, when is the revision scheduled for?
>
> [Morris] Tuesday daytime, a revision sheet, through the day anytime. I have put it on my [phone] alarm for 2 pm.

7.2.2 Assessment limiting engagement with, and challenge of, learning

Steve and Wayne liked open-book tests in which test questions were similar to classroom examples, and how they could review their classroom notes during the assessment. Although there seemed a close alignment between what was taught and what was assessed, Steve did not consider he was 'copying' from his notes but was demonstrating his 'knowledge' of the subject:

> It's like all the stuff we get in our tests, we have done. We have covered it well and gone over it quite a bit. …. I think the open-book tests are the best. The reason I think that is that you get to see the work you have done. It's not really copying but because you get different questions you have to use your own knowledge as well.
>
> [Steve]

Wayne offered similar views as Steve, but also liked not having to 'cram' for the test as he had access to his lecturer-supplied workbook:

> You are not having to cram everything into your brain [at College], you can use your book to help you along with little bits of …we still get formulae in the front of papers here, but if you see how it is used it gives you a lot better understanding. The questions are different; it's not that you are just copying out of your notes. You have still got to work it out, you are still showing your understanding of the subject, I don't see why it makes any difference to not have an open-book.
>
> [Wayne]

Mario equated 'research' in an open-book test with using his workbook:

> …you could just open the book and if you needed any research it was all just there in the back.
>
> [Mario]

Allowing access to notes and workbooks during an open-book test had the potential to discourage students from engaging and preparing for the assessment, and aligning class work with assessment questions, as suggested above, limited the academic challenge of learning. Harold also stated information during assessments could be found in workbooks, but suggests a greater understanding would be required for a closed-book test, relating this to memorising formulae:

> A lot of the time on assignments or assessments you can look through your book, it stills shows you understand it, but I think the [closed-book] tests would need you to understand it a bit more. You would have to know the formulas off by heart.
>
> [Harold]

The other main assessment method used was the written, open-assignment that could be completed outside the controlled classroom. Such assessments are formally given submission dates at the discretion of the lecturer, but typically of four weeks duration. However, the submission dates tended not to be taken seriously by students or lecturers:

> [Mario] The hand in dates is a bit lax. I do like the fact that it is lax, but I think it is better practice if we had to get it in by a date. No one takes the submission dates seriously; its due in that day but if you don't, it just seems we have a lot of time to hand it in, because on my report it just said that I have got work due in the 2nd semester between January and July, and that did not really give me any specific dates, just got a 6 month period to hand it in.
>
> [Interviewer] Is this the fault of our system?
>
> [Mario] Yes as if you move on to university, deadlines will be really strict; because we are so used to 'get it in when you can' kind of thing.
>
> [Mario]

Mario's comment about 'lax' submission dates was substantiated on reviewing the students' assessment portfolios where some degree of lateness occurred across all units employing open-assignments. Late submissions ranged from one to eight weeks in some units, for which the students did not appear to be penalised.

Assignments could require students to 'research' information, which Steve associated with reading through workbooks, handouts or classroom notes:

> Just kind of read through the notes and do it.
>
> Yeah I prefer that way; you are having to research it, you have to look up things and when you look up things I find I remember it that way.
>
> We got books again, workbooks, I like that way. …., you have your book and you have everything in it, you have the questions and what relates to the questions and it is so much easier to just look through it and see where you are at.
>
> [Steve]

Unlike open-book tests undertaken in a controlled environment for a specified time, open assignments did not require revision before attempting the assessment. However, again there is a concern as to what level of learning is assessed when students have access to their notes and research is orientated to reading notes or internet searching.

Another example of assessment appearing to limit engagement with learning is offered by Hector, who compared his school A-level experience of practical work in Physics with his National Diploma experiences. In his comment below, he suggested that as part of A-level study, experiments were used to help 'learn the theory', whereas in his National study he suggested experiments equated to filling out tables, with learning not the main emphasis:

> No it [A-level Physics] was all exam-based and theoretical. We did a lot of practicals as well but there wasn't the assessment like here, it was not sort of doing an experiment and fill out tables, you know, you do an experiment to learn the theory, which I did not like as much.
>
> [Hector]

Hector's comment may relate to the first year Engineering Science and Mechanical Principles units, which incorporated experiments as part of the unit assessment criteria.

7.3 Referrals – a chance to be redeemed

One aspect of Sophwort-on-Sea College assessment practice students particularly liked was the referral system. Students became encultured into the BTEC assessment process, realising if referred, they would have opportunities to re-sit a test or re-submit an assignment:

> I don't think there is any bad points about the referral system. Because it is not a fail, all it is that you get it back and you change it because you can see where you went wrong. It is not as though it is locked up without telling me what I have done wrong. That is the good thing, you know what you have done wrong; you know how to rectify it and you remember it for future.
>
> [Steve, similar from Colin and Wayne]

Hector perceived the referral system as offering a chance at redemption:

> Here I have a chance to redeem myself if I get an assessment wrong or fail something, I have an opportunity to re-sit it and re-do it and get it right, which is good.
>
> [Hector]

Although several students in the context of referrals used the term *fail*, they did not use it in the terminal sense, in that they could no longer achieve a unit, it simply meant further work required.

7.3.1 Feedback in referrals

Feedback was obviously an important aspect of the referment process in order to help students understand where they had not yet achieved, and what they had to do next to pass. Students appeared to value the personalised, verbal feedback they received from lecturers, which helped them understand why they had been referred, and focused them on areas for improvement:

> Lecturer tells you what have got wrong – they go over it with you.
>
> [Cameron]

Often the verbal feedback was initiated by a request from the student:

> Prefer college approach, because when you make a mess you can always ask what you have done wrong and go and have another try. Find feedback does help. It guides you what to do.
>
> [Stu]

> I ask him [lecturer] what I done wrong you and the lecturer would point it out and make you understand by explaining point by point what I did. If you don't understand he will do a similar question related to it then you should be able to understand this by then.
>
> [Rick]

Mario suggested that feedback from written assessments could be very prompt:

> Depends most of the time [lecturer] will sit there during the lesson whilst we are getting on and he will go through them [assessment submissions] for us and give it back to us in the lesson.
>
> [Mario]

Indeed lecturers appeared to be supportive by offering ongoing assistance to students throughout the referral process:

> In the sense when you talk about referrals the way the referral system works, …. there is always help on hand and things like that I find to be helpful. I would say I have been pleasantly surprised here.
>
> [Hector]

7.3.2 A good way to learn or an easy way to achieve?

Some students also perceived the process of revisiting their referred scripts and seeing where they had made mistakes as conducive to their learning:

> Good point of the referral system is that you get to have another go and you learn from your mistakes. Quite a good way to learn.
>
> [Steve]

> It [referral system] is more conducive to learning. You learn by your mistakes and if they are pointed out to you in a sensible manner and you are going to learn.
>
> [Wayne]

Rick particularly liked the multiple attempts at the same assessment to achieve a pass, based on teacher feedback of what was wrong:

> Good point [of referral system] is that you can keep attempting until you pass. When you fail, teacher tells you what you failed at and what you got wrong, I cannot actually see any bad points.
>
> [Rick]

Although students perceived they were learning from their mistakes and the feedback they received through the referral system, Hector appeared to view 'learning' as achieving the assessment criteria:

> …I like the fact that at the end of the year there is a check list of things of what you have got and which you have not got. You know where you are in terms of learning and you can say right I need this one and this one.
>
> [Hector]

7.3.3 Assessment recycling and incremental improvement

Students liked the fact that if unsuccessful on attempting an assessment, they were able to reattempt the same assessment and only the questions referred, as opposed to being faced with new questions or an entirely new assessment:

> You know where you have gone wrong and the great thing is that if you are referred on Question 1 and 8 out of 9, you go back and do question 1 and 8; you don't do the whole paper again.
>
> [Wayne]

> I like the way in one test you have, say, P1, P2 and P3, and if you pass P1 and P2, you get referred, then all you have to do is do the P3, I like that; that it's in sections and that you do not fail straight away.
>
> [Harry]

> I think it is pretty fair, if I get something wrong, like on [Lecturer's] lesson, if I get like a P5 wrong I don't have to do the whole assessment again, just that section. It is the same with all the others as well, you just have to go back to it and think through it again.
>
> [Morris]

> That is the best thing if you have done it wrong then you can get the same questions instead of going over what you really know, to prove what you know. You can get it back; you can just focus on the parts that you got wrong.
>
> [Harold]

Even where formal, in class, time-constrained tests were used; the identical assessment was used for re-sits. Both Morris and Mario made reference to one particular Science assessment that was of open-book test format, which they sat three times:

> I have failed the same science test [same paper] three times.
>
> [Morris]

> Had problems with Newton's 2nd Law [assessment]. The first time I used the wrong formulas; the 2nd time I re-sat it I forgot my book and so could not remember any of the formulas and so was trying to do it off memory and so used the wrong formulas again. The third time [the lecturer] sat all the people who had failed it twice already, down and he just went over it with us and I passed. I had already got the merit in the first test but not the pass.
>
> [Mario]

This assessment is reviewed in detail within Section 6.4.1 (page 128), and contained in Appendix N (page 256).

7.3.4 Offering a fail-safe comfort zone

Being referred did not appear to have a detrimental impact on students' self-confidence ultimately to achieve, views summed up by Glen and Mario:

> It does not bother me, it just means I have done it wrong and I have to do it right.
>
> [Glen]

> Referrals do not depress me; I just think I will try harder next time.
>
> [Mario, similar from Hector]

> The referral system does not make me feel bad about myself. I don't feel, 'Ah crap – got that wrong'. Sometimes you see your own mistakes – and you think that you must have got carried away by a certain formula.
>
> [Rick]

At the time of this research, students' grades were placed on a notice board in an engineering classroom in which all students were timetabled to attend at least once during the week. Glen, commenting on a fellow student's referrals on the board, suggested having so many outstanding referrals could be disheartening, although he acknowledged that even in such a situation there were still opportunities to succeed:

> Looking at Harold he has a lot of referrals on the board and it must be so disheartened to go to the next assessment and not passing knowing that you have all this work to do, but he is still in with a chance and he has not been sent down the road to Tescos.
>
> [Glen]

Both Harold and Colin admitted to having many referrals in a Science unit, but maintained a positive outlook on their prospects ultimately to achieve through the referral system:

> Even though have lots of referrals it does not depress, as you can move on into other parts of the area and come back to where you were, as in Science I was able to do other things and come back to the vectors.
>
> [Harold]

> If you think I have failed this time but I am going to get it next time. You can be more determined to get it.
>
> [Colin]

The use of the term, referral, appeared to encompass a variety of circumstances associated with the summative assessment of students' work. For example, a student's script could be referred for omitting the unit from a correct numerical answer in a formal test, or referred if hardly anything on the script was correct. Although Harold was a student having multiple referrals, the ill-defined nature of the term appeared to help him maintain a positive attitude towards his studies:

> Even though have lots of 'referrals' on the board, I think it is good, because a referral could mean a tiny bit wrong or miles wrong.
>
> [Harold]

Wayne also had a positive attitude towards being referred, not seeing it as a fail but as progress to achievement:

> I do not see referral as a fail. You are nearly there but you are not.
>
> [Wayne]

Only Morris, who experienced referrals often, suggested that although he liked the referral system, he felt it highlighted his lack of capability in his studies:

> Just most of the time lots of people pass something and I get referred and it just bugs me a bit, it shows everyone my downside, something that I am not that good at.
>
> [Morris]

However, Morris preferred the vagueness of referral, which masks any academic inadequacies, to the assigning of a grade or percentage as used at school:

> In school I was always like at the bottom, but here you just get referred or pass, so you can't get shown as a dumb person really you just get referred; no one can tell how bad you did.
>
> [Morris]

Although no student stated any negative comments towards the referral process, there was a suggestion from some students that the awareness of the multiple attempts to achieve had the potential to make them complacent with regards their preparations for an assessment:

> Maybe when you are taking the test you think you could fail it and then take it again. Maybe it's making people a bit slack … I don't know? I don't feel that.
>
> [Colin]

Mario, who studied A-levels prior to commencing the National, suggested the multiple opportunities to attempt an assessment impacted on his approach to revision:

> You can get use to the referral system whereas at A-level you have got one chance to do the test and that is it. I had to revise at A-level.
>
> [Mario]

7.4 Perceptions on preparing for progression

Diploma students' perception of progression from the National highlights the varying array of options available on successful completion. When asked if the National course was 'training or educating' them, Glen, Rick, Steve and Stu considered the course did both. Harold thought the course was turning what they were learning into, *'*real life jobs*'*, alternatively Wayne felt he was being educated, as he *'*did not see a use for algebra in his future job'. Although mathematics is a struggle for the majority of students, it was seen as useful from a general progression perspective by Harry as, 'Always good to know maths anyway; anywhere you go you need it.*'*

Having to achieve all the assessment criteria to pass a unit was seen by Harold as beneficial with regards being proficient when in the workplace. Glen considered this BTEC requirement was appropriate as they were, 'training to do a job', although he also saw part of the purpose of the course to, 'show you can be educated'. Steve and Glen specifically stated their progression path was into (or back into) employment. Glen and Harry having had previous employment experience were returning to education in an attempt to achieve a better job, 'because I know what it is like to work in a crap job' [Harry]. Colin saw his progression path as leading into 'higher education and a well paid job'. The National course appeared to provide a greater sense of purpose than when studying GCSEs at school, as indicated by Steve's comment, 'I see myself as getting into a job because of the work I am doing'. Stu perceived the National as offering an easier route to progression than studying A-levels at school, due to its more practical and applied nature.

From this cohort, at the time of the 2008 student interviews, only Hector chose a progression path to university direct from the National programme (to study politics), although both Harold and Mario were considering university study after completing a HNC Engineering programme. One aspect of the National course at Sophwort College

that was not considered to help with progression to university, related to the lack of rigid deadlines for submission of assignments and the, ‘get it in when you can kind of thing’ [Mario].

7.5 Summary

Within this chapter, the student culture has been reviewed and students’ perspectives, reactions and engagement with BTEC assessment, presented through their voices. The next chapter will discuss the lecturers’ and students’ assessment constructions, and the impact this has on the effectiveness of BTEC assessment practice.

8. Discussion of data and findings

The previous data presentation chapters used extracts from both lecturers' and students' interview transcripts, to illustrate how BTEC assessment practice operates at the micro-level of classroom engagement in a small college Engineering Programme Area. This chapter now discusses these data, with reference to themes from the literature (see Chapter 2) and issues arising from the analysis.

8.1 The potential of BTEC assessment to facilitate learning and achievement

BTEC assessment practice in the Engineering Programme Area offered many positive attributes, having the potential to facilitate student learning, maintain student engagement and aid student achievement. The following discussion initially outlines how the use of learning outcomes can aid alignment of teaching, learning with assessment. This discussion also considers how a move to authentic assessment methods allows for practical simulations, avoids rote-learning, and assesses skills and knowledge having vocational relevance. Finally, it is considered how opportunities for formative assessment encouraged by Edexcel policy, and practised in small sized cohorts at Sophwort College, allowed both students and lecturers to receive prompt feedback on progress, enabling them to respond to this and so aid students' learning and achievement.

8.1.1 Aligning assessment with learning outcomes

As was stated in Chapter 2, assessment has a significant influence on what is taught and learnt, with appropriate assessment of students' knowledge, skills and abilities being essential to the process of learning (Brown, 1999, p. 4):

> …assessment methods and requirements probably have a greater influence on how and what students learn than any other single factor.
>
> (Boud, 1988, p. 35)

Research into HE has found lecturers often view assessment as a separate entity from the teaching and learning process, something considered *after* the curriculum has been devised and plans for delivery finalized. If assessment is to be motivating and

productive for students, it needs to be an integral part of teaching, not a bolt-on or an after-thought (Brown, 1999, p. 3).

Edexcel ensured BTEC National assessment was an initial and central focus for all lecturers, by defining learning outcomes through unit-based assessment and grading criteria, and requiring students to achieve all assessment criteria to pass a unit. These criteria formed the basis of ensuring national standards across BTEC programmes, monitored through the Edexcel's external verification process. As BTEC assessment practice was primarily under the control of individual unit lecturers, they had significant influence over how the assessments were constructed and implemented, such as the number of assessments used per unit, the number of criteria covered per assessment, and the method and timing chosen. In a formative sense, Edexcel encouraged lecturers to use assessment as part of the learning process to develop students' practical skills, knowledge and proficiency, by allowing students opportunities to improve their work and so achieve the respective unit criteria. The Edexcel requirement for students to achieve all assessment criteria to pass a unit encouraged lecturers to ensure 'constructive alignment' (Biggs, 1996) of teaching/learning activities with assessment of learning outcomes. Indeed, aspects of the BTEC assessment practice displayed attributes of Bloom's mastery learning principles (see Section 2.1), offering the potential for all students to achieve stated goals through appropriate and ongoing feedback.

8.1.2 Authentic assessment

The use of such assessment methods as open-assignments and open-book tests did not require students to undertake passive rote-learning, a problem associated with traditional, formal written examinations (Entwistle, 2005, p. 4; Ramsden, 1992, p. 32; Ramsden, 2005, p. 204). Instead, the assignments and tests had the potential to produce 'authentic assessment' methods (Gipps, 1994a, p. 284), simulating the nature of industrial practice and so assess different and more vocationally relevant skills, such as demonstrating students 'engineering knowledge and understanding to apply technical and practical skills' (EngC, 2005, p. 7). Assessments could also be designed with the intention to develop students' learning relating to practical, industrial problems. Within mathematics and science-based units, lecturers predominantly used open-book tests, in contrast to traditional closed-book phase tests or end-of-year exams used in the 1970s

(see Table 10, page 222). Research evidence suggests that open-book tests are less stressful on students than closed-book tests, and where assessing knowledge and comprehension (the lower order levels of Bloom's Taxonomy (Bloom et al., 1956)), can significantly improve achievement (Michaels and Kieren, 1973, p. 206). Both lecturers and students acknowledged the vocational relevance of open-book tests and open-assignments over traditional closed-book assessments, as 'when in the real world engineers and scientists never rely on memory: if they're stuck, they look things up' (Wiliam, 2001, p. 61), and often work in teams so can discuss problems and ask if they need help. Why use timed tests when in vocational practice, 'it is usually far more important to get things done right than to get things done quickly' (Wiliam, 2001, p. 61).

8.1.3 Opportunities for formative assessment

The small class sizes of the Engineering Programme Area was a positive characteristic, as research suggests more is learned in small class sizes, which raise students' performance (Fearnley, 1995; Glass and Smith, 1979; Lindsay and Paton-Saltzberg, 1987). If it is a 'truism that learners require feedback in order to learn' (Gipps, 1999, p. 46) and 'feedback is the lifeblood of learning' (Rowntree, 1977, p. 24), then the small class sizes offered the potential for lecturers to undertake formative assessment activities prior *to* a summative assessment event, a practice encouraged by Edexcel (see Section 5.2, page 94). If students were unsuccessful on their first attempt at an assessment, the referral system was capable of supporting learning through individualised feedback, which was often oral and ongoing. Again this has positive resonance with research, as students receiving individualised, encouraging comments on their work tend to have the best potential for improvement (Black and Wiliam, 1998b, p. 12; Page, 1958, pp. 180-181), particularly where 'verbal comments' are used, which incorporate 'suggestions for improvement' (Rowntree, 1977, p. 26). Research also finds that it is not just that feedback should happen, but it 'has to happen reasonably soon after the learning activity' (Gipps, 1999, p. 46). With practical-based assessments in the Engineering Programme Area, feedback was prompt as students worked on assessment tasks. Even where written assessments were used, some lecturers provided very prompt feedback, sometimes within minutes of students submitting work. Lecturers did not specify percentage grades within their feedback, and used the 'R' notation to signify where a 'referral' occurred. They emphasised,

often verbally, what was to be done to aid achievement rather than failure (the term *fail* was hardly mentioned within the assessment practice) and did not compare students' performances against each other, only against the assessment/grading criteria.

The above attributes of assessment in the Engineering Programme Area had the potential to facilitate student learning through the three essential elements of formative feedback as stated by Black and Wiliam (1998b, p. 10), based on Sadler (1989). Firstly, the 'desired goal' was stated through the use of criterion-referenced assessment. Second, the evidence about students' 'present position' could be found due to small class sizes providing ongoing checking of individual progress. Thirdly, there was some understanding of a 'way to close the gap' between the two, which was aided by lecturers writing their own assessments, and so knowing the level and content required. Indeed, if the above stated characteristics of the Engineering Programme Area assessment practice are compared with the ARG's research-based '10 principles' (ARG, 2002) related to Assessment for Learning, similarities are found. With such seemingly positive pedagogical practices associated with BTEC assessment, from where did the concerns, the backdrop to my interest in this study (see Section 1.1, page 1), emanate?

8.2 The reality of BTEC assessment in the Engineering Programme Area

The literature review of Chapter 2 discussed the implementation problems associated with criterion-referenced assessment and formative assessment, both underpinning characteristics of modern BTEC qualifications. Although criterion-referencing is promoted as offering objectivity and clarity of assessment requirements, in practice it is often associated with subjectivity based on ambiguous specifications and objectives (see Section 2.2.2, page 24). Within the literature, formative assessment lacks precise theoretical definition and understanding, with its implementation compounded by lecturers often having limited grounding in the theory of assessment. This can lead to confusion between the purposes of summative and formative assessment, and conflation in practice as summative assessment dominates and diminishes the potential of formative assessment (see Section 2.3.2, page 29). Within a vocational educational context, the assessment literature also finds these problems compounded by cultural

considerations associated with communities of practice (see Section 2.4, page 32), and it is from these communities (lecturers and students) that notions and interpretations of the required standard of achievement are jointly constructed. The influence of such contextual factors in vocational FE education has produced an environment in which assessment procedures come to completely dominate students' learning experiences, with the focus of lecturers and students on compliance with the assessment criteria and not on learning. Torrance (2007) characterises this as 'assessment as learning' (Section 2.4.1, page 34), where assessment procedures and practices dominate all aspects of students' learning experiences, and 'criteria compliance' replaced 'learning' (Torrance, 2007, p. 282). This emphasis had the potential to remove the challenge of learning and reduce the quality and validity of outcomes achieved. Torrance also found an orientation towards 'pursuit of achievement', with an 'overwhelming culture of support at every level and across every sub-sector of the LSS' (Torrance, 2007, p. 285). This was in part, attributed to the 'high stakes accountability and financial insecurity' (Torrance, 2007, p. 292) that institutions experience relating to funding (see Section 2.5.1, page 38).

Although Sophwort College was not subjected to the same target-driven funding arrangements based on student achievement as centres in other studies, the assessment constructs of the Engineering Programme Area exhibit an emphasis on criteria compliance as opposed to learning. However, this emphasis was also evident as the Engineering Lecturers developed their summative assessment instruments, chose assessment methods that accommodated their perceptions of students' dispositions to study and academic abilities, and which underpinned a *pursuit of a pass* ethos. This orientation appears based on the notion BTEC programmes only offer chances to pass students, not fail them. Failure is now related to students choosing not to submit/re-submit an assignment or not sitting/re-sitting a test (Ecclestone, 2007, p. 326), or 'running out of time', and where responsibility for achievement is as much on lecturers as on students (Torrance et al., 2005, p. 47). The ethical basis of criterion-referencing in which all students can achieve (contrasting with norm-referencing), has translated into an assessment practice within the Engineering Programme Area having the ethos that all students should pass. This orientation has resonance with the Haslegrave Report (1969) on which TEC programmes of the 1970s were founded:

> It (TEC) believes, with the Haslegrave Committee, that a student who meets the admission requirements for a programme and studies reasonably hard and well, should be entitled to expect that he [sic] will be successful in his studies. The Council will be concerned if in practice this does not happen' (TEC 1974).
>
> (Halliday, 1981, p. 176)

Lecturers acknowledged the increased diversity of students enrolling on National study when compared to the 1980s, as found across the FE engineering sector (Wolf, 2002, p. 95) and within HE (Brown, 1999, p. 4; Gibbs and Simpson, 2004-05, p. 9). Lecturers perceived current National student intake as academically weaker than in the past (Ecclestone, 2002, p. 126), with students out of the habit of studying or lacking study skills. On reviewing the Sophwort College students' entry qualifications, nearly half the intake did not have the recommended prerequisite entry qualifications (see Table 8, page 103 and Table 9, page 104), with six out of the thirteen students not achieving the required GCSE grade C in Mathematics (Edexcel, 2002b, p. 17). Mathematics formed a specific unit of the National programme and provided essential underpinning knowledge for science-based units (Edexcel, 2002b, p. 50). This suggested some students lacked preparedness for National study on entry, which needed to be accommodated by lecturers, and indeed was one of my personal concerns when developing assessments as outlined in Section 6.4.2, page 130. Lecturers constructed their standard and academic rigour of assessment based on the stipulations of the awarding body, which required interpretation of the BTEC unit assessment and grading criteria. However, lecturers balanced these external requirements, by accommodating their perceptions of students' dispositions to study and abilities.

The following sections show how the above perceptions of the Engineering Lecturers significantly influenced their assessment constructs, implicitly causing them to focus on criteria compliance and achievement of the pass grade throughout the various stages of assessment.

8.2.1 Accommodating students' dispositions to study

Lecturers expressed a preference for the academic rigour of the traditional, written, closed-book tests and end-of-year examinations, suggesting this required retention of knowledge and showed understanding. However, this inclination may be attributed to

experiences from their own assessment careers (Ecclestone and Pryor, 2003) of vocational study in 1970s and 1980s (see Table 7, page 101), and the methods of assessment they experienced. Although Edexcel emphasised assessment by assignment (Section 5.3.1, page 97), this was not the prime reason lecturers avoided closed-book testing. Instead, lecturers' move to alternative assessment methods was based on their perceptions of students unlikely to prepare themselves well for such tests, and so unlikely to pass. To counteract this concern, lecturers used assessment methods that limited or eliminated the need for students to prepare, and through which they could more easily facilitate students' achievement of a pass grade. This focus on assessment methods to aid student achievement draws parallels with recommendations of the Haslegrave Report (1969) on which TEC assessment practice of the 1970s was based, and also found to be a consideration within some HE Engineering programmes (Townend, 2001, p. 208). In essence, the historical gate-keeping attribute of assessment (Section 2.1, page 15), acknowledged to restrict the numbers of qualified technicians in the 1960s, was implicitly acknowledged by lecturers to hamper students' progression in the 2000s. The Engineering lecturers' perceptions of students being unlikely to prepare themselves well for assessments led them to a compromise of using written, timed-constrained methods such as open-book tests and controlled assignments within maths and science units, allowing access to notes and limiting the requirement for student preparation outside of the classroom environment. Within technology/business/project-based units, the open assignment was the predominant method of assessment, requiring no preparation beforehand other than regular attendance at lectures.

Students expressed liking for the BTEC broken-up summative approach to assessment, with the level set and the methods used by lecturers, as producing a less stressful assessment regime. However, the accommodation of perceived student traits by lecturers had the effect of reinforcing students' lack of preparation for assessments, often traits formed whilst at school. Students admitted to undertaking limited work outside of the classroom environment, considering homework as an optional extra, not part of the course and not directly related to achievement. Students were averse to revising for tests, seeing little need and limited benefit, and so refrained from the practice. Lecturers' approach to open-assignments, often allowing them to be

progressed in lecture time and not enforcing submission dates, encouraged students to take a relaxed view towards their studies and preparation for assessments.

8.2.2 Achievement through instrumental learning

As has been found in the literature, criterion-referencing lacks precision about standards (Boys, 2000, p. 311), and contributes to lecturers' difficulty in setting a standard for assessment, as found in Boys' study:

> ...exactly what level of understanding should be shown at pass, merit and distinction grades? How much could they [the lecturers] structure students' work and how much help could they legitimately give to students.
>
> (Boys, 2000, p. 194)

The above concerns from Boys' study, were also expressed by the Engineering lecturers, as they described 'difficulties' in setting a 'fair standard'. However, the Engineering lecturers used the subjectivity associated with criterion-referencing to set an academic standard for a pass, which accommodated their perceptions of students' academic abilities. This approach to setting the standard is analogous to findings from Colley and Jarvis's (2007) research into the assessment of motor vehicle apprentices. Colley and Jarvis found some NVQ assessors aided students' achievements by asking 'leading questions' causing 'manipulation of the assessment process' (Colley and Jarvis, 2007, p. 307), to facilitate student achievement. There was a similar, although less visible, manipulation of the assessment process in the approach some lecturers adopted when developing open-book tests and open assignments. Within some summative assessments, to achieve the assessment criteria, the level of understanding was orientated around *giving back what was given*, such as extracting information from handouts, workbooks, or what was readily available on the internet.

The assessment instruments presented in Section 6.4 (page 128) show how within mathematics and science units, student understanding resided at an instrumental level, based on following procedures, illustrated through questions structured by lecturers and rehearsed by students within lessons. Again, students found this aspect of assessment practice favourable, liking the way they 'knew what to expect' in the assessment, had 'covered it well' and could refer to their workbooks, handouts and classroom notes for help during the assessments. However, this approach suggested achievement related to procedural compliance with limited understanding being developed (Torrance, 2007, p.

293). In essence, the apparent validity of the assessments hid the fact that understanding shown could be predominantly derived from direct reference to, and repetition of, lecturers' structured classroom solutions. In this context, achievement was possible with limited assessing of students' analytical ability, mathematical proficiency, or grasp of the subject content and concepts. Again, this was a characteristic resonating with Boys' research, where perceptions of students' abilities were influencing lecturers' approach to teaching and assessment:

> We don't ask for analytical understanding. We haven't got time to get them to understand the concepts – …….. But we don't think that is required. …They would not understand it anyway…if you don't spoon feed the students (the tutor group), they go to pieces….
>
> (Boys, 2000, p. 303)

8.2.3 Referrals and deferred success

Although modern-day BTEC assessment practice was a radical departure from that of the 1960s, there was still an element of the fail-one, fail-them-all philosophy, no longer associated with grouped, end-of-year examinations, but with achieving all assessment criteria to pass a unit (see Torrance et al., 2005, p. 17). For this reason, lecturers had to allow students further attempts at assessments or else potentially a student could fail the entire course if unsuccessful at the first attempt at any assessment. In the Engineering Programme Area the term 'referral' as opposed to fail, was used to denote an unsuccessful attempt at an assessment, essentially deferring success. Within the vocational assessment literature the use of 'referral' is found associated with NVQ assessment, where opportunities to update students' submissions to achieve the pass standard are permitted (Torrance et al., 2005, p. 25). Although the term referral is not found in other studies into vocational FE qualifications such as the GNVQ, it is clear within these qualifications, students are permitted to repeat parts of assignments, often more than once (Ecclestone, 2002, p. 150), and sometimes with unlimited restrictions on reattempts (Boys, 2000, p. 285). The referral system provided a fail-safe facility, a safety net that allowed students to remain engaged with units of study, and indeed the programme as a whole, by offering continual support and opportunities to achieve.

Throughout the referral process, students received ongoing, written and verbal feedback, although most lecturers placed an emphasis on verbal feedback, often given on a one-to-one basis (similar findings in Ecclestone (2010b, p. 132)). Within a

referred assessment, students were only required to reattempt questions relating to outstanding criteria, with no defined limit on the number of times the same assessment could be attempted or submitted, despite some lecturers expressing reservations about this practice. In essence, the referral process was implicit and informal as it was ill-defined departmentally, and tended to be reactive and ad-hoc in nature. Classifying a student as 'referred' and the ensuing referral process was at the discretion of the lecturer, evolving through an 'interactive pedagogy' (Ecclestone and Pryor, 2003, p. 472), between lecturer-student, which was both a subjective and sheltered entity. Feedback tended to be focused on achievement of criteria, which for some students became a cyclic process of summative assessment (against the criteria), leading to formative assessment, leading to summative assessment, and so on, forming a continuous process until achievement occurred (Taras, 2007, p. 364). Lecturers could adapt various attributes of the referral process to aid students' progress as they deemed fit, such as the type, detail and frequency of feedback provided, the number of submissions of the same assessment allowed, and a change in assessment methods (from written to verbal) if required.

The students perceived the referral system as a positive, reassuring and supportive process that aided their progress and learning through a unit of study. However, there was also an implicit student perception of progress and learning being directly related to the number of assessment criteria achieved. Although some lecturers disliked the referral system and the multiple attempts students were permitted to achieve, they saw it as a necessary requirement of the BTEC assessment philosophy, which tended to reward the student that 'turns up and does what he is told', and has 'slugged his way through'. Lecturers were very conscious that students not achieving one assessment criterion could result in them failing a unit, and possible failure of the National Diploma (or Certificate) programme.

8.2.4 The blurring of formative and summative practices detracting from students' learning

Although Edexcel's assessment guidance (see Section 5.2, page 94) stated a clear distinction between formative and summative assessment, as shown in Section 6.2.1 (page 116), in practice, lecturers devised approaches that best facilitated students

achieving the learning outcomes of a respective unit. Where practical work was assessed, formative assessment based on verbal feedback appeared ongoing until the criteria were achieved and students were signed-off. In contrast, limited formative assessment appeared used prior to a written assessment event. As stated above, if students were referred, they entered a cyclic process of summative assessment leading to formative assessment, through repeated submissions, until achievement of the criteria occurred. Thus, when supervising practical-based assessments, lecturers complied with the spirit of Edexcel's guidance, but when using written assessments they did not, as much formative assessment occurred *after* a defined summative assessment opportunity.

In May 2010, I was fortunate to interview an Edexcel Quality Manager, visiting Sophwort College to present a seminar to Programme Managers, after which he kindly allowed me an hour to discuss aspects of my research. On discussing the above contrasting approaches lecturers adopted, he suggested Edexcel's 'Application of Criteria' document (Edexcel, 2006a) required contextual interpretation as it related to 'human interactions':

> I think you should not read it as a black and white statement, it has to be in terms of the context and also umh, there is an aspiration for formative and summative to be separate, but the reality is that they are very often interlinked. Yeah, particularly where you have got human interaction.
>
> [Edexcel Quality Manager, 2010]

He contrasted assessment in the academic and vocational sectors, and accepted the more interactive and subjective nature of teacher-based assessment over that of external examinations:

> ...it is great if you are doing things from a distance [reference to A-levels and GCSE external exams] you can be impassionate and objective. …if the learner takes an examination, or test and you have set it, then it would be very difficult to stand back and say, 'Well actually I think you have misunderstood this bit here, look here you have forgot a decimal point up there...', it would be a very hard member of staff to do that and that's where it becomes a little bit blurred. You are setting a summative assessment but because you are there, you are in the

> room with the person, it is very difficult to not give feedback, it is human nature isn't it.
>
> [Edexcel Quality Manager, 2010]

The Edexcel Manager's comments appear to approve lecturers' practice, in that written summative assessment can lead to formative assessment, not end it. As he suggests, and as this study has shown throughout all aspects of assessment practice, this is an unavoidable consequence of lecturer-based assessment and the effect of the lecturer-student interaction occurring at the micro-level of classroom practice. However, as is found in the literature, a problem of blurring formative and summative assessment practices has the potential to consume formative assessment within the summative assessment intent of lecturers (McDowell, 2004, p. 179), resulting in conflation and so reducing the potential to develop learning (Harlen and James, 1997, p. 365).

In the Engineering Programme Area, lecturers perceived assessment primarily in a summative sense, which combined with a cultural ethos in which all students enrolled were expected to pass, had the potential to produce feedback emphasising closure of the gap on the criteria, and not closure of the gap on learning. This was particularly highlighted through the referral process and indicated by students' comments on the feedback they received (See Section 7.3, page 141). Again, this was an aspect of assessment practice students liked, considering it beneficial to their learning and progress, although they viewed learning and progress in a context of achieving and collecting criteria.

The referral process in the Engineering Programme Area involved students receiving feedback on their summative assessment, to help them re-submit or re-sit the same assessment, could be considered, formative use of summative assessments. However, this was not in the same sense as that proposed by Black and Wiliam (2002, pp. 12-13), where school pupils reviewed past examination papers to help identify gaps in their knowledge and through peer-groups, reengaged with their studies to develop their knowledge in preparation for a new assessment. In the Engineering Programme Area, feedback on a summative submission was aimed at helping students improve their next attempt at the same assessment, also a finding from other studies related to the BTEC National Diplomas (Ecclestone, 2010b, p. 132; Torrance et al., 2005, p. 14). As only

outstanding criteria had to be re-assessed, feedback could be very specific and if multiple attempts were required, could result in incremental improvement of atomised parts of the assessment. As illustrated in Section 6.4 (page 128), when open-book tests were re-sat, the same paper was used multiple times. Although this may have shown student progress and achievement, again it suggests an incremental, directed strategy to success. The original sitting of the test had an unknown content, but repeated attempts at the same, often short questions, had a 'teaching to the test' (Ecclestone, 2010b, p. 217) mechanical emphasis, requiring students to focus on specific questions in specific unchanging contexts. With this approach, formative assessment was being conflated with a summative intent for the purpose of achieving the criteria and so passing the assessment, but at best reinforced instrumental learning and could hamper understanding.

8.3 Summary

This chapter commenced by discussing the many educationally positive aspects of BTEC assessment over which lecturers had influence to aid students' learning and progress. The initial focus on BTEC's respective unit learning outcomes through assessment and grading criteria allowed lecturers to align teaching and assessment into a coherent entity. The use of authentic assessment methods had vocational relevance, and allowed assessment to occur in a less stressful environment, whilst still assessing appropriate skills and knowledge. Small cohorts of students within the Engineering Programme Area allowed for increased opportunities for formative assessment, which formed an intrinsic requirement of BTEC assessment practice. However, as this chapter has shown, much of the potential of BTEC assessment practice to develop learning is lost, as lecturers endeavour to accommodate cultural perceptions of students throughout all aspects of the assessment practice.

This accommodation commenced with development of the summative assessment and the level and content set, and choice of assessment methods, all aimed at students being able to pass. The accommodation continued through instrumental learning when preparing students for assessments due to alignment of classroom work with assessment questions. For students not passing an assessment at the first attempt, the referral system was used, through which incremental achievement could occur founded

on the recycling of assessments, and within which summative and formative assessment became conflated in a focus on achieving the criteria.

In essence, the above lecturer assessment constructs had a positive, ethical basis, which maintained students' engagement in their studies, allowed all the chance to pass, and through which learning did occur. However, even for capable students, achievement could be defined in fairly narrow and instrumental terms, limiting the challenge of learning, where proficiency was often related to a procedural context. This approach reduces the effectiveness of BTEC assessment and has the potential to hamper students' progression from the National programme.

9. Conclusions

This small-scale case study at Sophwort-on-Sea College, has researched BTEC National assessment at the micro-level of classroom practice in a small Engineering Programme Area, as constructed by seven lecturers and thirteen students during academic years 2006-2008. In this final chapter, I review the findings of this study with reference to its original research questions as stated in Section 1.3.1 on page 8, and repeated below for convenience:

1) What are the salient influences impacting on the development, implementation and effectiveness of modern-day BTEC National assessment practice in engineering?
2) What is the nature and form of 'BTEC National assessment practice' at the micro-level of classroom engagement?
3) How do the constructions of assessment affect students' preparedness for progression to employment or higher education?
4) What can be learned from this study that will enable assessment to facilitate students' learning and improve their preparedness for progression?

In line with these questions, this chapter reviews the main influences impacting on the development and implementation of lecturers' approach to BTEC National assessment, and the resulting constructions that evolve to produce the nature and form of assessment practice in the Engineering Programme Area. The effectiveness of the constructed assessment practice on students' preparedness for the various progression routes from the National programmes is considered, these being: progression to university, to BTEC Higher National study, and to employment. Based on these findings, recommendations are offered, both at the BTEC policy level and at the College Programme Area level. The chapter concludes with some reflective thoughts on technician engineering assessment practice.

9.1 Overview of study

This study has shown that since the 1960s, the two ethically-founded educational concepts of *criterion-referenced assessment* (allowing all students to have their achievements recognised) and *formative assessment* (through which student learning

and achievement is facilitated), have increasingly been used to underpin modern assessment practice across all educational sectors, but which are particularly prominent in the vocational FE sector. The study has also shown how BTEC National qualifications of the 2000s have their origins in the recommendations of the Haslegrave Report of 1969. Prior to the 1970s, National assessment practice was traditionally founded on end-of-year, fail-one, fail-them-all, grouped examinations, allowing few or no referment opportunities. Haslegrave proposed a radical move to a unitised programme structure, incorporating broken-up, teacher-based summative assessment using a range of methods, and permitting referment within all units. These recommendations, implemented through TEC programmes of the 1970s, still underpin modern-day BTEC assessment practice.

Current BTEC qualifications are now criterion-referenced, stating learning outcomes in terms of assessment criteria to be achieved for a pass, and grading criteria relating to Merit and Distinction awards. BTEC qualifications also place an explicit emphasis on the use of formative assessment, allowing students multiple opportunities to develop their assessment submissions. Thus, in the BTEC context, the combination of criterion-referencing and formative assessment forms 'assessment for learning', which has become 'integral to the educational ethos of the qualification' (Torrance et al., 2005, p. 14).

However, as this Sophwort College case study has shown, due to various influences, not least cultural considerations, the potentially significant benefits for developing students' learning associated with assessment for learning, can be eroded, as both lecturers and students focus their endeavours on the assessment process and criteria compliance. This research has uncovered similar findings to existing studies in the current vocational FE research literature, and has produced much evidence of assessment providing a central role in defining teaching and learning at the micro-level of classroom practice.

9.2 Influences impacting on BTEC assessment

Within the Engineering Programme Area, assessment practice was essentially a co-construction through which lecturers endeavoured to accommodate the various external

explicit and internal implicit influences placed upon them. A highly influential external, structural constraint on lecturers' BTEC assessment practice was the requirement for a student to achieve all learning outcomes stated within a unit, that is, 'to achieve a pass a learner must have satisfied all the pass assessment criteria set out in the unit specifications' (Edexcel, 2002b, p. 10; Edexcel, 2010b, p. 11). The use of learning outcomes is not specific to BTEC qualifications as HE curricula are increasingly specified in terms of learning outcomes, where students are graded on the extent to which they have attained the expected outcomes, what is considered a 'variant of mastery learning' (Yorke, 2011, p. 256). However, within modern BTEC programmes, numerical or percentage marking is not permitted (Edexcel, 1996), with summative assessment having a competency-orientated basis, in that a student has or has not achieved the criteria. With this approach, there is no possibility of students cramming for an end-of-year exam and attaining a high mark to counteract a poor mark in a previous test or piece of coursework. The system does not allow an overall average pass mark to be achieved, as is often the case in HE (and was the case in TEC units of the 1970s, see Section 3.3, page 53). All assessment criteria are effectively equally weighted, and all have to be achieved. Failing one criterion results in failing a unit, and failing one unit has the potential to result in failing the qualification.

Lecturers were also conscious of satisfying the Awarding Body quality assurance verification procedures, requiring external sampling (by an Edexcel appointed Verifier) and internal sampling (by departmental appointed lecturer) of assessment material from a selection of students' scripts (see Section 5.2.1, page 95), and through which Edexcel ensured national standards. However, from this study, it is clear lecturers viewed the above external requirements and constraints within the local context of cultural influences of the programme area. These cultural influences related to lecturers' perceptions of students' academic abilities and general dispositions to their studies, perceptions that had generally formed over time from contact with previous National cohorts. This study has shown how accommodation of these students' perceived traits impacted on pragmatic classroom practice, which aligns with Ecclestone's findings through her GNVQ-based research (Ecclestone, 2002, p. 171).

Due to the requirement to achieve all assessment criteria to pass a unit, lecturers had no choice but to offer students further attempts at an assessment if unsuccessful on the first

attempt. This resulted in the construction of a referral process almost totally under their control, with little or no scrutiny from verifiers and peers. The referral process had a significant impact on the effectiveness of assessment practice, both in a positive and negative sense. This process was highly effective in aiding students' engagement with the programme in a staying the distance sense, and aiding their ultimate achievement by permitting multiple attempts at assessments, underpinned by continuing, predominantly verbal, feedback. However, these very same attributes of the referral system detracted from its effectiveness in developing learning. There was a potential for conflation of formative and summative assessment to occur, with feedback focused on achieving criteria, which did not necessarily engage students in worthwhile learning. This emphasis on criteria compliance is found at other FE learning sites (Ecclestone, 2010b; Torrance et al., 2005), and described as a move from 'assessment for learning, to assessment as learning'*'* (Torrance et al., 2005; Torrance, 2007).

9.3 The nature and form of BTEC assessment

Within the Engineering Programme Area, there is an underpinning ethos of 'all students enrolled should achieve the qualification', which is a feasible objective when assessment practice is based on the combined use of formative assessment (used to aid achievement) and criterion-referencing (allowing all to have their achievements recognised), as BTEC qualifications are. This emphasis did not involve sinister or subversive attempts to inflate student achievements, and lecturers did not circumvent or ignore assessment criteria. However, the well-documented ambiguity and subjectivity inherent within criterion-referenced assessment (see Section 2.2.2, page 24) allowed lecturers licence to tweak standards and practices to accommodate perceived students' traits, such as academic background, ability and dispositions to learning. To an external observer, standards year-on-year would appear consistent, but assessment methods and content coverage, often closely aligned with classroom-worked exercises and tutorial questions, combined with the unseen and personalised nature of formative feedback during practical assessments or throughout the referral process, allowed for subtleties in accommodating the disparities in abilities between yearly cohorts, and between students within a cohort.

It is not clear why Sophwort College lecturers had such a seeming desire to support student achievement, other than through their professionalism, and so wanting to help improve employment prospects and life chances of their students. Researchers have found a focus on enhancing achievement rates at other colleges is often associated with concerns related to funding (Boys, 2000, p. 287; James and Biesta, 2007, p. 132; Wolf, 2011, p. 91). However, this was not the case for Sophwort College, whose funding arrangements were not dependent on student retention and achievement targets (see Section 1.6, page 11). Some thoughts tend to Sophwort College being located in a small, isolated and close-knit community, having close links with local industry, which combined to exert external pressure on achievement rates. Lecturers might have perceived ensuring a high success rate from the National programmes as offering social benefits to the local community of which they were part, and providing economic benefits to the local economy, which was still strongly manufacturing-based. In addition, the human interaction associated with small class sizes had the potential to develop cordial relationships between lecturers and students, with lecturers not wanting to see students fail their units, or Course Tutors not wanting students failing their programmes. Other possibilities relate to line-management and some lecturers having previously worked at Colleges in England where funding was directly related to retention and achievement rates (see Table 7, page 101) and this exposure filtering into the departmental psyche. However, no lecturer referred to funding considerations and concerns relating to Sophwort College whilst being interviewed. Another explanation may be that the Haslegrave ethos of the 1970s lives on. One of the radical philosophical changes emanating from the TEC programmes of the 1970s, was the underpinning Haslegrave ethos (see page 52) that all students having the required entry qualifications, and who 'studies reasonably hard and well' (Halliday, 1981, p. 176), should expect to pass. Indeed four of the seven lecturers in this study had taught or studied TEC programmes of the 1970s, so had been exposed to the culture of these qualifications, with the remaining having been encultured into this ethos.

The BTEC National students of the Engineering Programme Area liked the assessment practice and its broken-up summative nature, having no high-stakes, end-of-year examinations, a finding also found from an evaluation of the original TEC programmes of the 1970s (Moor et al., 1983, p. 105). In the Sophwort College study, this is not surprising as lecturers tailored assessment practice to accommodate their perceptions of

students and what was realistically expected of them with regards effort and academic ability. However, there was a contrast in the effects of assessment practice, with students of the 1970s perceiving assessment as helping them to revise and learn unit material (Moor et al., 1983, p. 105), whereas Sophwort College students saw little need to revise or revisit classroom material when preparing for an assessment, and associated learning with achieving criteria.

Although the nature of the lecturers' constructions had the benefit of producing a less intimidating and less stressful assessment regime than students had experienced at school, it also limited students' academic engagement in their studies and the challenge of learning. The departmental ethos that all should pass, tended to see lecturers limit the demands of assessment, having the side-effect of encouraging some students to adopt, or remain at, a superficial level of engagement within their studies. This not only had the potential to hamper the learning of the weaker-ability students, who could achieve through incremental improvement made possible by a referral system offering multiple attempts at the same assessment supported by ongoing feedback, but of all students who could achieve through instrumental learning. Thus, the lecturers' ethically founded constructs of assessment were able to increase student retention in the programme and enhance student achievement rates, but in so doing could limit the challenge of learning, reduce understanding of subject material, and so hamper students' preparedness for progression from the National programmes.

9.4 Assessment's effect on preparedness for progression

The following section considers the effect assessment practice has on students' various progression paths from the National. The traditional Joint Committee National qualifications that spanned 1920 through to the 1970s (see Section 3.1, page 47), aimed to prepare students for the triple progression routes of: (a) a technician in its own right, (b) a preparatory course for higher technician study, (c) a preparation for entry to a degree course (Haslegrave, 1969, p. 33). The modern-day BTEC Nationals still endeavour to accommodate the same vocational and academic aspirations (Edexcel, 2002b, p. 9; Edexcel, 2010b, p. 2; Wolf, 2011, p. 50), so from the above findings, how do the National programmes aid development of students' preparedness for progression?

9.4.1 Preparedness for university study

Although only one student from the cohort forming the basis of this research, opted for a progression path direct from the National Diploma programme to an English university (to study Politics, see Table 8, page 103), within most National Diploma cohorts a few students annually choose to undertake undergraduate study at a UK-based university. Students studying either Electrical or Mechanical undergraduate programmes often require at least merit grades across most BTEC units, including Mathematics and Science. Entry to such university programmes typically require students to achieve an overall National Diploma grade of MMM, which is assumed equivalent to three A-level grades at CCC (UCAS, 2011). As found from the transcript data, lecturers tended to perceive the integrity of the BTEC National to reside in the higher-grade awards, a characteristic found in Boys' study (Boys, 2000, p. 295), and as a consequence they were less engaged with students in offering feedback and support at this level. Instead, lecturers expected students to show greater commitment and autonomy in their studies, requiring students to be self-motivated and independent learners, characteristics expected to underpin successful university study. However, there are some concerns associated with the constructed assessment practice in the Engineering Programme Area that may hamper students' progression onto engineering undergraduate programmes.

As found from this research, the predominant methods of assessment in the Engineering Programme Area are open-assignments and open-book tests; end-of-year exams are no longer part of the BTEC assessment landscape. From HE-based assessment literature (Entwistle and Entwistle, 2005; McDowell, 2004; Ramsden, 1992), university assessment is still significantly founded on the use of end-of-year, closed-book examinations, although there may also be an element of coursework. As seen from the Sophwort College students' comments, open-book tests do not encourage them to undertake revision or revisit taught material. Indeed, students may have lost the ability to revise for closed-book assessment during their period of National study – something they may need to relearn at university.

Another contrasting feature between the assessment in the HE sector and the BTEC programmes is the orientation towards mastery learning. The requirements to achieve

all assessment criteria to pass a BTEC unit resulted in the associated use of a referral system offering students multiple attempts at the same assessment to enhance their submissions and so achieve the criteria. This is in stark contrast to university assessment methods, based on typically a 50% numerical mark required to pass. Thus, ex-BTEC students need to realise that they only have *one-shot* at an assessment in any form in HE, which is a total contrast to their National study and the inherent and ongoing use of the referral system. Other aspects of their BTEC study that may not acclimatise students well to progression to university study includes: the relaxed cultural nature of the Engineering Programme Area, its small class sizes having approachable, supportive and easily accessible lecturing staff; extensive, personalised, ongoing verbal feedback, and the 'lax submission dates' for assignments.

However, what is potentially the most significant problem for BTEC students who study undergraduate engineering programmes may emanate from the assessment of mathematics and science in the Engineering Programme Area. As shown within this research, such assessments tend not to require analytical thinking, but the strong correlation between class work and assessment questions, limit the development of concepts, and encourages a 'reproducing orientation' as opposed to a 'meaning orientation' (Ramsden, 2005, p. 214), even at higher grade level:

> …mere procedural knowledge, and teaching methods of a narrow instructional or training kind…… They supported neither development of mind nor that of autonomy.
>
> (Davis, 1995, p. 5)

Indeed, even the reproducing orientation may be hampered by students' lack of participation with homework and revision, and so limiting consolidation of techniques and procedures. As has been highlighted from research, students who progress from BTEC Nationals to university tend to have difficulties with the mathematical content of such undergraduate courses, much more so than students following the A-level route (Sutherland and Pozzi, 1995). BTEC assessment practice can hamper students' progression in the area of engineering undergraduate study, which appears a long-standing problem of this vocational route (Moor et al., 1983, p. 46).

9.4.2 Preparedness for Higher Technician HNC/D study

The progression route to studying the Edexcel BTEC HNC or HND programmes at Sophwort College is probably the best aligned and best supported by National study, as both the students and lecturers are encultured into their co-constructed assessment practice, which essentially continues from National to Higher National Study. The same assessment methods, those of open-assignments and open-book tests, are used throughout HNC/D units and as with the National programmes, the referral system is again available to support students' progress through all units of study. The Higher Nationals are to an extent, a continuation of the National in both structure and content, with all National lecturing staff also teaching on the Higher programmes, so lecturers know their students' abilities and aptitudes well. The most likely prominent progression problem is again associated with mathematics and science subject matter, where National students may have achieved a pass grade in the Mathematics unit, through incremental improvement and instrumental learning, and not achieved the level of proficiency and understanding required for the Higher programmes. As the engineering epistemology requires 'mastery of techniques in linear sequence' (McDowell, 2004, p. 177), Higher National Mathematics uses and builds upon knowledge, understanding and application developed at National level. Thus, as with the progression route to university, lack of mathematical proficiency can cause problems for some students progressing to the Sophwort College HNC/D programmes. However, unlike with university progression, the referral system would support students' progress and achievement through the Sophwort BTEC Higher programmes.

9.4.3 Preparedness for employment

Preparedness of students for employment is probably the most difficult progression path to consider, as technician employment is highly varied (see Section 1.4, page 9), with wide-ranging academic and vocational requirements. From Edexcel literature (Edexcel, 2002b, p. 9; Edexcel, 2010b, p. 2), the BTEC National Diploma in Manufacturing Engineering is intended to prepare learners for employment in this vocational sector. The Diploma provides knowledge, understanding and skills for learners wishing to enter a career as a technician in the area of Manufacturing Engineering. Certainly, the Sophwort College National programme offered an

extensive range of technology and business-orientated units as well as the traditional mathematics and science-based units.

However, there have been long-standing concerns expressed about the relationship between National qualifications and workplace relevance. In the 1950s, the Crowther Report (1959) considered apprentices climbed two ladders, one related to their industrial work and one to their college studies, there being limited relevance between the two (Crowther, 1959, pp. 334-335). In the 1980s Moor et al. (1983) found similar sentiments expressed by TEC Engineering students (Moor et al., 1983, p. 105), and even modern-day National Electrical Engineering programmes are considered to have 'vocational irrelevance' (James and Biesta, 2007, p. 88). Similarly, it could also be argued that the assessment practice of the 1960s, with its emphasis on end-of-year exams, had little relevance to the vocational context in which technicians work. So, do modern BTEC assessment practices have any greater relevance?

Although essentially a semi-educational course, there was an emphasis on practical, authentic assessments within some BTEC units, which assessed practical skills, and also developed learning through the assessment. The majority of technology and business based-units were assessed using assignment work, which had the potential to develop research-based skills and solve realistic contextualised vocational problems, so developing vocationally oriented skills and knowledge. However, did the referral system impinge on this positive aspect of assessment for some students? As has been found from this study, Sophwort College lecturers had a general dislike of students re-submitting assessment work, although all permitted multiple submissions if required. Lecturers' concerns suggested repeated submissions could produce a disparity between some students' achievements and their actual proficiency. Such multiple attempts, supported by detailed and ongoing feedback, are considered not to prepare students for vocational practice and the Engineering Lecturers' scepticism about the validity of the some students' achievements relating to employability is found in the research literature:

> 'We keep sending the work back to the students and make them re-submit it again and again. If they do it, it will be because we have done the work or they will go away and copy off someone else. But if they do, how do we prove it?'

> She added, 'If there was a line, it was in the grading.' The other member of staff then declared, 'If I was an employer, I wouldn't touch a pass.'
>
> (Boys, 2000, p. 286, emphasis in original)

9.5 Recommendations for BTEC Policy

Based on the findings of this Sophwort College case study, the following considerations and recommendations are offered for future BTEC policy reviews.

9.5.1 Verification procedures

The localised and cultural influences highlighted through this research, and accommodated within the constructed assessment practice, illustrate why there can be disparities between students' ability relating to the same unit or programme when studied at different colleges. Within the bounds of this research, any notion of *national standards* attained from the assessment instruments via the awarding body verification processes, tends to reside at an aesthetic level, verifying 'face validity', that is, it looks like it is assessing what it should, and 'content validity', it assesses what is in the syllabus (see Wiliam (1992) for various validity definitions). However, these processes do not determine what is referred to as the 'construct validity', that is, being confident the assessment has measured the knowledge, skill or ability intended (Atkin et al., 2001, pp. 55-56; James and Pedder, 2006, p. 129; Wolf, 1990, p. 32). With regards to quality assurance scrutinisers, such as Internal Verifiers, External Verifiers and the QCA (see QCA, 2005), BTEC assessment purported hallmarks of validity, and students' scripts may indicate a level of knowledge, ability and understanding complying with assessment criteria, but this may not be commensurate with their actual proficiency. Of course, construct validity is difficult to assess, but there is a lack of robustness about current verification procedures. However, Wolf suggests Awarding Bodies may be content to operate at this surface level of oversight due to commercial pressures (Wolf, 2011, p. 95). As this research has shown, BTEC assessment significantly relies on the integrity of the lecturers, and it is within the local communities of practice in which lecturers reside, that all meaningful standards are devised.

9.5.2 The local context defines meaningful standards

As found by James and Biesta (2007), learning sites have their own learning culture and within this, their own assessment culture, formed by social practices (see Section 2.4, page 32). Despite the more transparent and rigorous external requirements and constraints placed on lecturers through the Awarding Body's use of criterion-referenced assessment and verification processes to set national standards, it was clear lecturers in the Sophwort College Engineering Programme Area still had significant responsibility and control over the micro-level of assessment practice, and it was their integrity on which 'standards' were founded. As Torrance's et al. (2005) research into various FE programmes found:

> ...local 'communities of practice' constitute the context in which all meaningful judgements about standards are made, ...
>
> (Torrance et al., 2005, p. 3)

This Sophwort College case study has highlighted how lecturers conflate summative and formative assessment at the micro-level of classroom practice to maintain engagement of students in their studies and allow more to succeed, 'but succeed at what?' (Torrance et al., 2005, p. 82). As found within the FE vocational assessment literature, the use of:

> Detailed tutor and assessor support, in the form of exam coaching and practice, drafting and redrafting of assignments, ... is widespread throughout the sector and is effective in facilitating achievement and progression.
>
> (Torrance et al., 2005, p. 83)

The Sophwort College study has shown, at the detailed level of classroom practice, how and why this support can be effective in facilitating achievement, but conversely, how it is primarily focused on criteria compliance, and not necessarily developing and advancing learning.

Awarding Body verification procedures may confirm assessments have strong aesthetic validity, but this may at best tend towards confirming notional compliance with what are perceived to be national standards. As seen from this study, ultimately, it is the responsibility of lecturers to set and maintain standards within their units, based on an array of influences and requirements, from which constructions of assessment practice and a pragmatic realism about standards arise. Such 'assessor interaction with candidates' is inevitable within teacher-assessment (Torrance et al., 2005, p. 87), and

should be formally recognised by awarding bodies as acceptable practice. Awarding bodies should offer guidelines and materials to facilitate this process and 'address equity issues' (Torrance et al., 2005, p. 83) that may occur between different learning sites, and which may generate disparities in standards. The following recommendations, some of which align with those of James and Biesta (2007) and Torrance et al. (2005), are based on the findings of this study.

9.5.3 Support for assessors at a local level

Centrally set policies are required to provide over-arching policy aims, objectives and directives at the macro and meso-level of programme operation, but at the micro-level of pragmatic classroom engagement, it is the lecturers who disentangle rhetoric from reality, and construct assessment practice. This is highlighted within this study, where Engineering Lecturers appeared to choose their own interpretation of, and relationship between, formative and summative assessment, and in practice blur the two, in contrast to Edexcel's guidance which suggested they are distinctive entities (Section 6.2, page 116).

Edexcel's centrally set policy should support and develop local assessor judgements through increased use of exemplar material and possibly a centrally set data bank of assessments allowing students a choice of assessment methods. This research also suggests Edexcel should offer illustrations of how to implement their requirements relating to the 'Application of assessment and grading criteria', and the use of formative assessment 'prior to summative assessment' (Edexcel, 2006a), across all assessment methods and units.

Such material could include examples of written and verbal feedback provided to students in referral situations to improve their performance, how feedback from summative closed-book or open-book tests can be used to aid learning, classroom use of formative feedback whilst students are working on assignments, and *appropriate use* of coaching. This material could also include DVDs of actual classroom engagement, showing lecturers providing feedback to groups of students or on an individual basis, with the intention of making students think and so develop their learning.

Edexcel should offer staff development sessions for centres relating to the use of formative assessment specifically for BTEC Nationals, to illustrate its integration into classroom practice and relationship to summative assessment. Also, Edexcel should encourage local centres to develop links through which shared practice related to formative assessment activities can be forthcoming and from which, best practice may evolve that provides for greater consistency of approach and coherency in standards across centres.

The use of dedicated External Verifiers responsible for colleges across specific regions of the country (akin to the TEC External Moderators of the 1970s and 80s), could provide a key role in supporting lecturers in developing their assessment practice, and so help maintain consistent standards across centres through dissemination of best practice. However, it is recognised that such a move may be unpalatable due to cost implications for the awarding body.

9.5.4 Problems associated with the use of non-numerical marking

The prevailing aims of the TEC and BTEC programmes have always been to ensure satisfactory student performance occurs over a whole unit of study. The 1970s TEC units employed numerical marking with an overall average of 50% required for a pass, but this could result in an inherent averaging effect, obscuring failure in some parts of the syllabus. The move to the use of outcomes and literal marking in assessment was aimed at removing this concern (Edexcel, 1996). However, as this Sophwort College study has shown, despite students producing written evidence demonstrating achievement of stated assessment criteria: the multiple attempts at the same assessment supported by ongoing verbal feedback, concern over authenticity of submissions, and an emphasis on instrumental learning, does not ensure students have achieved a level of proficiency commensurate with the criteria, and can still obscure failure.

In addition, BTEC competence-orientated assessment is in contrast to the numerical marking approach used within the school and HE sectors, causing enculturation problems, both for students entering BTEC programmes, and for students whose progression path is to university undergraduate programmes, where again numerical marking is used. Indeed the requirement for lecturers continually to offer opportunities at assessments places an increased workload on them, and a consideration for BTEC is

whether their requirement for students to achieve all assessment criteria to pass a unit has any significant benefit to student learning over the use of traditional numerical marking. This concern particularly relates to academically weaker students who often require the ongoing support and multiple attempts at the same assessment to pass.

9.6 Recommendations for Departmental Policy

The following are considerations and recommendations proposed with the intention to standardise and enhance BTEC assessment practice within the Engineering Programme Area. As this research has found, lecturers tended to accommodate their perceptions of students, which included accommodating the lack of effort some students showed towards their studies. The lecturers' constructed assessment practice and approaches to delivery, tended to reinforce not reverse these dispositions, which had negative consequences for learning and academic standards. The following proposals are an attempt to increase discipline and positive engagement of students within their studies, although it is acknowledged, they may reduce overall achievement rates in the short term.

9.6.1 Departmental policy for assessment practice

At the time of this research, although no Sophwort College-wide policy was in operation specifically related to BTEC assessment practice, there was an Engineering Programme Area Departmental Handbook relating to use of assignments and a procedure for accommodating late submissions (see Section 5.3, page 96). However, this handbook was not issued to students and lecturers did not enforce its procedures, and as a consequence, this study has found lecturers were primarily responsible for their approach to all aspects of assessment practice. Lack of implementation of the handbook procedures resulted in assignment submission dates being considered by both lecturers and students as superficial, adding to students' perceptions of the informal nature of the departments' assessment practice. However, lecturers' reluctance to enforce submission dates was in part a consequence of the BTEC requirement for students needing to achieve all assessment criteria to pass a unit, and lecturers realising that not accepting one assignment, resulted in failure of a unit.

To offer standardisation and improved rigour in assessment practice across BTEC programmes in the Engineering Programme Area, a departmental policy should be developed jointly by line-management and staff, encompassing summative *and* formative assessment practices, with procedures devised to aid development of a common approach to late submissions and referment opportunities. As part of this process, and to ensure coherent and consistent implementation of any such policies, an Engineering Department Academic Review Board should be instigated, where late submission of work or options for referrals can be considered and debated amongst BTEC staff. This would provide a forum for the sharing and scrutiny of lecturers' approaches to formative assessment and referrals, and help develop best practice and consistency of standards across the programme area at the micro-level of classroom practice. However, a major element of this proposal is communication of the assessment policy to students at induction, and its reinforcement throughout the academic year as the assessment practice unfolds and various aspects of the departmental policy are encountered. Lecturers would need to adhere collectively to any such policies and procedures introduced to ensure consistency of approach to students.

9.6.2 Increased awareness of formative assessment practices

This research suggests a lack of understanding of formative assessment is present within the Engineering Programme Area. Continued Professional Development (CPD) should be used, specifically to increase lecturers' understanding of formative assessment, and how this can be pragmatically implemented into classroom practice to develop feedback that encourages reflection and deep learning. Although this proposal relates to Section 9.5.3 and is a consideration for BTEC, lecturers' understanding of such techniques as peer and self-assessment could be enhanced by specific training sessions. Through such techniques, students can be encouraged to develop a sustainable approach to learning, and prepare them for progression from the course, in whatever path they choose. However, the cultural characteristics of the students within this research does suggest applying formative assessment as defined by Black and Wiliam (that feedback should require students to 'think' about their learning), may enhance learning for those engaging with the feedback, but may reduce overall achievement statistics for the department due to some students lacking positive dispositions to learning.

9.6.3 Use of homework to aid learning

The Engineering Lecturers perceived students as undertaking limited work outside of the classroom environment, which was confirmed through students' responses, with what work students did undertake related to completing assignments. The BTEC assessment practice appeared to inhibit lecturers' use of homework, as they were unable to give students a formal grade or mark for homework submissions to account for summative assessment, and could not penalise students who did submit homework (lecturers could only assess work against stipulated unit criteria). As students did not perceive homework as relating to summative assessment, they were not motivated to engage with it, and viewed it as an optional extra. However, research evidence indicates homework has a 'strong effect on student achievement' (Marzano et al., 2000, p. 4), providing 'opportunities for students to practice skills, prepare to learn new information, or elaborate on introduced material' (Marzano et al., 2000, p. 58).

Homework per se is not necessarily useful and needs to be well thought out to enhance learning, and so should only be used where educational benefits will occur. Where homework is used, students need to be made aware of its relevance to their learning, such as developing their proficiency or conceptual understanding to aid their achievement and future progression. For homework to be effective, students need timely and detailed formative feedback from lecturers, placing further demands on their time, although as discussed above, the use of peer and self-assessment practices may help alleviate the extra workload. As an incentive for students to undertake homework, lecturers could withhold issuing assignments or the sitting of a test until the work is submitted and they have evidence that the student is prepared for the assessment. If the homework is not correct, lecturers and students have the opportunity to take remedial action to develop learning before the assessment. Such an approach, used effectively and regularly, may reduce the need for students to have multiple re-submissions through the referral process, aid the development of students' study skills, and in the long-term, move the culture to one focused on learning and not only criteria compliance.

9.6.4 Employing a modicum of closed-book testing

Although there was evidence of lecturers avoiding the use of traditional closed-book tests due to problems in determining the standard required (that is how much of the test did students need to complete correctly to achieve the assessment criteria?), their main reason for avoiding this method was the perception students would not prepare themselves appropriately, and so fail. This would entail lecturers needing to offer students further, possibly multiple, opportunities to re-sit the test, requiring much time, effort and organisation. Open assignments, a main method of assessment used across most units, could be progressed by students outside of the classroom. This made such assessments less problematic to lecturers when referrals occurred, as they did not need further classroom time, and could reuse the same assessment instrument. However, the use of open-book tests in the Engineering Programme Area, combined with recourse to the referral system, had the effect of accommodating, reinforcing and even encouraging students' lack of preparation for such assessments.

The use of an element of closed-book testing within unit assessment strategies may provide for a greater degree of focus for students, and have the potential to develop study skills that appear to be lacking by students and accommodated within the lecturers' constructed assessment practice. Using an occasional closed-book test alongside a variety of other, authentic methods to asses a unit, has the benefit of providing authenticity of students' work and not having the problem of accommodating late submissions. Closed-book tests would increase the academic rigour of BTEC assessment and reinforce or improve students' ability to revise, aiding those students' progression to higher-level programmes, where traditional examinations are likely to be encountered.

9.6.5 Increased tutorial support for students

As highlighted through this research, BTEC programmes, and particularly the assessment practice, is in stark contrast to that most students have experienced at school. Although students prefer the BTEC system, as it is perceived to be more relaxed, less intimidating, less demanding and less formal, this has the potential to provide a comfort zone in which some students' previous ill-disciplined learning dispositions and lack of study skills are accommodated. These dispositions can be

further reinforced on their exposure to a referral system offering continual chances to achieve, leading some students into a false sense of security and reducing their engagement with learning.

The department could consider greater tutorial support for students, particularly during their first year of study, to help them become encultured in the BTEC procedures and practices of the assessment system, and be aware of the expectations and responsibilities placed upon them if they are to be successful. Explanation of the variety of assessment methods used and what is expected from students with regards preparation for assessments, such as undertaking set homework, revising for tests and developing time-management activities associated with open-assignments, should be an ongoing aspect of this tutorial support. As stated above, emphasising and ensuring rigid adherence to submission deadlines for assignments, would instil a sense of formality, focus and discipline within students' approach to assessment, benefiting their achievement and preparedness for progression.

9.7 Final thoughts.....

Although this is a small-scale, single site study encompassing one BTEC Qualification, its findings resonate with much of the current FE vocational research literature on assessment. However, what this study offers, in the context of the Sophwort College Engineering Programme Area, is an insight into the salient influences on, and considerations of, lecturers as they translate awarding body requirements and regulations into pragmatic classroom assessment in a cultural context. Returning to the anecdotal comments stated in Section 1.1 (page 3) such as: lecturers' remarks about students achieving 'notional passes', students achieving high grades in BTEC Mathematics units but failing Mathematics on progression to university, and university tutors expressing concerns over the variability BTEC qualifications, this research has illuminated how BTEC assessment practice allows such vagaries to occur.

Finally, I return to the Haslegrave Report of 1969, which instigated a revolution in technician engineering education and in particular, assessment practice; the structure and principles of which still underpins aspects of the modern BTEC National programmes. One of the main aspirations of Haslegrave was to improve student

wastage and achievement rates of the 1950s and 60s. The move to broken-up, teacher-assessment, combined with use of authentic assessment methods, and since the late 1980s, an increasing emphasis on criterion-referencing and formative assessment, has enabled an ethically founded, 'all can achieve' (Black and Wiliam, 1998b, p. 9) ethos to underpin technician engineering education.

However, many of the criticisms and concerns relating to the traditional Joint Committee Nationals of the 1960s (see Section 3.2, commencing page 51) can be levelled at the modern-day BTEC Nationals forty years on. For example, in the 1960s end-of year external examinations were considered a constraining influence on teaching, and deemed poor predictors of student abilities for the role of Technician Engineer. In modern practice, lecturers are focused on, and to an extent feel constrained by, criterion-referenced assessment. As to assessment being used as indicators of performance for practicing technician, it could be argued that the modern methods of assessment provide no greater clarity of the abilities of some students than did the 1960s end-of-year examinations. Principal concerns of the Haslegrave report were the high wastage rates (students leaving the course before completing their studies), and high failure rates (student not passing the assessments). As shown in Figure 2, page 48, throughout the history of the National Certificate programme, the success rate was typically never higher than 60% and that for the Diploma, typically 70% (Bourne, 1984, p. 747). However, even with a move to criterion-referenced assessment and an emphasis on the use of formative assessment to aid achievement, doubts about improvements in success rates remain. With reference to Figure 5 (page 183), during the 1990s the BTEC National Certificate programmes showed no significant changes in success rates that occurred in the 1960s, with the National Diploma pass rates falling below 50% for much of the 1990s (down to 41% pass rate in 1999).

Figure 5: Success rates for BTEC National in Engineering (1990s)

Table 5: Number of students registered on BTEC National Certificate in Engineering from 1993/94 to 1998/99 and the number passing by September 1999 (Source: EdExcel)

Year registered	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99
Normally completing	1995	1996	1997	1998	1999	2000
Total NC registered	11587	10855	11014	11076	11400	11369
Total NC passed	6788	6369	6644	6458	5161	638
% NC passed	59	59	60	58	45	6

Table 6: Number of students registered on BTEC National Diploma in Engineering course from 1993/94 to 1998/99 and the number passing by September 1999 (Source: EdExcel)

Year registered	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99
Normally completing	1995	1996	1997	1998	1999	2000
Total ND registered	10530	8720	6607	5059	4421	4452
Total ND passed	5281	4099	3022	2361	1803	66
% ND passed	50	47	46	47	41	1

(Brown, 2001, p. 48)

Within the National Diploma cohort forming the basis of this study, only eight of the thirteen students that commenced the National programme achieved a qualification. It should be noted, I requested up-to-date achievement rates from Edexcel, but was provided with the following response from a Support Manager:

> I have contacted our Legal team and head of BTEC Assessment and unfortunately we will be unable to provide you with any further information regarding figures for BTEC National Diploma as this information is commercial in confidence.
>
> [Edexcel Support Manager, e-mailed response, 2nd Dec 2010]

This reluctance of Edexcel to publically release such statistical information about their programmes, may be another example (see Section 9.5.1, page 173) of the current commercial pressures experienced by awarding bodies, and their concern to protect market share (Wolf, 2011, p. 95).

This thesis has illustrated how the BTEC assessment regime of the 2000s is a radical departure from the original Joint Committee National courses that prevailed, almost unchanged from their inception in 1918 through to the 1960s. The Joint Committee Nationals' assessment was based on end-of-year, externally set, grouped examinations, allowing little or no referment. In contrast, modern BTEC National programmes are

criterion-referenced, employ broken-up, teacher-assessed summative practices that incorporate a variety of authentic assessment methods. BTEC programmes are also underpinned by formative assessment practices that are integral to the ethos of the qualification, and allow multiple referment opportunities. However, despite this radical shift in assessment practice, similar concerns associated with the 1960s assessment of Nationals, as highlighted through the Haslegrave Committee's Report (1969), still find resonance today. A case of 'plus ça change[1]', or perhaps:

> ...the more important general finding here is that no approach to or method of assessment is immune from distortion when too many consequences ride on the results.
>
> (Torrance et al., 2005, p. 82)

[1] Plus ça change (plus c'est la même chose).

SAYING The more things change, the more they stay the same. Used when a change does not result in an improvement in a situation. CAMBRIDGE UNIVERSITY PRESS (2011) Cambridge Dictionaries Online, http://dictionary.cambridge.org/dictionary/british/ [Accessed: 2nd Oct 2011].

REFERENCES

ALLEN, K. W. (1965) Technical Education in England and Wales. *History of Education Quarterly,* 5**,** 3, 147-152.

AQA (2003) *Setting the Standard - A century of public examining by AQA and its parent boards,* Manchester, Great Britain, Assessment and Qualifications Alliance.

ARG (2002) *10 principles of assessment for learning*, Cambridge, University of Cambridge.

ARGLES, M. (1964) *South Kensington to Robbins,* London, Longmans.

ATKIN, J. M., BLACK, P. & COFFEY, J. (Eds.) (2001) *National Assessment and the National Science Education Standards,* Washington, D.C., National Academy Press.

AVIS, J., BATHMAKER, A.-M. & PARSONS, J. (2002) Communities of practice and the construction of learners in post-compulsory education and training. *Journal of Vocational Education & Training,* 54**,** 1, 27-50.

BEC (1977) *Circular 4/77. Assessment for BEC Awards,* London, Business Education Council.

BECHER, T. (1989) *Academic Tribes and Territories - intellectual inquiry and the cultures of disciplines*, Buckingham, SRIE and Open University Press.

BERA (2004) *Revised Ethical Guidelines for Educational Research*, British Educational Research Association.

BIGGS, J. (1992) The psychology of educational assessment and the Hong Kong scene. *Bulletin of the Hong Kong Psychological Society,* Nos. 28/29, 5-26.

BIGGS, J. (1996) Enhancing teaching through constructive alignment. *Higher Education,* 32**,** 3, 347-364.

BIGGS, J. (1998) Assessment and Classroom Learning: a role for summative assessment? *Assessment in Education,* 5**,** 1, 103-110.

BIGGS, J. (1999) *Teaching for Quality Learning at University,* Buckingham, SFHE & Open University Press.

BIRBECK, R. (1980) The History and Operation of the Technician Education Council Programmes in Colleges of Technology in the United Kingdom. *International Journal of Electrical Engineering Education,* 17, 293-299.

BLACK, H. D. & DOCKRELL, W. B. (Eds.) (1988) *New Developments in Educational Assessment,* Edinburgh, Scottish Academic Press.

BLACK, P. (1998) *Testing: Friend or Foe? Theory and Practice of Assessment and Testing,* London, The Falmer Press.

BLACK, P. & WILIAM, D. (1998a) Assessment and Classroom Learning. *Assessment in Education: Principles, Policy & Practice*, 5**,** 1, 7-74.

BLACK, P. & WILIAM, D. (1998b) *Inside the black box - Raising standards through classroom assessment*, London, Kings College London, Department of Education and Professional Studies.

BLACK, P. & WILIAM, D. (2002) *Working inside the black box - Raising standards through classroom assessment*, London, Kings College London, Department of Education and Professional Studies.

BLACK, P. & WILIAM, D. (2003) In praise of educational research: formative assessment. *British Educational Research Journal*, 29**,** 5, 623-637.

BLAKEY, H. & STAGG, R. (1978) The Technician Education Council. *Post Office Electrical Engineers Journal,* 90**,** Pt Jan, 219-226.

BLOOM, B. S. (1974) Time and Learning. *American Psychologist,* 29**,** 9, 682-688.

BLOOM, B. S. (1976) *Human Characteristics and School Learning,* New York, McGraw-Hill Book Company.

BLOOM, B. S., ENGELHART, M. D., FURST , E. J., HILL, W. H. & DAVID R. KRATHWOHL, D. R. (1956) *Taxonomy of Educational Objectives: The Classification of Educational Goals - Handbook 1 Cognitive Domain,* New York, David McKay and Co.

BLOOM, B. S., HASTINGS, J. T. & MADAUS, G. F. (1971) *Handbook on Formative and Summative Evaluation* New York, McGraw-Hill Inc.

BORREGO, M., DOUGLAS, E. P. & AMELINK, C. T. (2009) Quantitative, Qualitative, and Mixed Research Methods in Engineering Education. *Journal of Engineering Education,* 98**,** 1, 53-66.

BORREGO, M., STREVELER, R. A., MILLER, R. L. & SMITH, K. A. (2008) A New Paradigm for a New Field: Communicating Representations of Engineering Education Research. *Journal of Engineering Education,* 92**,** 2, 147-162.

BOUD, D. (1988) *Moving Towards Autonomy*. IN BOUD, D. (Ed.) *Developing Student Autonomy.* 2nd ed. London, Kogan Page Ltd., 17-39.

BOUD, D. (2000) Sustainable Assessment: rethinking assessment for the learning society. *Studies in Continuing Education,* 22**,** 2, 151-167.

BOUD, D. (2007) *Reframing assessment as if learning were Important*. IN BOUD, D. & FALCHIKOV, N. (Eds.) *Rethinking Assessment in Higher Education - Learning for the longer term.* London, Routledge, 14-25.

BOUD, D. & FALCHIKOV, N. (2007) *Introduction: assessment for the longer term*. IN BOUD, D. & FALCHIKOV, N. (Eds.) *Rethinking Assessment in Higher Education - Learning for the longer term.* London, Routledge, 3-13.

BOURNE, R. (1984) The rise and fall of the HNC: long live the HNC! *IEE Proceedings,* 131, Pt A**,** 9, 745-748.

BOYS, C., (2000) *The GNVQ Experiment 1991 to 1996 - Lost for words?*, PhD Thesis, University of Sussex.

BRANNEN, J. (2005) Mixed Methods Research: A discussion paper, *ESRC National Centre for Research Methods*, December 2005, 1-30.

BROADFOOT, P. M. (1996) *Education, Assessment and Society,* Buckingham, Open University Press.

BROWN, K. (2001) The downward slope: engineering HE and vocational qualifications in terminal decline? *Engineering Science and Education Journal,* 10**,** 2, 44-48.

BROWN, S. (1999) *Institutional Strategies for Assessment*. IN BROWN, S. & GLASNER, A. (Eds.) *Assessment Matters in Higher Education - Choosing and Using Diverse Approaches.* Buckingham, The Society for Research into Higher Education, 3-13.

BRUCE, C., (2006) *Growing Engineers for a Knowledge-Based Economy: Lost Cause or Reasons for Hope*, EdD Thesis, The University of Sheffield, School of Education.

BTEC (1984) *Policies and Priorities into the 1990s*, London, Business and Technician Council.

BTEC (1986a) *Assessment and Grading - General Guideline*, London, Business and Technician Council.

BTEC (1986b) *Assignments Help Students to Learn*, London, Business and Technician Council.
BTEC (1986c) *Circular 15 - BTEC Qualifications and Certificates of Achievement Framework*, London, Business and Technician Council.
BTEC (1986d) *Circular 17 - Grades for BTEC Qualifications and Certificates of Achievement*, London, Business and Technician Council.
BTEC (1993) *Success with BTEC starts here - A Guide for Centres*, London, Business and Technician Council.
CAMBRIDGE UNIVERSITY PRESS (2011) Cambridge Dictionaries Online, http://dictionary.cambridge.org/dictionary/british/ [Accessed: 2nd Oct 2011].
CAPEY, J. (1995) *GNVQ Assessment Review*, London, NCVQ.
CARLSON, E., MACDONALD, D., GORELY, T., HANRAHAN, S. & BURGESS-LIMERICK, R. (2000) Implementing Criterion-referenced Assessment Within a Multi-disciplinary University Department. *Higher Education Research & Development*, 19**,** 1, 103-116.
CARROLL, J. B. (1963) A Model of School Learning. *Teachers College Record*, 64**,** 8, 723-733.
CASE, J. & LIGHT, G. (2011) Emerging Methodologies in Engineering Education Research. *Journal of Engineering Education*, 100**,** 1, 186-210.
CHITTY, C. (1996) Ruskin's legacy, http://www.tes.co.uk/article.aspx?storycode=19668 [Accessed: 18th July 2009].
COCKETT, M. (1996) *Vocationalism and Vocational Courses 14-16*. IN HALSALL, R. & COCKETT, M. (Eds.) *Education and Training 14-19: Chaos or Coherence.* London, David Fulton Publishers Ltd, 33-49.
COHEN, L., MANION, L. & MORRISON, K. (2000) *Research Methods in Education, 5th edition*, Oxon, United Kingdom, RoutledgeFalmer.
COLLEY, H., HODKINSON, P. & MALCOM, J. (2003) *Informality and formality in learning: a report for the Learning and Skills Research Centre*, London, Learning and Skills Research Centre.
COLLEY, H. & JARVIS, J. (2007) Formality and informality in the summative assessment of motor vehicle apprentices: a case study *Assessment in Education*, 14**,** 3, 295–314.
CONNELLY, G. (2003) *Curriculum development in further education*. IN BRYCE, T. G. K. & HUMES, W. M. (Eds.) *Scottish Education Second Edition Post-Devolution.* Edinburgh, Scotland, Edinburgh University Press, 644-653.
CORDON, A. (2003) Assessment, http://www.artsci.utoronto.ca/faculty-staff/teacher-info/pdfs/assessment.pdf [Accessed: 1st May 2009].
COWAN, J. (2003) Assessment for Learning - giving timely and effective feedback. *Exchange (issue focus on assessment)*, Spring 2003**,** 4, 21-22.
CROWTHER, G. (1959) *15-18: A Report of the Central Advisory Council for Education (England), Vol. 1*, London, HMSO.
DANN, R. (2002) *Promoting Assessment As Learning*, London, RoutledgeFalmer.
DAVIES, A. & LE MAHIEU, P. (2003) *Assessment for learning: reconsidering portfolios and research evidence*. IN SEGERS, M., DOCHY, F. & CASCALLAR, E. (Eds.) *Innovation and Change in Professional Education: Optimising New Modes of Assessment: In Search of Qualities and Standards.* Dordrecht, Kluwer Academic Publishers, 141-169.
DAVIS, A. (1995) Criterion-referenced Assessment and the Development of Knowledge and Understanding. *Journal of Philosophy of Education*, 29**,** 1, 3-21.

DEARDEN, R. F. (1979) The Assessment of Learning. *British Journal of Educational Studies,* XXVII**,** 2, 111-124.
DEARING, R. (1996a) *Review of Qualifications for 16-19 Year Olds - A Summary of Sir Ron Dearing's Recommendations,* Hayes, England, SCAA Publications.
DEARING, R. (1996b) *Review of Qualifications for 16-19 Year Olds. Completion of A Level and GNVQ Courses: A literature Review*, Hayes, England, SCAA Publications.
DENZIN, N. K. & LINCOLN, Y. S. (Eds.) (1994) *Handbook of Qualitative Research* London, SAGE, Publications Inc.
DENZIN, N. K. & LINCOLN, Y. S. (Eds.) (2000) *Handbook of Qualitative Research 2nd edition,* London, SAGE, Publications Inc.
DEPARTMENT OF EDUCATION AND SCIENCE, D. O. E., WELSH OFFICE (1991) Education and training for the 21st century. HMSO.
DEPARTMENT OF EMPLOYMENT (1986) Working Together - Education and Training. Her Majesty's Stationery Office.
DUNN, K. E. & MULVENON, S. W. (2009) A Critical Review of Research on Formative Assessment: The Limited Scientific Evidence of the Impact of Formative Assessment in Education. *Practical Assessment, Research & Evaluation,* 14**,** 7, 1-11.
DUNN, L., PARRY, P. & MORGAN, C. (2002) Seeking quality in criterion referenced assessment http://www.leeds.ac.uk/educol/documents/00002257.htm [Accessed: May 2009].
EARL, L. (2003) *Assessment as Learning: Using Classroom Assessment to Maximise Student Learning,* Thousand Oaks, CA, Corwin Press.
ECCLESTONE, K. (2001) 'I know a 2:1 when I see it': understanding criteria for degree classifications in franchised degree programmes. *Journal of Further and Higher Education,* 25**,** 3, 301-313.
ECCLESTONE, K. (2002) *Leaner Autonomy in Post-16 Education: The politics and practice of formative assessment,* London, RoutledgeFalmer.
ECCLESTONE, K. (2003) *Understanding assessment and qualifications in post-compulsory education,* Leicester, NIACE.
ECCLESTONE, K. (2007) Commitment, compliance and comfort zones: the effects of formative assessment on vocational education students' learning careers. *Assessment in Education,* 14**,** 3, 315-333.
ECCLESTONE, K. (2009) *Chapter 9: Instrumental or Sustainable Learning? The Impact of Learning Cultures on Formative Assessment in Vocational Education*. IN JOUGHLIN, G. (Ed.) *Assessment, Learning and Judgement in Higher Education.* New York, Springer, 153-173.
ECCLESTONE, K. (2010a) [Personal communication: e-mail, 2nd November 2010].
ECCLESTONE, K. (2010b) *Transforming Formative Assessment in Lifelong learning,* London, Open University Press.
ECCLESTONE, K. & PRYOR, P. (2003) Learning Careers or Assessment Careers? The Impact of Assessment Systems on Learning. *British Educational Research Journal,* 29**,** 4, 471-488.
EDEXCEL (1996) [Letter (extract) sent to Engineering External Verifiers from Lead Verifier. July 1999].
EDEXCEL (1999) *Qualification Report - Centre Visit and Sampling Details*, London, Edexcel Foundation.
EDEXCEL (2002a) *Edexcel Level 3 - BTEC Nationals in Electrical/Electronic Engineering - Guidance and units,* London, Edexcel Foundation.

EDEXCEL (2002b) *Edexcel Level 3 - BTEC Nationals in Manufacturing Engineering - Guidance and units,* London, Edexcel Foundation.
EDEXCEL (2006a) Assessment and grading: application of criteria, http://www.edexcel.org.uk/VirtualContent/59386/AGAC_18_05_06_Final.pdf [Accessed: 10th Jan 2007].
EDEXCEL (2006b) *Edexcel Facts — BTEC Fact Sheet*, London, Edexcel Limited.
EDEXCEL (2006c) *Our pedigree - a potted history*, London, Edexcel Limited.
EDEXCEL (2007a) *BTEC National Engineering - Study Guide*, London, Edexcel Limited.
EDEXCEL (2007b) *Edexcel Level 3 BTEC National Certificate and Diploma in Manufacturing Engineering For first teaching September 2007,* London, Edexcel Limited.
EDEXCEL (2009a) *Re-titling of the Level 2 BTEC Firsts and Level 3 BTEC Nationals*, London, Edexcel Limited.
EDEXCEL (2009b) UCAS points and key skills equivalents, http://www.edexcel.com/iwantto/Pages/ucas-points.aspx [Accessed: 3rd Aug 2011].
EDEXCEL (2010a) *Centre Guide to Internal Verification - BTEC Qualifications Entry, Level 2 and 3 including Specialist Courses*, London, Edexcel Limited.
EDEXCEL (2010b) *Edexcel Manufacturing Engineering Level 3 BTEC National Specification from September 2010*, London, Edexcel Limited.
EDEXCEL (2010c) *Quality Assurance Centre Handbook - Standards Verification Sampling (BTEC)*, London, Edexcel Limited, SV-new-Final-v20.
EDUCATION SELECT COMMITTEE (1995) *Education and Training for 14 to 19 Year Olds - Minutes of Evidence and Appendices*, London, HMSO.
EISNER, E. W. (2000) BENJAMIN BLOOM 1913–99. *The Quarterly Review of Comparative Education,* XXX**,** 3, 1-7.
ELTON, L. & JOHNSTON, B. (2002) *Assessment in Universities: a critical review of research*, Learning and Teaching Support Network, Generic Centre.
ELY, M., VINZ, R., ANZUL, M. & DOWNING, M. (1997) *On writing qualitative research - living by words*, London, The Falmer Press.
ENGC (2005) *Engineering Technician Standard*, London, Engineering Council U.K.
ENGC (2011) *UK Standard for Professional Engineering Competence (UK-SPEC)* London, Engineering Council U.K.
ENTWISTLE, N. (2005) *Contrasting Perspectives on Learning*. IN MARTON, F., HOUNSELL, D. & ENTWISTLE, N. (Eds.) *The Experience of Learning: Implications for Teaching and Studying in Higher Education.* 3rd (Internet) ed. Edinburgh, University of Edinburgh, Centre for Teaching, Learning and Assessment, 3-22.
ENTWISTLE, N. & ENTWISTLE, A. (2005) *Revision and the Experience of Understanding*. IN MARTON, F., HOUNSELL, D. & ENTWISTLE, N. (Eds.) *The Experience of Learning: Implications for Teaching and Studying in Higher Education.* 3rd (Internet) ed. Edinburgh, University of Edinburgh, Centre for Teaching, Learning and Assessment, 145-158.
ESRC (2005) *Research Ethics Framework (REF),* Swindon, England, Economic & Social Research Council.
EVANS, D. (2007) The History of Technical Education - A Short Introduction. *TMag.* 2nd edition ed. Cambridge, T Magazine Ltd.
FEARNLEY, S. (1995) Class Size: the erosive effect of recruitment numbers on performance. *Quality in Higher Education,* 1**,** 1, 59-65.

FISHER, R. (2003) The golden age of BTEC: the business education curriculum in 1980s further education. *The Curriculum Journal,* 14**,** 2, 253–277.
FISHER, R. (2004) From Business Education Council to Edexcel Foundation 1969-96: the short but winding road from technician education to instrumentalist technicism. *Journal of Education and Work,* 17**,** 2, 237-255.
FLYVBJERG, B. (2006) Five Misunderstandings About Case-Study Research. *Qualitative Inquiry,* 12**,** 2, 219-245.
FODEN, F. E. (1951) The National Certificate. *Journal of Vocational Education,* 3**,** 6, 38-46.
GIBBS, G. & SIMPSON, C. (2002) *How assessment influences student learning – a conceptual overview,* Centre for Higher Education Practice, Open University, SSRG 42/2002.
GIBBS, G. & SIMPSON, C. (2004-05) Conditions Under Which Assessment Supports Students' Learning. *Learning and Teaching in Higher Education***,** 1, 3-31.
GIPPS, C. (1990) *Assessment - A Teachers' guide to the issues,* Sevenoaks, Hodder and Stoughton Educational.
GIPPS, C. (1994a) Developments in Educational Assessment: what makes a good test? *Assessment in Education,* 1**,** 2, 283-291.
GIPPS, C. V. (1994b) *Beyond Testing: Towards a Theory of Educational Assessment* London, The Falmer Press.
GIPPS, G. R. (1999) *Using Assessment Strategically to Change the Way Students Learn*. IN BROWN, S. & GLASNER, A. (Eds.) *Assessment Matters in Higher Education - Choosing and Using Diverse Approaches.* London, Society for Research in Higher Education and Open University Press, 41-53.
GIPPS, G. R. (2007) *Analysing Qualitative Data,* London, SAGE Publications Ltd.
GLASER, R. (1963) Instructional technology and the measurement of learning outcomes: Some questions. *American Psychologist,* 18**,** 8, 519-521.
GLASER, R. (1990) Toward new models for assessment, . *International Journal of Educational Research,* 14**,** 5, 475–483.
GLASER, R. (1994) Instructional Technology and the Measurement of Learning Outcomes: Some Questions. *Educational Measurement: Issues and Practice,* 13**,** 4, 6-8.
GLASS, G. V. & SMITH, M. L. (1979) Meta-Analysis of Research on Class Size and Achievement. *Educational Evaluation and Policy Analysis,* 1**,** 1, 2-16.
GREEN, S. (2006) *Curriculum, Assessment and Pedagogy*. IN TOUGH, S. & REED, J. (Eds.) *Curriculum, Assessment and Pedagogy: Beyond the "standards agenda".* London, Institute for Public Policy Research (IPPR).
GUBA, E. G. (Ed.) (1990) *The Paradigms Dialog,* London, UK, Sage Publications.
GUBA, E. G. & LINCOLN, Y. S. (1994) *Competing Paradigms in Qualitative Research*. IN DENZIN, N. K. & LINCOLN, Y. S. (Eds.) *Handbook of qualitative research.* 2 ed. Thousand Oaks, CA, Sage Publications, 105-117.
GUSKEY, T. R. (1990) Cooperative Mastery Learning Strategies. *The Elementary School Journal,* 91**,** 1, 33-42.
HALLIDAY, J. S. (1981) TEC physics assessment. *Phys. Educ.,* 16**,** 3, 172-177
HARGREAVES, E. (2005) Assessment for learning? Thinking outside the (black) box. *Cambridge Journal of Education,* 35**,** 2, 213–224.
HARGREAVES, E. (2007) The validity of collaborative assessment for learning. *Assessment in Education,* 14**,** 2, 185-199.
HARLEN, W. (1994) Developing Public Understanding of Education: A Role for Educational Researchers. *British Educational Research Journal,* 20**,** 1, 3-16.

HARLEN, W. (2007) *Assessment of learning,* London, Sage Publications.
HARLEN, W., GIPPS, C., BROADFOOT, P. & NUTTALL, D. (1992) Assessment and the improvement of education. *The Curriculum Journal,* 3**,** 3, 215-230.
HARLEN, W. & JAMES, M. (1997) Assessment and learning: differences and relationships between formative and summative assessment. *Assessment in Education,* 4**,** 3, 365–379.
HASLEGRAVE, H. L. (1969) *Report of the Committee on Technician Courses and Examinations (The Haslegrave Report),* London, Department of Education and Science.
HASLEGRAVE, H. L. (1970) Dr HL Haslegrave on Haslegrave. *Industrial and Commercial Training,* 2**,** 1, 20-31.
HAYWARD, G., HODGSON, A., JOHNSON, J., KEEP, E., OANCEA, A., PRING, P., SPOURS, K. & WRIGHT, S. (2004) *Annual Report 2003-04 - The Nuffield Review of 14-19 Education and Training,* Oxford, University of Oxford Department of Educational Studies.
HODKINSON, P., ANDERSON, G., COLLEY, H., DAVIES, J., DIMENT, K., SCAIFE, T., TEDDER, M., WAHLBERG, M. & WHEELER, E. (2007) Learning Cultures in Further Education. *Educational Review,* 59**,** 4, 399-413.
HUDDLESTON, P. & UNWIN, L. (2002) *Teaching and Learning in Further Education, 2,* London, RoutledgeFalmer.
HUSEN, T. (2001) *Benjamin S. Bloom.* IN PALMER, J. A. (Ed.) *Fifty Modern Thinkers on Education: From Piaget to the Present.* Abingdon, England, Routledge, 86-90.
HYLAND, T. (1993) Competence, Knowledge and Education. *Journal of Philosophy of Education,* 27**,** 1, 57-68.
HYLAND, T. (1997) Reconsidering Competence. *Journal of Philosophy of Education,* 31**,** 3, 491-503.
HYMEL, G. M. (1993) Instructional Design Applications in the Teaching of Psychology., *101st, Annual Meeting of the American Psychological Association, Toronto, Ontario, Canada,,* August 20-25, 1993.
IMECHE (1961) *Historical Notes on National Certificate Exams; notes on National Certificate Scheme,* London, Institute of Mechanical Engineers.
JAHODA, M. (1963) *The Education of Technologists,* London, Tavistock Publications (1959) Ltd.
JAMES, D. & BIESTA, G. (Eds.) (2007) *Improving Learning Cultures in Further Education,* London, Routledge.
JAMES, K. & KNOTT, R. (1994) Examining the GNVQ assessment model or 'The old women who swallowed a fly'. *British Journal of Curriculum and Assessment,* 5**,** 1, 12-15 & 21.
JAMES, M. & PEDDER, D. (2006) Beyond method: assessment and learning practices and values. *The Curriculum Journal,* 17**,** 2, 109–138.
JESSUP, G. (1991) *Outcomes: NVQs and the Emerging Model of Education and Training,* London, The Falmer Press.
JESSUP, G. (1995a) Characteristics of the GNVQ Model. *British Journal of Curriculum Assessment,* 5**,** 3, 8-11 & 16.
JESSUP, G. (1995b) *The Outcomes Model.* IN BURKE, J. (Ed.) *Outcomes, Learning and the Curriculum.* London, The Falmer Press, 31-96.
JOUGHLIN, G. (1999) *Dimensions of Oral Assessment and Student Approaches to Learning.* IN BROWN, S. & GLASNER, A. (Eds.) *Assessment Matters in*

Higher Education - Choosing and Using Diverse Approaches. Buckingham, England, SRHE & Open University Press, 146-156.
KNIGHT, P. & YORKE, M. (2003) *Assessment, Learning and Employability,* Maidenhead, England, Open University Press.
KOEN, B. V. (2003) *Discussion of The Method,* New York, Oxford University Press.
LAMBERT, D. & LINES, D. (2000) *Understanding Assessment: Purposes, Perceptions, Practice,* London, England, RoutledgeFalmer.
LAVE, J. & WENGER, E. (1999) *Legitimate Peripheral Participation*. IN MURPHY, P. (Ed.) *Learning, Learners and Assessment.* London, Paul Chapman Publishing Ltd., 83-89.
LINDSAY, R. O. & PATON-SALTZBERG, R. (1987) Resource Changes and Academic Performance at an English Polytechnic. *Studies in Higher Education,* 12**,** 2, 213-227.
LINN, R. L. (1989) *Current Perspectives and Future Directions*. IN LINN, R. L. (Ed.) *Educational Measurement.* 3 ed., American Council on Education/MacMillan Series on Higher Education, 1-10.
LLOYD, C. (1953) Technical Education Today. *The Journal of Education,* 85**,** No. 1007, 269-270, 272.
LUMBY, J. & FOSKETT, N. (2005) *14-19 Education. Policy, Leadership and Learning,* London, Sage publications.
MACFARLANE, E. (1993) *Education 16-19 - In transition,* London, Routledge.
MARTIN, J. K. & MITCHELL, J. W. (2005) Experiences Combining Technology, Assessment and Feedback to Improve Student Learning in Mechanical Engineering Thermal Science Courses, *35th ASEE/IEEE Frontiers in Education Conference, Indianapolis, IN*, T2F-18 to T2F23.
MARZANO, R. J., GADDY, B. B. & DEAN, C. (2000) *What Works In Classroom Instruction*, Mid-continent Research for Education and Learning (McREL), www.mcrel.org [Accessed: 11th July 2011].
MASON, J. (2002) *Qualitative Researching,* London, England, SAGE.
MCDOWELL, L., WHITE, S. AND DAVIS, H. (2004) Changing assessment practice in engineering: how can understanding lecturer perspectives help? *European Journal of Engineering Education,* 29**,** 2, 173-181.
MCNEILL, P. (1990) *Research Methods, 2nd edition,* London, Routledge.
MEDAWAR, P. B. (1963) Is the Scientific Paper a Fraud? *The Listener,* 70, 377-378.
MELTON, R. (1996) Learning Outcomes for Higher Education: Some Key Issues. *British Journal of Educational Studies,* 44**,** 4, 409-425.
MICHAELS, S. & KIEREN, T. R. (1973) An Investigation of Open-Book and Closed-Book Examinations in Mathematics. *The Alberta Journal of Educational Research,* XIX**,** 3, 202-207.
MILES, M. B. & HUBERMAN, M. (1994) *Qualitative Data Analysis: An Expanded Sourcebook, 2nd edition,* London, SAGE Publications.
MINISTRY OF EDUCATION (1961) *Better Opportunities in Technical Education: Cwnd 1254*, London, Her Majesty's Stationery Office.
MOOR, C., DEAN, A. & ANDREWS, S. (1983) *TEC Programmes Evaluated: student progress and employer perceptions,* Windsor, England, NFER-Nelson.
MORGAN, D. L. (2007) Paradigms Lost and Pragmatism Regained - Methodological Implications of Combining Qualitative and Quantitative Methods. *Journal of Mixed Methods Research,* 1**,** 1, 48-76.
NEESOM, A. (2000) *Report on Teachers' Perception of Formative Assessment*, London, Qualifications and Curriculum Authority.

NEWTON, P. (1997) Examining standards over time, http://www.informaworld.com/smpp/title~content=t713707783 [Accessed: 27th March 2009].
NEWTON, P. E. (2007) Clarifying the purposes of educational assessment. *Assessment in Education: Principles, Policy & Practice,* 14**,** 2, 149-170.
PAGE, E. B. (1958) Teacher comments and student performance: a seventy-four classroom experiment in school motivation. *The Journal of Educational Psychology,* 49**,** 4, 173-181.
PARSONS, R. H. (1947) *A History of the Institution of Mechanical Engineers 1847 - 1947,* London, Institution of Mechanical Engineers.
PLATT, J. (1981) On Interviewing One's Peers. *The British Journal of Sociology,* 32**,** 1, 75-91.
POLLOCK, H. N. (2003) *Uncertain Science ...Uncertain World,* Cambridge, Cambridge University Press.
POPE, R. (1998) *The British Economy Since 1914: A Study in Decline,* London, Addison Wesley Longman Ltd.
POPHAM, W. J. (1994) The Instructional Consequences of Criterion-Reference Clarity. *Educational Measurement: Issues and Practice,* 13**,** 4, 15-18, 30.
POPHAM, W. J. & HUSEK, T. R. (1971) *Implications of Criterion-Referenced Measurement.* IN POPHAM, W. J. (Ed.) *Criterion-Referenced Measurement.* New Jersey, Educational Technology Publications, Inc., 17-37.
PRICE, M. (2005) Assessment standards: the role of communities of practice and the scholarship of assessment. *Assessment & Evaluation in Higher Education,* 30**,** 3, 215–230.
PRING, R. (2004) *Philosophy of Educational Research, 2nd edition,* London, Continuum.
PRING, R., HAYWARD, G., HODGSON, A., JOHNSON, J., KEEP, E., OANCEA, A., REES, G., SPOURS, K. & WILDE, S. (2009) *Education for All: The Future of Education and Training for 14-19 year olds,* London, Routledge.
PRYOR, P. & CROSSOUARD, B. (2005) A Sociocultural Theorization of Formative Assessment, *Sociocultural Theory in Educational - Research and Practice Conference, University of Manchester,* 8th & 9th September 2005, 1-14.
QAA (2006) *Section 6: Assessment of students - September 2006,* Glouster, The Quality Assurance Agency for Higher Education, QAA119 08/2006.
QCA (2005) *Comparability study of assessment practice - BTEC National qualifications in business, engineering and media,* London, Qualifications and Curriculum Authority QCA/05/1681.
RAGGATT, P. & WILLIAMS, S. (1999) *Government, Vocational Markets and Qualifications: An Anatomy of Policy,* London, Falmer Press Ltd.
RAMAPRASAD, A. (1983) On the definition of feedback. *Behavioral Science,* 28**,** 1, 4-13.
RAMSDEN, P. (1992) *Learning to Teach in Higher Education,* London, Routledge.
RAMSDEN, P. (2005) *The Context of Learning in Academic Departments*. IN MARTON, F., HOUNSELL, D. & ENTWISTLE, N. (Eds.) *The Experience of Learning: Implications for Teaching and Studying in Higher Education.* 3rd (Internet) ed. Edinburgh, University of Edinburgh, Centre for Teaching, Learning and Assessment, 198-216.
ROOS, B. & HAMILTON, D. (2005) Formative and Summative Assessment: A cybernetic viewpoint. *Assessment in Education,* 12**,** 1, 7–20.

ROSELLI, R. J. & BROPHY, S. P. (2006) Experiences with Formative Assessment in Engineering Classrooms. *Journal of Engineering Education,* 95**,** 4, 325-334.
ROWNTREE, D. (1977) *Assessing Students - How shall we know them?,* London, Harper & Row Ltd.
SADLER, D. R. (1998) Formative Assessment: revisiting the territory. *Assessment in Education,* 5**,** 1, 77-84.
SADLER, D. R. (2005) Interpretations of criteria-based assessment and grading in higher education. *Assessment & Evaluation in Higher Education,* 30**,** 2, 175-194.
SADLER, R. (1989) Formative assessment and the design of instructional systems. *Instructional Science,* 18**,** 2, 119-144.
SCOTT, D., BROWN, A., LUNT, I. & THRONE, L. (2004) *Professional Doctorates - Integrating Professional and Academic Knowledge,* Berkshire, Open University Press.
SCRIVEN, M. (1967) *The Methodology of Evaluation*. IN TYLER, R., GAGNE, R., SCRIVEN, M. (Ed.) *Perspectives on Curriculum Evaluation (AERA Monograph Series – Curriculum Evaluation).* Chicago, Rand McNally and Co, 39-83.
SEMTA (2010) Apprenticeships and Advanced Apprenticeships in Engineering, http://www.semta.org.uk/training_providers__awarding/apprenticeship_frameworks.aspx [Accessed: Oct 2011].
SHARP, P. (1998) The Beginnings of GNVQs: an analysis of key determining events and factors. *Journal of Education and Work,* 11**,** 3, 293-311.
SLAVIN, R. E. (1987) Mastery Learning Reconsidered. *Review of Educational Research,* 57**,** 2, 175-213.
SMITHERS, A. (1993) All Our Futures: Britain's Education Revolution. A Dispatches Report on Education. *Dispatches.* England, United Kingdom, Channel 4/Broadcasting Support Services, P.O. Box 4000, London W3 6XJ, .
SMITHERS, A. & ROBINSON, P. (2000) *Introduction: The Making of a New Sector*. IN SMITHERS, A. & P., R. (Eds.) *Further Education Re-formed.* London, Falmer Press, 1-12.
SNYDER, B. R. (1971) *The Hidden Curriculum,* New York, Alfred A. Knopf Inc.
SOPHWORT-ON-SEA COLLEGE (2008) *Annual Report 2007/2008*.
SOUNDWELL TECHNICAL COLLEGE (1980) T.E.C. Students Code of Conduct. Bristol.
SRA (2003) Ethical Guidelines, http://www.the-sra.org.uk/documents/pdfs/ethics03.pdf [Accessed: August 2006].
STAKE, R. (2004) *Standards-Based & Responsive Evaluation,* London, England, Sage Publications.
STASZ, C., HAYWARD, G., OH, S.-A. & WRIGHT, S. (2004) *Outcomes and processes in vocational learning - A review of the literature,* London, Learning and Skills Research Centre.
STASZ, C. & WRIGHT, S. (2004) *Emerging policy for vocational learning in England - Will it lead to a better system?,* London, Learning and Skills Research Centre.
STOBART, G. (2006) EDITORIAL: Influencing classroom assessment. *Assessment in Education,* 13**,** 3, 235–238.
SUTHERLAND, R. & POZZI, S. (1995) *The Changing Mathematical Background of Undergraduate Engineers: A Review of the Issues,* London, Engineering Council.

TARAS, M. (2005) Assessment – Summative and Formative – Some Theoretical Reflections. *British Journal of Educational Studies,* 53**,** 4, 466–478.
TARAS, M. (2007) Assessment for learning: understanding theory to improve practice. *Journal of Further and Higher Education,* 31**,** 4, 363–371.
TARAS, M. (2008) Summative and formative assessment - Perceptions and realities. *Active Learning in Higher Education,* 9**,** 2, 172-192.
TEC (1983) *TEC Record of Success,* London, Technician Education Council.
TGAT (1988) *Task Group on Assessment and Testing: a report,* London, DES.
TIERNEY, R. D. (2006) Changing practices: influences on classroom assessment. *Assessment in Education,* 13**,** 3, 239–264.
TONSO, K. L. (1996) The Impact of Cultural Norms on Women. *Journal of Engineering Education,* 85**,** 3, 217-225.
TORRANCE, H. (1993) Formative Assessment: some theoretical problems and empirical questions. *Cambridge Journal of Education,* 23**,** 3, 333-343.
TORRANCE, H. (2007) Assessment *as* learning? How the use of explicit learning objectives, assessment criteria and feedback in post-secondary education and training can come to dominate learning. *Assessment in Education,* 14**,** 3, 281-294.
TORRANCE, H., COLLEY, H., GARRATT, D., JARVIS, J., PIPER, H., ECCLESTONE, K. & JAMES, D. (2005) *The impact of different modes of assessment on achievement and progress in the learning and skills sector (London, LSDA for the LSRC).* London, The Learning and Skills Research Centre.
TORRANCE, H. & PRYOR, J. (1998) *Investigating Formative Assessment: teaching, learning and assessment in the classroom* Buckingham, London, Open University.
TOWNEND, M. S. (2001) Integrating Case Studies in Engineering mathematics: a response to SARTOR 3. *Teaching in Higher Education,* 6**,** 2, 203-215.
TYLER, R. (1967) *Changing Concepts of Educational Evaluation*. IN TYLER, R., GAGNE, R., SCRIVEN, M. (Ed.) *Perspectives on Curriculum Evaluation (AERA Monograph Series – Curriculum Evaluation).* Chicago, Rand McNally and Co, 13-18.
TYSOME, T. (1995) BTEC diploma phaseout halted. *TES.*
UCAS (2011) BTEC QCF Qualifications (suite known as Nationals), http://www.ucas.ac.uk/students/ucas_tariff/factsheet/btecqcf [Accessed: 4th May 2011].
WATSON, A. (2006) Some difficulties in informal assessment in mathematics. *Assessment in Education,* 13**,** 3, 289–303.
WEISER, M. (1999) The spirit of the engineering quest. *Technology in Society,* Vol. 21, 355-361.
WELLINGTON, J. (2000) *Educational Researcher - Contemporary Issues and Practical Approaches,* London, Continuum.
WELLINGTON, J., BATHMAKER, A.-M., HUNT, C., MCCULLOCH, G. & SIKES, P. (2005) *Succeeding with your Doctorate,* London, SAGE Publications Ltd.
WENGER, E. (2006) Communities of Practice: A Brief Introduction, http://www.ewenger.com/theory/ [Accessed: 11th Feb 2011].
WILIAM, D. (1992) Some technical issues in assessment: a user's guide *British Journal of Curriculum and Assessment,* 2**,** 3, 11-20.
WILIAM, D. (2001) What is wrong with our educational assessments and what can be done about it? *Education Review,* 15**,** 1, 57-62.

WOLCOTT, H. F. (1999) *Ethnography - A Way of Seeing*, Walnut Creek, AltaMira Press.

WOLF, A. (1990) *Unwrapping knowledge and understanding from standards of competence*. IN BLACK, H. & WOLF, A. (Eds.) *Knowledge and Competence: Current Issues in Training and Education.* Sheffield, Careers and Occupational Information Centre, 31-38.

WOLF, A. (1993) *Assessment Issues and Problems in a Criterion-Based System*, London, Further Education Unit.

WOLF, A. (1994) *Failures and Reform in Mathematics Education: The Case of Engineering. National Institute Briefing Note No. 5*, London (England), National Institute of Economic and Social Research.

WOLF, A. (1995) *Competence-Based Assessment, The first*, Buckingham, Open University Press.

WOLF, A. (1997) *GNVQs 1993-7: A National Survey Report. The final report of a joint project: The Evolution of GNVQs: Enrolment and delivery patterns and their policy implications.*, London, Further Education Development Agency and The Nuffield Foundation.

WOLF, A. (2002) *Does education matter?*, London, England, Penguin Books.

WOLF, A. (2011) *Review of Vocational Education – The Wolf Report*, London, Department for Education.

WOOD, R. (1986) *The agenda for educational assessment*. IN NUTTALL, D. (Ed.) *Assessing Educational Achievement.* London, Falmer Press, 185-203.

YATES, J. & HALL, J. (1988) *The National Certificate: An Example of Modular-based Criterion-referenced Assessment in Practice*. IN BLACK, H. D. & DOCKRELL, W. B. (Eds.) *New Developments in Educational Assessment.* Edinburgh, Scottish Academic Press, 67-82.

YORKE, M. (2003) Formative Assessment in Higher Education: Moves Towards Theory and the Enhancement of Pedagogic Practice. *Higher Education*, 45**,** 4, 477-501.

YORKE, M. (2011) Summative assessment: dealing with the 'measurement fallacy'. *Studies in Higher Education*, 36**,** 3, 251-273.

INDEX

APPENDICES

Appendix A

My academic and vocational background

I left school in 1978 at the age of nearly seventeen, being one of those pupils that could not wait to 'escape' the rigour and ritual of comprehensive secondary school education. That said, at my careers interview a few weeks prior to leaving, the emphasis was on the benefits of 'staying on' for 6th form study and it was made clear to me by the female Careers Officer that this had been 'expected' of me, and indeed that I was 'underselling myself' by applying for the engineering jobs that I had. There was an element of truth in her comments, as at one job interview I was asked to sit a short test in which one question stated, *"Which of the following three shapes [a circle, square and triangle were drawn] is a triangle?"* I remember thinking that this could be a trick question, and very nearly gave up on this question!

I left school in an era when few people, in my eyes, 'stayed-on' at school and most sought jobs and boys in particular, strove to obtain apprenticeships. This perception was coupled with the fact that with the exception of one female cousin who attended teacher-training college, no one in my family had ever studied sixth form at school. Most of the male members had sought trade apprenticeships (left school at fifteen), and most of the females did not work. I actually wanted to join my dad and become a 'sheet-metal worker' and have a 'trade' for the rest of my working life, and was taken aback when he said he did not want me to work with him; only providing me with an application form after I already had a series of job offers!

After sitting an induction test and attending two interviews, I was offered employment with Newman Electric Motors of Yate near Bristol as an Apprentice Draughtsman (i.e. as a technician). I still remember the Chief Draughtsman asking me the questions, *"What does BSW stand for?"* and *"What does A/F mean?"* to which I responded correctly and to which he retorted, *"So you know a bit about engineering then?"* Even though his compliment was facetious for the 70s, it is unlikely that many if any, modern-day students entering college engineering programmes could correctly answer these questions due to a general lack of exposure to engineering at school.

This four-year apprenticeship involved day release study of a technician course at college. I remember the very first day of employment, sat in the rather plush surroundings of the company's social club where the Training Officer was informally reviewing the three technician apprentices' expected O-level qualifications. The electrical technician, having studied at Bristol Grammar School, was expected to achieve nine O-levels; the Mechanical Technician from a comprehensive school was expecting eight O-levels, and then he turned his attention to me and asked what I was expecting. I have to say I was feeling quite academically inferior at this stage and so replied in a positive fashion, "Seven O-levels". After shuffling his paper work, the Training Officer commented, "I think you mean six O-levels as you are taking a CSE in English?" I felt that my inferiority had been confirmed as the Training Officer's paper work was correct, and the fact that I was expected to achieve a Grade 1 in my CSE (equivalent to a Grade C at O-Level) paled into insignificance. This was my first experience of how professional life could really surprise me as two months later, the week before we were due to commence our year 'off-the-job' training at college, we were back in the same social club in almost identical seating arrangements and the same Training Officer was reviewing our now 'known' O-level results. To my total surprise, the ex-Grammar School apprentice had failed all his examinations and was downgraded to a Craft Apprenticeship to the obvious disgust of the Training Officer. The Mechanical Technician apprentice had achieved four of his eight O-levels, the minimum requirement for a technician apprentice, and when I was asked the question, I replied, "Five B grades and one C grade at O-Level….and a CSE Grade 1 in English", to which the Training Officer said, "Well, we will call that seven O-levels for the record!" Therefore, in the space of two-months I progressed from being the least qualified technician, in an academic sense, to the most qualified.

We were sent to Soundwell Technical College for what was then termed 'off-the-job' training; essentially to learn basic fitting, machining, fabrication and electrical skills for four days of the week, with the other day involving academic study at the main College location. I was not very confident at the practical work but seemed to excel at the theoretical side and indeed would spend every evening and most of my weekends studying. I only allowed myself Saturday afternoon to go out with my long-time school friend who was also an apprentice.

It was during this off-the-job training that the seed was planted in me to one day seek a position as a lecturer. People often comment that they know where they were when the likes of J. F. Kennedy died or when Princess Diana had her fatal accident, but I know exactly when and where I was when the thought of becoming a lecturer became an aspiration. It was in 1978 whilst I was on the 'bench fitting section' during my off-the-job training period. I was bordering on the inept with regards to my practical skills and several of the off-the-job instructors appeared to think I had two left feet so to speak in a workshop context, and seemed to have admitted defeat over improving my proficiency for all things practical. Mr Pitt, one of the instructors, initially also saw me as a hapless student and perhaps an unknown quantity, but after a few weeks I felt he warmed to me and would often visit my fitting bench for a brief chat or to help me keep on the straight and narrow with my hack-sawing exploits. Although I found the practical work difficult, I liked the idea that everything we made formed part of a toolbox that we could eventually take home and I remember saying to him how satisfying this was that almost each week I had made an addition to my toolkit. I recall suggesting to him how little satisfaction he seemed to experience in his teaching job on a weekly basis. He replied that, although there was satisfaction 'off-and-on' throughout the year, his main job satisfaction related to his students passing end-of-year exams and progressing to the next year of study or completing their apprenticeship; *"What satisfaction that is!"* he exclaimed. For some reason that still eludes me, this was the point at which I really felt that I wanted to as aspire to be an engineering lecturer – a clichéd statement perhaps, but that is essentially why I am where I am now.

From that day, I decided to endeavour to keep my college notes in pristine condition and always revisited them every week to ensure they were as legible as possible as I felt I would be able to use them as a reference source when I became an 'Engineering Lecturer'. In truth, I have never used them extensively, but they are still carefully filed and always accessible in a study cupboard to this day. One other trait that I noted about myself at this time was espoused by another instructor who certainly did not consider me competent at practical work. He was a supervisor of a design-make project that a fellow Newman Apprentice and I were involved with undertaking. As I was the Apprentice Draughtsman, I felt obliged to produce all the engineering drawings for the design, which I did. In the final report to the employer, this supervisor made reference to the high quality of the drawings presented (page 212), and on one occasion

commented to the Company Training Officier that I was an 'extremely self-motivated' individual. Indeed, in 1980, I was awarded the Newman Apprentice of the year trophy for my efforts in my first few years of my apprenticeship; an award I was informed, usually bestowed on final year apprentices (see page 214). So the seed that was sown in 1978 has been propagated by a self-determination to achieve an aspiration that has led me to the environment in which I currently reside…but am I there for all the right reasons?

Although I left school as soon as possible, my motivation for this was primarily fuelled by a lack of affinity for the school environment, and a family and friends culture that said 'get a trade' and thus a 'career for life'. On reflection, I did enjoy the learning and studying aspect of school and that trait has never left me to this day. Having lost the distracting influences of 'girls' and my best friend from school, I really took my male-dominated vocational education seriously. I was actually disappointed to find that I was studying the 'new ONC', called TEC as in 1978 Soundwell Technical College had stopped intake on the 'old ONC', which was being phased out across the country. Although the TEC was deemed 'equivalent' to the traditional course, it was apparent to me even at that early stage of my studies, that it did not have the same status as the previous course. Partly, it appeared, because it had a change in name that was not recognised by industry (the ONC and HNC dated back to the 1930s at least), and partly because the continuous assessment ethos, a radical change to the previous course, was viewed by some in the engineering fraternity as a 'lowering of standards'.

My recollections of the initial year of college study, relate to a first Mechanical Science test (Level II) sat after about two months of study. All the questions seemed to be the same as we had worked through in the lessons or had been given on a homework sheet, and in which I scored 92%. The second test in this subject was termed an 'open-book' test where we could access our notes to assist with answering the questions. I personally felt that this was 'cheating' and although I did take my folder of notes into the test, it remained closed in front of me for the duration of the test. Open-book tests did not seem an appropriate assessment method based on my O-level exam background. Perhaps I considered it 'dumbing-down', but that phrase did not seem to have been invented at that time. My progress through the TEC course was successful, achieving merit grades in almost all units studied (see page 213), from where the

natural progression for most apprentices seemed to be onto the HNC programme (then termed HC, see page 215).

I was very lucky that as an apprentice draughtsman, the Chief Mechanical Designer was responsible for my work-based training and he ensured I visited all aspects of the company's manufacturing facilities and thus saw the relevance of college-based theory in the mechanical design of the electric motors. This provided relevance and interest in mechanical and structural design calculations, and developed an ethos in me, that it was good to learn at college on the Monday, and apply in the workplace on the Tuesday – this remains the essence of vocational education to me.

I completed my apprenticeship in 1982 and I was now a qualified technician, but considered myself 'academically hollow'. I felt that my qualification was seen by some senior engineers whom I greatly respected, as second class to that of the traditional ONC and HNC. Indeed, at a job interview in 1982, I found the interviewer (an Engineering Manager) had no idea what a TEC qualification entailed and we even had a lengthy debate about whether TEC stood for 'Technician Education Council' or 'Technician Education Certificate' (at that time I did not know)!

I was successful in my job application and commenced work as a 'Junior Design Draughtsman' with Jordan Engineering, a predominantly structural design organisation. I informed the manager at the interview that I was 'very keen' to study the four year part-time Mechanical Engineering degree at Bristol Polytechnic, although at the time of the interview. I was not deemed eligible due to a conflict between my technician studies and the entry requirements of the degree programme, i.e. I had not studied any thermodynamics. However, due to seemingly a lack of applicants for the degree programme that year, I was offered a place in September 1982. The company agreed to release me for a day a week, providing I funded all course costs and both lost a day's pay and a week's annual holiday entitlement. I agreed to all conditions that the company could throw at me, and commenced my four years' study. My father thought this a disastrous decision, and that at my age (nearly 21 now), I should not be spending my evenings shut in my bedroom working; as I overheard him once commenting to my mother, *"He should be going out, not stuck up there studying…..I learned more at the back row of the cinema with you than I ever did in any college classroom!"*

Apart from my lack of self-confidence as I commenced the degree study, the main difficultly in transition from technician study to undergraduate study was in the use of algebra. I recall on technician study we had algebraic proofs set as test questions, but often these could be avoided and questions requiring purely numerical solutions could be attempted instead. On the degree course, I realised after the first few weeks that my algebra skills were hampering my progress and for a two-week period decided to undertake every calculation using letters and not numbers. I remember this being a truly taxing time but after those weeks, found that I preferred using letters in place of numbers wherever possible, and that preference prevails to this day. Although the assessment regimes between the technician study and the degree study were different, I do not remember any significant problem in this regard. In essence, although we were continually assessed on the technician course with term-based phase tests, we still had end-of-year exams to revise for; although there was less emphasis placed on the results of this assessment. Progression within the degree programme was based almost entirely on the end-exam marks attained.

For the next four years, I remained employed with the same company, and for the first two years completely dedicated myself to my degree studies, only socialising on a Sunday when playing squash. During my third year of study, I met my future wife and lost a little focus on my studies, but still managed to graduate with a Commended BSc in 1986. The whole essence of the degree was to provide a route to Institute Membership and in 1982 the academic requirements was a BSc in Mechanical Engineering. However, by the time I graduated in 1986, this had a changed to a BEng degree, which was highly infuriating. After studying a short additional programme of work, my degree was ultimately accredited by the Institute of Mechanical Engineering and I joined the Institute as an Associate Member (a proud moment).

During my degree studies, I developed a great interest in stress analysis, particularly relating to aircraft structures, partly influenced by the course subject matter and partly influenced by the lecturers who would tell stories of their practical experiences from industry. I noted that the lecturers I respected most, and lectures I found most stimulating, pertained to former practitioners of industry, and that if I wanted to be a lecturer, it was to be the ‘former practitioner’ platform on which I preferred to stand.

After completing my degree, I finally made the breakthrough into the 'Stress Office' that I had been seeking for many years. This was through a contract agency in Bristol where I was involved with the computer modelling of jet engines. However, it was aircraft structural analysis that interested me the most and I finally moved to British Aerospace at Filton, Bristol after almost four years of sending letters relating to employment opportunities. I viewed stress analysis of aircraft structures as the ultimate forum in which I could literally apply a significant quantity of knowledge that I had accumulated over the past eight years or so of study – and applying what I had learnt was important to me.

In 1987, I contacted several Bristol academic establishments (see pages 217 and 218) in an attempt to obtain a part-time lecturing position and indeed had an interview at Filton Technical College. I felt that at this stage of my career I would like to commence my teaching career whilst still gaining that engineering knowledge and experience that I hoped would underpin my future-lecturing persona. The interview was unsuccessful as I specifically wanted to teach stress analysis and there was no requirement for such specialism at the college. I was informed that if I wanted to teach mathematics there would be a greater opening although I would need a teaching certificate before being considered eligible for such a position. Having absolutely no interest in gaining a teaching qualification at that time, I left my lecturing aspirations on the back burner… where they were to languish lukewarm for another decade, albeit unbeknown to me at that time.

During 1986 and 1989, I focused more so on personal relationships and became married and moved to Sophwort-on-Sea to take up employment as a Stress Engineer with a subsidiary of Short Brothers in 1989. I had replaced my formal studies with the development of an array of stress analysis software that I was developing and this self-imposed project spanned 1988 to effectively 1998 as almost a hobby. The software was used by me and a few other colleagues for design purposes throughout this period. Around 1991 Shorts were beginning to sponsor employees to study for MSc qualifications in manufacturing technology through Warwick University. I was interested in MSc study, but not manufacturing and not through Warwick. In addition, I was working for a subsidiary, not the parent company, so financing arrangements and enrolment opportunities were limited. Again, looking towards a possible future career

in academia, I realised the need for a higher academic qualification if I was ever likely to enter the engineering lecturing fraternity; thus, I felt compelled to study an MSc. Initially I applied to the Open University (OU), but they were concerned that only having a 'pass' grade degree, I was not prepared for MSc study with them, and stated I would need to undertake one of their third level half-unit engineering qualifications. Dependent on the outcome of this study, they would then decide if I could enrol on a Masters programme. During 1992, I studied the OU course, Failure of Stressed Materials T351, essentially a Fracture Mechanics course. Once again, I felt the Gods were smiling me as the month I enrolled on this course I was given a fracture mechanics work package, and thus I had returned to what I deemed the essence of vocational education, namely learning on the Monday and applying on the Tuesday! After seven assignments and sitting a three-hour end-of-year exam, ironically at the college where I now work, I achieved a distinction grade averaging 90% over all assessments. Also about this time, I also became a Chartered Engineer (CEng) with the Institute of Mechanical building on Student Membership in 1982 and Associate Member status in 1986. This was a very proud professional moment and the CEng Certificate still takes pride of place on the wall of my study – I was a 'Professional Engineer'!

After contact with UWE about their newly advertised Integrated Graduate Development Scheme (IGDS) programme, in September 1992 I enrolled on their MSc Aerospace Technology operated through a consortium of universities including Bristol, Bath and UWE. This course was aimed at managers and senior engineers within the aerospace industry and had the industrial backing of Rolls Royce and British Aerospace. I was granted permission to study this course, providing I incurred all flight costs to and from the island; accommodation costs and took my annual holiday entitlement to study the five weeklong modules that had to be attended per year. Again, what primarily appealed to me was the fact that the majority of module work (twelve of them), and the final year thesis, had to be based around professional practice and thus provided for industrial relevance – which I found highly motivating. This course forced me to expand my knowledge-base beyond purely science and technology-based subject matter, and expanded my rather specialised academic horizons. I also surprised myself that some of the higher module scores I achieved

were in the 'softer' units of study. In 1996, I graduated with an MSc (Distinction) in Total Technology award by UWE.

My aspiration to move into lecturing was still strong and I made applications to the Sophwort-on-Sea College in both January and August of 1996 for a position. In September 1997, I obtained a part-time lecturing position with the College and commenced teaching of a Level II Engineering Science unit, which had content similar to that I had studied in 1978. The group was small, five or so students, most uninterested in the subject matter and all struggled with the mathematics content. After three weeks, I became aware of the sheer lack of ability in the most elementary use of algebraic transposition, something that essentially remains a problem to this day. During 1997, I commenced the T730/7 teacher training course, ten years after I was told it was a requirement by Filton Technical College, but now I felt self-confident enough to tackle my first 'non-engineering' qualification and enjoyed the contact with fellow students teaching such diverse subjects as bagpipe playing, yoga and hospitality. The course was timetabled for a Wednesday afternoon so I again had to use my holiday entitlement to attend the classes directly from work. I remember several of my fellow students commenting that 'I did not look like an engineer'; no 'boiler suit, oily rag and spanner' I guess? The following year a fulltime position in the engineering department arose, and this coincided with my then employer's future seeming uncertain, so I applied for the position and was successful. Thus, in September 1998, almost twenty years after Mr Pitt planted the seed of the lecturing profession in me, I had achieved my aspiration – I was an Engineering Lecturer!

I was slightly concerned on leaving my engineering employment as two separate, very senior engineers, commented that I was the sort of person that required significant mental stimulation and that I might not find the stimulation I had enjoyed within the analytically orientated Stress Office environment, in a College environment. Indeed the reason I was interested in the College position at this time was predominantly due to the requirement of the successful applicant to teach on the CEng and BEng programmes currently offered – stimulation enough I thought?

The first year was difficult, as I had to teach the CEng Mechanics of Solids to three mature students, one a College Lecturer and one a former industrial colleague, which

made me very apprehensive. Only the Lecturer sat the formal external 'traditional' examination and passed with a grade C. During this year, I completed my T730/7 and studied my PGCE in the following year, being presented with a C&G Medal of Excellence award in 2000. In my second year at College, I taught the Solid Mechanics and Mechanics of Machines first year degree for Liverpool University to two students; both passed this subject. In both these cases I could share in Mr Pitts 'What satisfaction!' expression, as I felt I had worked at a high level of academic study and saw students progress to higher level work. However, I seemed to put the 'kiss of death' onto all programmes in which I was involved, as both the CEng and BEng courses were effectively terminated by my third year at the College due to lack of student intake, and so I taught predominantly HNC work. Again, due to a few poor years of recruitment, even HNC courses became sparse and I found myself teaching mostly National units and some First Diploma units. I struggled with this low-level academic work and with the lack of interest and discipline exhibited by some students. In around 2002, lacking any significant academic stimulation, I was ready to hang up my lecturing hat as I became disillusioned with a profession I had longed to enter. It was then that I realised I had never been there for the students as I was not experiencing the Mr Pitt form 'satisfaction'; I realised it was the engineering subject matter all along that had driven me and if anything, the students were hampering my enjoyment of it. On seeking a return to industry a senior engineering manager commented, "Your problem Alan, is that few people find Newton's Laws of Motion as interesting as you do…and you cannot understand why!" I remember saying to myself after having a First Diploma group that 'I did not come to this profession to teach times-tables!". In truth, I am selfish. I do what I do for the challenge and to stimulate myself, I have no real interest in the students per se (shocking to hear myself admit), but hope they will find interest and fulfilment by being associated with my enjoyment and enthusiasm for a subject matter that on occasions, I myself still have difficulty in applying – and that is the enduring challenge of engineering to me. Indeed every year since commencing my academic career, I have returned to my former industrial employer during two-weeks of my annual holiday entitlement. Over recent years, I have now been able to include this as part of my CPD. Initially I returned, as I wanted to ensure I kept in contact with former colleagues, but over time, my intentions have been to obtain articles and illustrations to use within my classroom delivery and to update my knowledge of Stress Office practice, which has changed significantly over the past ten years. These bi-

annual visits also help to ensure that I do not ever forget my roots, back in the 'real world', observing problems Stress Engineers continually embrace and are required to surmount, soon places my feet firmly back on terra-firma!

So why am I still at the College after nearly ten years? Well during my 'annus horibilus', my line manager asked me to stay; a compliment not often bestowed on me; and after a shuffling of timetables, I had less contact with the lower-level students. I also requested to study the UWE EdD programme and both faculty and line management agreed to fund the course as long as I covered flight and accommodation costs. Therefore, my academic stimulation is once again satisfied (for the time being) and I am studying a programme that has enthused, engauged and exacerbated me in equal measures from a variety of perspectives, predominantly due to my lack of educational background both in an academic and professional sense. Since commencing the EdD I have been showered with comments from all quarters about why, 'as an engineer' I would want to study such a programme, and 'Why I did not stay with my engineering discipline?' Well why should an engineer not want to study an educational programme – it's not a sin or betrayal of one's professional discipline? I have surprised myself by the dedication and the enthusiasm I seem to generate for the course, despite having to re-submit the first two EdD assessments! I guess some thirty-years on; I am still 'self-motivated'?

Personally, I still feel somewhat inadequate in my job, due to my specialised engineering background and my selfish, lacklustre interest in students' progression. I do not feel I have completed the transition from Engineer to Lecturer and that I am still an 'Engineer lecturing' rather than an 'Engineering Lecturer'. I am still mentally grappling with the concept of vocational education and where and how I fit within it. By studying the EdD programme and having contact with other educational practitioners and eminent educational academics, I hope to complete the transition and at last feel at home in an environment where my professional engineering aspirations are commensurate with my responsibilities to my students. Perhaps then, I will experience the satisfaction and fulfilment that the lecturing profession should yield, and for which I seem to have waited so long.

[Written by Alan Carter, December 2007]

Supporting evidence of my academic and vocational background

Report from College 'Off-the job' Training - Sept 1978 to July 1979

Tutors assessment

TUTORS ASSESSMENT. T.E.C. 2.

PROJECT 2.

Students:- M. HARSE.) CAM CHECKING DEVICE
A. CARTER.) (DISPLACEMENT).

Visual Aid for checking various types of Cam.
Specification:-

(a) Minimum Cam Radius 20 mm

(b) Maximum Rise and fall of Cam 10 M/M

(c) Cam face graduated for every 30° of movement (or alternative method)

(d) Produce displacement diagram for every 30° of movement for 360°

(e) Type of Follower - flat (optional)

Design, make working drawings and complete the manufacture of a device suitable for this purpose.

-*-*-*-*-*-*-*-*-*-*-*-*-

INTEREST:- Both students settled down to the work in hand with a tremendous enthusiasm. This project was probably the most difficult to undertake of the three under my supervision. (J.Harris).

DESIGN:- The students initially started on a very complex design involving electrical motors etc. and at this stage they needed guidance as they seemed to be working along impractical engineering principles. Base-well designed - good location for uprights. Tie bars well thought out (stepped at either end so uprights remained parallel.) Gearing was thought to be a better idea than pulleys. Back of gear dimpled every 30° for precise movement.

DRAWINGS:- All the drawings were completed by Alan Carter to keep some form of uniformity with lettering and dimensions etc. The standard of the drawings were far above average for any of the three groups under my supervision. (J.Harris). Very good lines, clear outlines of components and well dimensioned.

MANUFACTURE:- Manufacture took a little more time than actually planned for, this was due to the fact that elements of the design were changed as manufacture progressed. Some distortion of the plastic side panels was evident especially after clamping had taken place. Matthew Harse did most of the machining, of which the result was very satisfactory.

GENERAL COMMENT:- A good project which required a great deal of thought. A guard for the gears was due to be manufactured from a safety aspect but unfortunately time ran out and the guard will have to be made at a later date. Alan and Matthew worked very hard on this project and I think the end result is a credit to them, well done Matthew and Alan.

Soundwell Technical College.,
Kingswood Division.
July 1979.

Supporting evidence of my academic and vocational background (continued)

Technician Education Certificate – July 1980

(ONC equivalent qualification)

TECHNICIAN EDUCATION COUNCIL CERTIFICATE

in GENERAL ENGINEERING

awarded to ALAN CARTER

who studied AT SOUNDWELL TECHNICAL COLLEGE, BRISTOL

The programme comprised the following

UNIT	LEVEL	GRADE
MATHEMATICS	I	EXEMPT
ENGINEERING SCIENCE	I	EXEMPT
ENGINEERING DRAWING	I	EXEMPT
ENGINEERING TECHNOLOGY	I	EXEMPT
ENGINEERING COMMUNICATIONS (HALF UNIT)	I	EXEMPT
MATHEMATICS (1) (HALF UNIT)	II	MERIT
ENGINEERING SCIENCE (1) (HALF UNIT)	II	MERIT
ENGINEERING DRAWING	II	MERIT
ENGINEERING TECHNOLOGY	II	PASS
ENGINEERING COMMUNICATIONS (HALF UNIT)	II	MERIT
MATHEMATICS (2) B (HALF UNIT)	II	MERIT
ENGINEERING SCIENCE (2) A (HALF UNIT)	II	MERIT
GENERAL AND COMMUNICATION STUDIES A (HALF UNIT)	-	EXEMPT
GENERAL AND COMMUNICATION STUDIES B (HALF UNIT)	-	PASS
GENERAL AND COMMUNICATION STUDIES C	-	MERIT
ENGINEERING DRAWING AND DESIGN	III	MERIT
ENGINEERING TECHNOLOGY	III	MERIT
MATHEMATICS	III	MERIT
ENGINEERING SCIENCE	III	MERIT

DATE OF AWARD JULY 1980 (TOTAL UNIT ENTRIES 19)

Chairman

Chief Officer

c 031965

124150-77-01/124150/C004262/M/19-09-61

Supporting evidence of my academic and vocational background (continued)

Apprentice of the Year Award – September 1980

Apprentices awards at Newman's

TWO HUNDRED guests attended the annual prizegiving for apprentices of Newman Electric Motors Ltd., Newman Electric Motors (Manufacturing) Ltd., and Yate Foundry Ltd., which took place at Newman's social club, Yate.

They were welcomed by Mr T. I. Moore industrial relations director of Newman Electric Motors (Manufacturing) Ltd., who also introduced Dr. F. D. Cox, Head of Engineering at Bristol Polytechnic.

Dr. Cox emphasised the importance of the links between education and industry which in the field of engineering and encouraged the apprentices to achieve such a high standard of work.

The Apprentice of the Year Award went to Alan Carter of St Davis [Davids] Avenue, Cadbury Heath.

Prizes were awarded to Gary Wiltshire (1st year, Newman Electric Motors (Manufacturing) Ltd.); Philip Green (2nd year, Yate Foundry Ltd.), Graham Group [Crump] (3rd year, Newman Electric Motor (Manufacturing) Ltd); Michael Kingsley (4th year, Newman Electric Motors Manufacturing Ltd. and Tracy Hewlett (office trainee prizewinner).

Following the distribution of prizes by Dr. Cox, the guests were invited by Mr. Moore to view an exhibition of work produced by the apprentices over the past year.

In addition, visitors were also able to "try your luck" on the new computer system being introduced to Newmans by Cotswold Computer Services Ltd.

Education and industry link stressed

The importance of the link between education and industry in the field of engineering was stressed by Dr Frank Cocks, head of engineering at Bristol Poly-technic.

Dr Cocks was speaking at the annual apprentice prize giving of Newman Electric Motors, Newman Electric Motors Manufacturing and Yate Foundry at Newman Social Club, Yate.

Two hundred guests were welcomed by Mr Thomas Moore, industrial relations director of Newman Electric Motors Manufacturing.

The apprentice of the year award went to Alan Carter, of St David's Avenue, Cadbury Heath.

Other prizewinners were Gary Wiltshire, first year, Newman Electric Motors Manufacturing: Philip Green, second year, Yate Foundry: Graham Crump, third year, Newman Electric Motors Manufacturing: Michael Kingsley, fourth year, Newman Electric Motors Manufacturing: Tracy Hewlett, office trainee prizewinner.

Verbatim extracts re-typed from two local newspapers of the time.
(original copies not of reproducible quality)

[corrections shown in brackets]

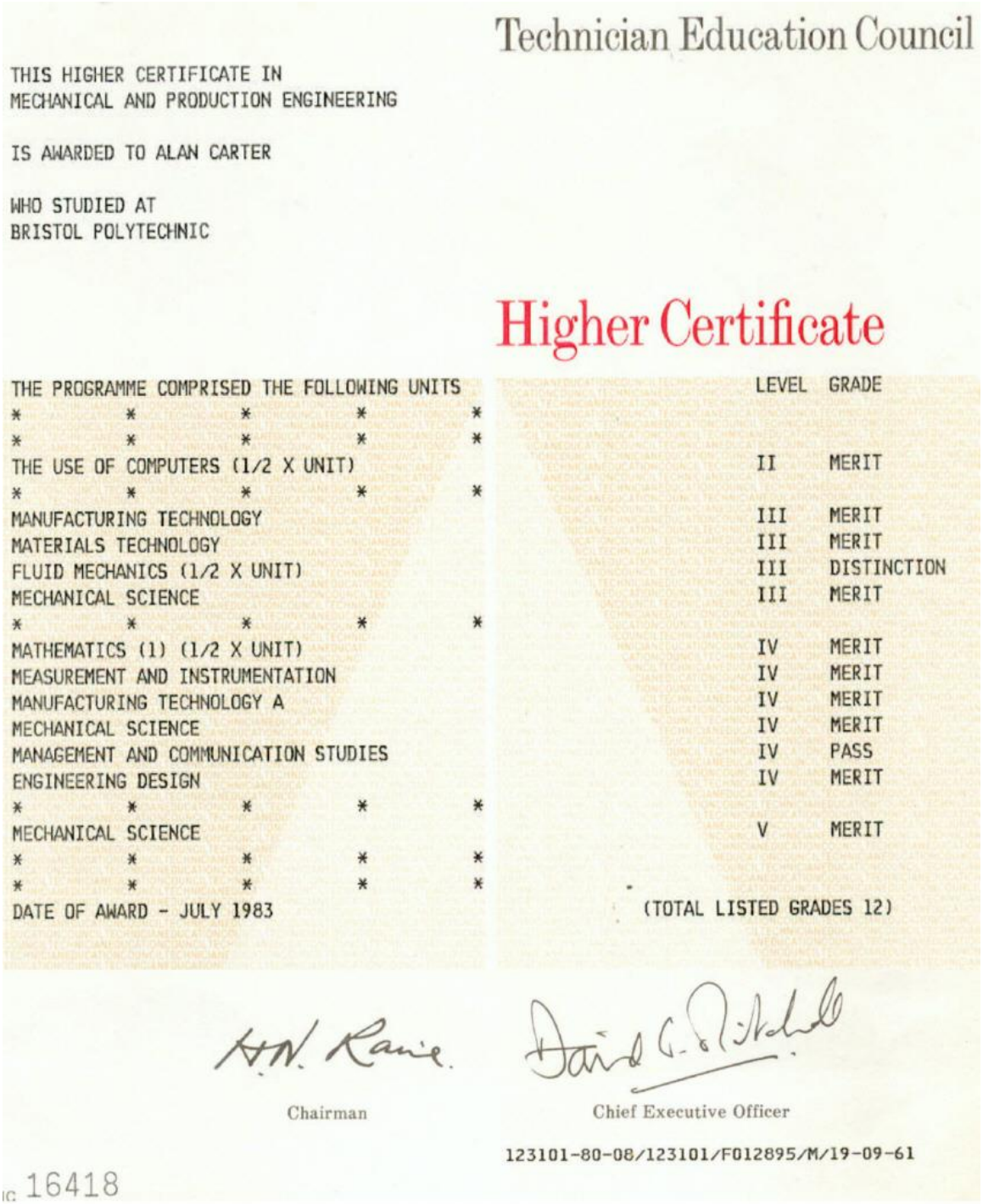
Photos of apprentices:

Mr. T. Moore & Alan Carter

Supporting evidence of my academic and vocational background (continued)

Higher Technician Education Certificate – July 1983

(HNC equivalent qualification)



Technician Education Council

THIS HIGHER CERTIFICATE IN
MECHANICAL AND PRODUCTION ENGINEERING

IS AWARDED TO ALAN CARTER

WHO STUDIED AT
BRISTOL POLYTECHNIC

Higher Certificate

THE PROGRAMME COMPRISED THE FOLLOWING UNITS	LEVEL	GRADE
THE USE OF COMPUTERS (1/2 X UNIT)	II	MERIT
MANUFACTURING TECHNOLOGY	III	MERIT
MATERIALS TECHNOLOGY	III	MERIT
FLUID MECHANICS (1/2 X UNIT)	III	DISTINCTION
MECHANICAL SCIENCE	III	MERIT
MATHEMATICS (1) (1/2 X UNIT)	IV	MERIT
MEASUREMENT AND INSTRUMENTATION	IV	MERIT
MANUFACTURING TECHNOLOGY A	IV	MERIT
MECHANICAL SCIENCE	IV	MERIT
MANAGEMENT AND COMMUNICATION STUDIES	IV	PASS
ENGINEERING DESIGN	IV	MERIT
MECHANICAL SCIENCE	V	MERIT

DATE OF AWARD - JULY 1983

(TOTAL LISTED GRADES 12)

Chairman

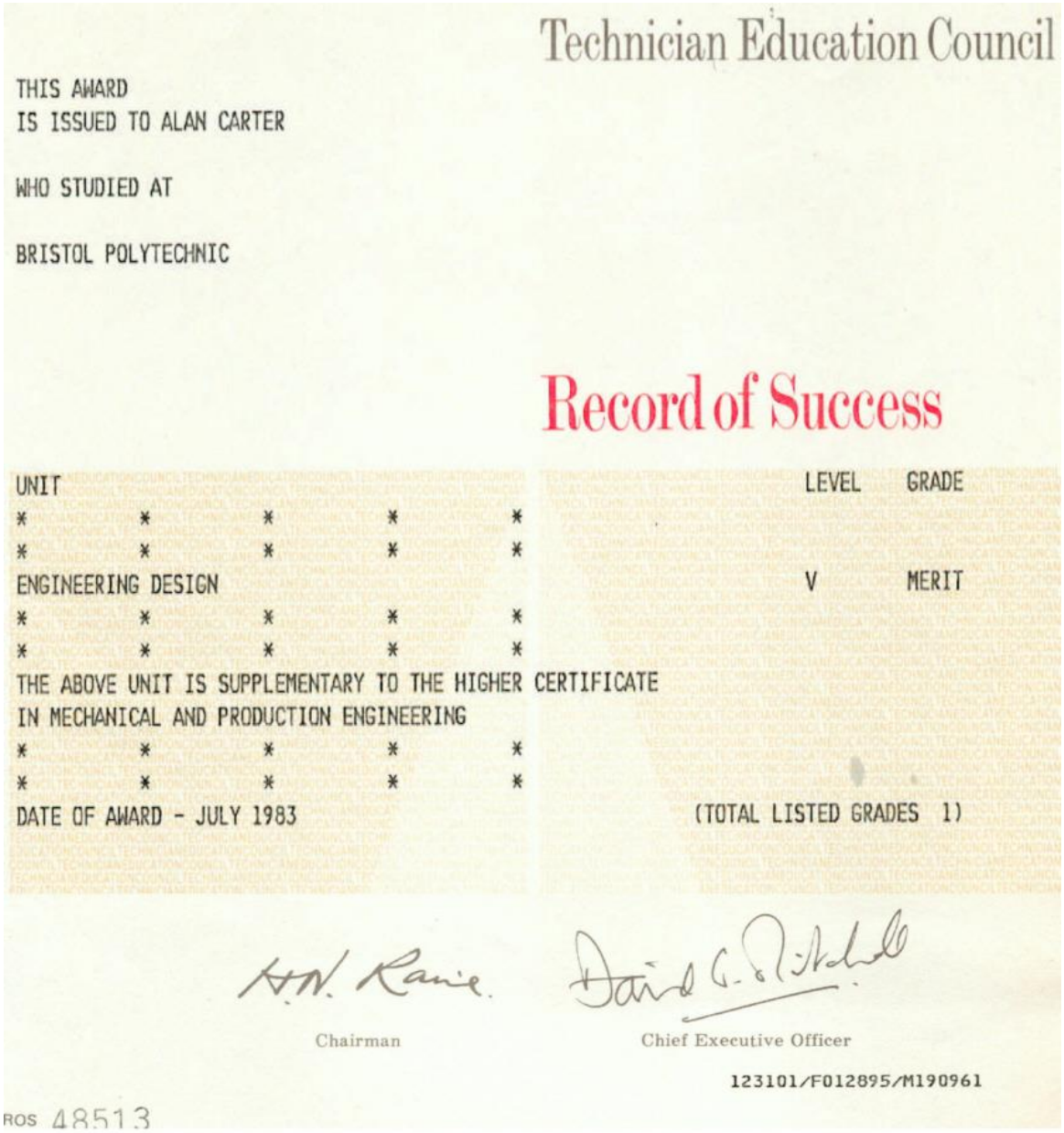
Chief Executive Officer

123101-80-08/123101/F012895/M/19-09-61

IC 16418

Supporting evidence of my academic and vocational background (continued)

Higher Technician Education Certificate – July 1983 – Supplementary Unit



Technician Education Council

THIS AWARD
IS ISSUED TO ALAN CARTER

WHO STUDIED AT

BRISTOL POLYTECHNIC

Record of Success

UNIT	LEVEL	GRADE
ENGINEERING DESIGN	V	MERIT

THE ABOVE UNIT IS SUPPLEMENTARY TO THE HIGHER CERTIFICATE
IN MECHANICAL AND PRODUCTION ENGINEERING

DATE OF AWARD - JULY 1983

(TOTAL LISTED GRADES 1)

Chairman

Chief Executive Officer

123101/F012895/M190961

ROS 48513

Supporting evidence of my academic and vocational background (continued)

My application to a college for a Lecturing position after graduation (1987)

Department of Mathematics, Science and Engineering

Head of Department:
AG Pierce BSc AFIMA

Filton Technical College

Filton Avenue
Bristol BS12 7AT
***Telephone:* 694217**
***Principal:* Dr Alan Phillips**

Date: 29 June 1987
Ref: AGP/SM/RE/C1M

Mr A Carter
56 Cedar Close
Highwwod
Patchway
BRISTOL
BS12 5HA

Dear Mr Carter

Thank you for your enquiry about part-time teaching at the College. I shall keep your letter and CV on file in case the need should arise for a lecturer with your qualifications. This is generally in September each year when the enrolments on to our part-time courses are known.

I enclose also a part-time lecturer's form for you to complete which makes reference in the filing system easier.

However, in practical terms, there is not likely to be much part-time work available in Engineering as this area is not expanding. You may feel it would be nice to come to the College to talk about a career in teaching; I should be happy to see you if you phoned up to make an appointment.

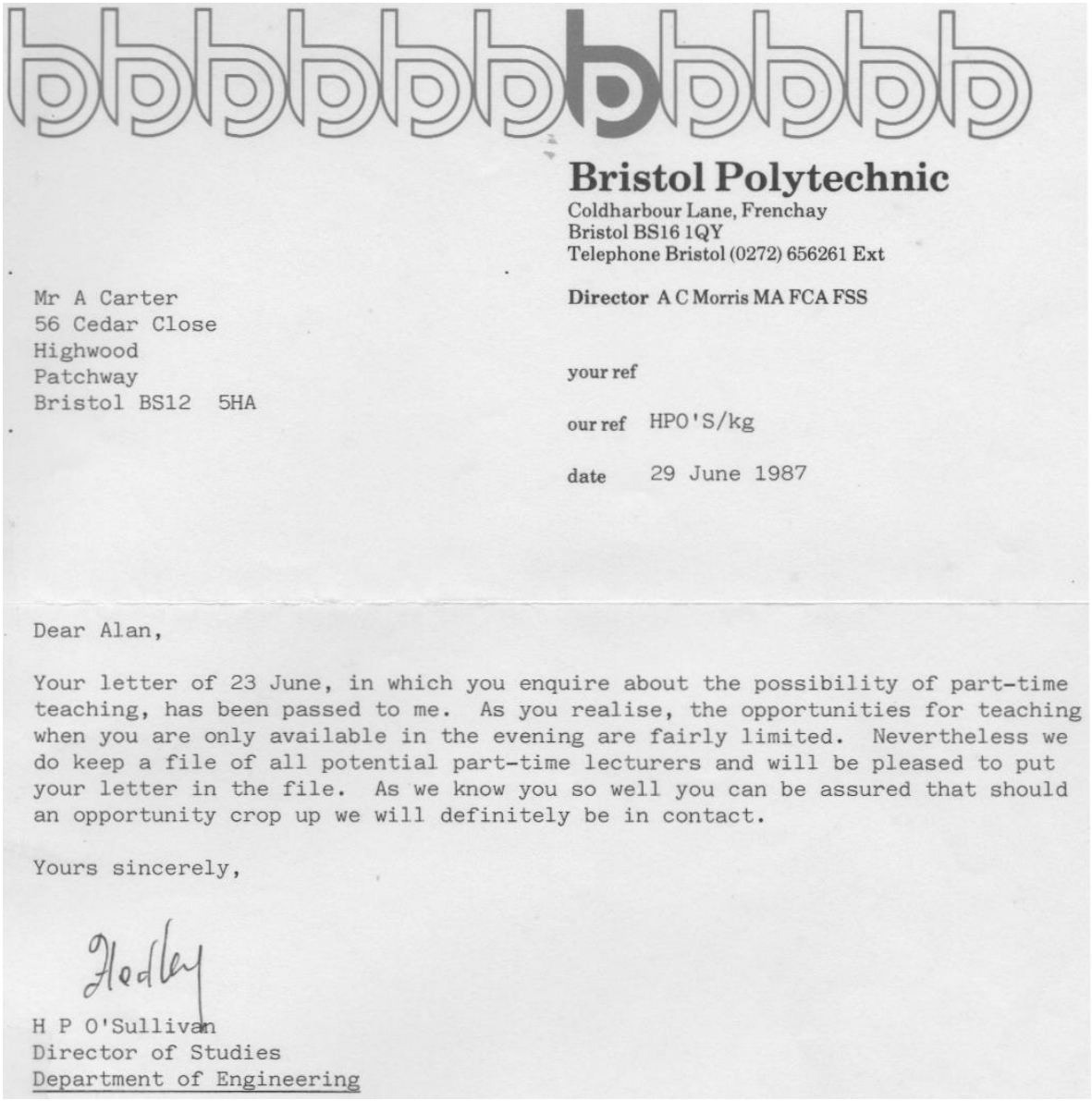
Yours sincerely

A G PIERCE
Head of Department

HAD A DISCUSSION WITH MR PIECE 13/7/87

Supporting evidence of my academic and vocational background (continued)

My application to Bristol Polytechnic for a Lecturing position after graduation (1987)



Bristol Polytechnic
Coldharbour Lane, Frenchay
Bristol BS16 1QY
Telephone Bristol (0272) 656261 Ext

Director A C Morris MA FCA FSS

Mr A Carter
56 Cedar Close
Highwood
Patchway
Bristol BS12 5HA

your ref

our ref HPO'S/kg

date 29 June 1987

Dear Alan,

Your letter of 23 June, in which you enquire about the possibility of part-time teaching, has been passed to me. As you realise, the opportunities for teaching when you are only available in the evening are fairly limited. Nevertheless we do keep a file of all potential part-time lecturers and will be pleased to put your letter in the file. As we know you so well you can be assured that should an opportunity crop up we will definitely be in contact.

Yours sincerely,

Hodley

H P O'Sullivan
Director of Studies
Department of Engineering

In 1992, Bristol Polytechnic gained University status, becoming the University of the West of England (UWE).

http://www1.uwe.ac.uk/aboutus/history/uwehistorytimeline.aspx

[Accessed: Dec. 2011]

Appendix B

TEC General and Specific Objectives - extracts from a Mathematics unit (1979)

Figure 6: Extracts from TEC Unit U75/005 Mathematics Level I (1979)

INTRODUCTION

Welcome to Mathematics I

The Mathematics I unit has been designed to give you a fundamental knowledge of Arithmetic, Algebra, Geometry and Trigonometry and so prepare you for the higher level mathematics units and subsequently to tackle the mathematical content of any unit in the Telecommunications programme.

This learning package has been written in such a way as to use the textbook, "Technician Mathematics" Volume 1, by Messrs Bird and May and you will find this book in the course binder. All the material necessary for your successful completion of this unit is contained within this learning package but should you require additional material your tutor will advise you.

Now a few words about the organisation of the package. It has been designed for individual use at home, so that you can study at your own rate and at times that suit you. A point to bear in mind is that during the course you will be required to take four assessment tests, i.e. three phase tests and one end test. Your tutor will tell you the dates of these tests. It is important that you have studied all the necessary material before each assessment. [Ref. Table 10 on page 222, TEC Assessment Model B]

The learning package consists of three smaller packages which will be sent to you one at a time. Each of these covers several of the **General Objectives** which are shown in the TEC Unit content.

C Algebra ← topic area

11. Solves, algebraically, simple and simultaneous equations.

↑ General Objective

11.1 Distinguishes between an algebraic expression and an equation.

11.2 Maintains the equality of a given equation whilst applying any arithmetic operations.

11.3 Solves linear equations in one unknown.

11.4 Constructs and solves simple equations from data derived from experimental work in other subjects at this level.

11.5 Solves simultaneous linear equations in two unknowns.

↑ Specific Objectives

Figure 7: Extract from TEC Unit U76/033 Mathematics 2 (1979): Unit content

UNIT CONTENT

The unit topic areas and the general and specific objectives are set out below, the unit topic areas being prefixed by a capital letter, the general objectives by a non decimal number, and the specific objectives by a decimal number. THE GENERAL OBJECTIVES GIVE THE TEACHING GOALS AND THE SPECIFIC OBJECTIVES THE MEANS BY WHICH THE STUDENT DEMONSTRATES HIS ATTAINMENT OF THEM. Teaching staff should design the learning process to meet the general objectives.

ALL THE OBJECTIVES SHOULD BE UNDERSTOOD TO BE PREFIXED BY THE WORDS: THE EXPECTED LEARNING OUTCOME IS THAT THE STUDENT:

A Algebra ← topic area

1. Solves linear simultaneous equations algebraically

↑ General Objective

1.1 Solves a pair of simultaneous equations in two unknowns

a. by substitution

b. by elimination.

1.2 Defines the roots of an equation.

1.3 Determines equation which is satisfied by a given pair of roots.

2. Solves simple quadratic equations by analytical methods.

2.1 Defines (a) a quadratic expression, (b) a quadratic equation.

2.2 Solves a quadratic equation by the method of factors.

2.3 Deduces a quadratic equation for given roots.

2.4 Shows that a constant term can be added to an expression such as $ax^2 + bx$ to make a perfect square.

2.5 Derives from 2.4 the formula for solving a quadratic equation.

2.6 Solves simple quadratic equations, which provide real roots, by the use of the formula.

2.7 Derives quadratic equations which are mathematical models of practical problems and finds a solution.

↑ Specific Objectives

Figure 8: Extract from TEC Unit U76/033 Mathematics 2: Assessment Spec. (1979)

Assessment Specification

The following gives the unit breakdown, by topic and types of learning, as a key to the production by a college of its assessment specification for this unit.

Unit Topic Area	Topic as % of assessment	% of total assessment				
		Motor Skills	Intellectual skills			
			Information	Comprehension	Application	Invention
A Algebra	12		2	3	7	
B Logarithms	15		4	8	3	
C Graphs	22		6	10	6	
D Calculus	12		2	8	2	
E Trigonometry	27		4	18	5	
F Boolean Algebra	12		2	8	2	
G						
H						
I						
Percentage of assessment for entire unit			20	55	25	

Appendix C

TEC Assessment Models (1979)

Table 10: TEC Guidance Note No 8 - Assessment Models (extract)

MODEL	SEE NOTES	PHASE TESTS: NUMBER	PHASE TESTS: MIN % OF TOTAL	END-OF-UNIT TEST: MAX % OF TOTAL	END-OF-UNIT TEST: SUGGESTED LENGTH	ASSIGNMENTS: MAX % OF TOTAL	APPLIES TO UNITS
A	a) c)	3	100%	none		none	At levels I/II
B	a) b) c)	3	60%	40%	1 - 2 hours	none	
C	a) c) d) e)	3	60%	none		40%	
D	a) b) c) d) e)	3	30%	40%	1 - 2 hours	30%	
E	a) b) c)	3	60%	40%	2 - 3 hours	none	At level III & higher
F	a) b) c) e)	3	30%	40%	2 - 3 hours	30%	
G	a) c)	2	100%	none		none	half units e.g. Maths
H	c) d) e)	none		none		100%	With predominantly practical skills
J	c) e) f)	none		50%	2 - 3 hours	50%	At level II & higher

NOTES

a) Phase tests are not cumulative and will cover only the material dealt with in the preceding fraction of the unit. The suggested duration of each phase test is approximately one hour.

b) There will not be unnecessary overlap between phase tests and the end-of-unit test. The final phase test could be combined with the end-of-unit test if appropriate in a two part examination.

c) The relative weightings of the assessment components will be derived from the assessment analysis and from the balance of skills and topics within the assessment components.

d) Practical assignments will be used to assess student competence in the areas identified as 'motor skills'. As such practical work will invariably assess some cognitive in addition to motor skills, these assignments will in general have a weighting which is greater than the percentage allocated to motor skills in the assessment analysis.

e) Assignments to assess the higher intellectual skills may include library research exercises, design projects, homework etc.

f) The end-of-unit test should be carefully structured into three approximately equally weighted sections each covering approximately one third of the objectives in a unit, and related to the assessment analysis for the unit. Each section must be passed in its own right. There should be no element of choice in the test.

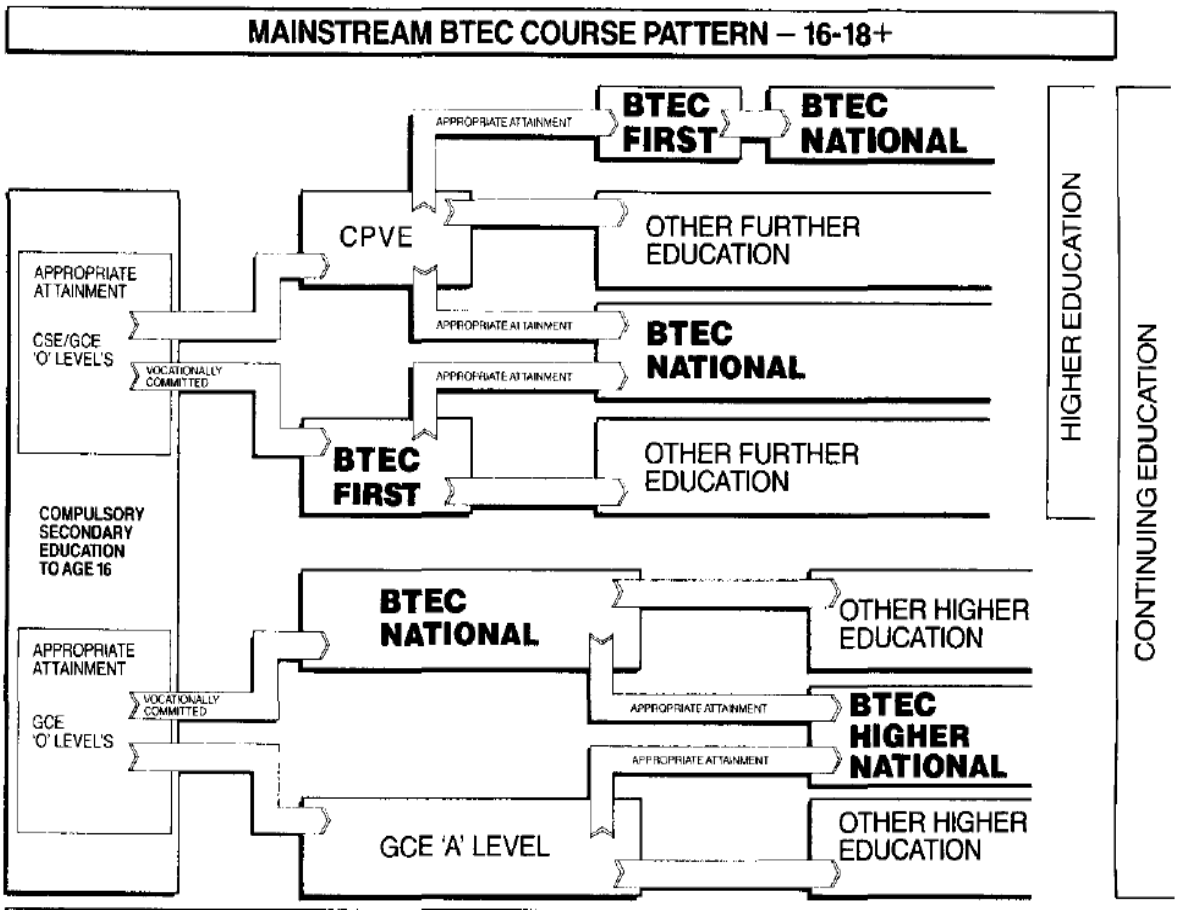
The use of any of the above model assessment plans is not intended to restrict the teaching method adopted (eg practical work, tutorials, homework, case studies :.)

Appendix D

Technical Education Courses (1986)

Figure 9 below shows the possible BTEC progression paths as of 1986. It should also be noted that the BTEC First Diploma was introduced in 1986 as a prerequisite course to the National (Macfarlane, 1993, p. 37).

Figure 9: Technical Education Courses (1986)



(BTEC, 1986c, p. 4)

Appendix E

Extracts from a BTEC Science unit (1986)

Figure 10 on page 224, shows an extract from a 1986 BTEC National Science Level II unit which shows similarities in format between this and the original 1970s unit. These similarities include the designed length of study, i.e. 60 hours for a full unit; both state the aims of the unit and suggest similar assessment methods employing 50% assignments, although the 1986 unit is less specific. However, unlike the layout of the 1970s units, the 1986 units do not state general and specific objectives, but instead principal objectives and indicative content; in other words the 'learning outcomes' and the objectives specifying the expected 'outcome', all of which students had to achieve, but without the traditional use of quantitative numerical marking.

Figure 10: BTEC Unit 1668C Science Level NII (1986) – Extract 1

Business & Technician Education Council

Unit Number 1668C

BTEC-devised Unit

Unit title	Science
Value	1.0
Learning support time	Typically 60 hours in a part-time course (where it is complemented by work-based experiential learning) with up to 90 hours being more usual in a full-time course.
Level	N II
Prerequisites	*Science F* or equivalent
Exemptions	None

Summary of aims

The aims are:

a to develop, through practical investigations, an understanding of scientific concepts which will provide a base for studies in technology;

b to develop the knowledge and ability to understand the concepts of systems, measuring systems, force and stress, motion and momentum, and energy, and their applications;

c to incorporate core themes and skills as identified in the BTEC Guidelines for National Certificates and Diplomas in Engineering.

Teaching and learning strategies

1 It is anticipated that practical work through laboratory experiments and modelling will be the most appropriate method of achieving a significant proportion of the objectives. This work should cover specific topics and interrelate objectives across units. Wherever possible, the course should incorporate appropriate mathematical processes and the use of computer software packages to encourage a practical understanding of science applied to engineering technology.

2 Care should be taken to integrate relevant topics into other parts of the course with particular reference to technology units.

3 Suitable audio-visual and practical examples from industry should be introduced throughout the course.

Figure 11: BTEC Unit 1668C Science Level NII (1986) – Extract 2

Teaching and learning strategies	4 It is expected that a substantial proportion of the learning support time for this unit will contribute towards the time required for the programme of integrative assignments.
Assessment scheme	An appropriate assessment plan might be to use assignments for 50% of the total unit assessment, with other type(s) of test accounting for the remaining 50%.
Special notes	1 This unit replaces *Engineering Science II* (formerly U80/734). 2 Examples and applications in assignments should ideally relate to student's occupation or intended occupation.
Section	Principal Objectives plus indicative content
A Systems 5%	1 Organise elements and information relating to engineering problems by identifying internal and external systems a system boundary b sub-system c interactional paths d effect of component interaction, eg interpretation of symptoms in fault diagnosis 2 Identify the significant features of systems and represent them by block diagrams a inputs and outputs b directions of signal flow c concept of signal modification and conversion Systems referred to might include, for example, diesel engine-generator set, air compressor, machine tool, robotic arm, manufacturing cell, or vehicle drive system.
B Measuring systems 15%	3 Represent practical measuring systems in block diagram form, identifying the functional elements as transducer/sensor, signal conditioner and receiver/ recorder/display unit a principle of operation of each element

Principal objective

Indicative content

Appendix F

"Who am I?" Perceptions of peers (2006 to 2007)

Just as *"No book can be free of the background and experiences of the author"* (Pollock, 2003, ix), then no research can be free of the researcher's background and experiences, particularly when a practitioner-researcher. Due to my 'embedded actor' status and being encultured into the environment researched, I am conscious that not only am I influenced by the departmental culture, practices and procedures, i.e. the Programme Area's learning culture, but also after ten years of employment, I may have a degree of influence on its practices. In an attempt to uncover how I am perceived by my colleagues prior to the research commencing, and thus determine possible data 'contamination' considerations; from September 2006 to March 2007 I undertook a, *'Who am I?'* exercise with engineering associated College personnel. This consisted of formal appraisals with management, one-to-one interviews with colleagues and e-mail correspondence. This was not a rigorous analysis, just an attempt to uncover the peer perceptions that might possibly affect the research study. Five engineering programme staff members in total were consulted for comments, with three eventually being interviewed as participants in this research study into assessment practice. Below is a synopsis of the favourable and unfavourable comments, as expressed by the five staff members.

The 'favourable' attributes generally expressed included such characteristics as my *professional attitude towards work; respected within the engineering department for hard work, knowledgeable "on your stuff", doing a good job, and determined to maintain standards.* 'Unfavourable' comments cited included: being *too dedicated to the job, having no hobbies, only talk about work, and limited time for family life.* I am not seen as a *big personality* within Sophwort-on-Sea College, *"some staff still do not know who you are"; Suffers from a lack of self-confidence …a lack of self-belief; needs to relax; too serious and intense with students. "Assessment work tends to have all the i's dotted and t's crossed, leaving very little manoeuvre for students."* I tend to be seen as *a loner; gets on with job in own area and not always seen as a team player* (although does work with other staff members); *quiet and introverted nature means, "students do not think you are approachable"*. My academic performance was seen to mirror my industrial environment and training as a Stress Engineer – very detailed, very thorough. Several lecturers considered me more suited to a position of university lecturer than that of a college lecturer. In truth, not a flattering synopsis of my pedagogical attributes.

These data compare closely to comments obtained from pre-module work pertaining to a Masters (in Total Technology), 'Human Factors in Organisations' module undertaken during in June 1993. A synopsis of the then perceived strengths included: *good/conscientious worker; highly self-motivated; persistent; consistent; honest and trustworthy; interested in all aspects of the job.* The perceived weaknesses included, *very quiet and therefore can appear not easily approachable; naive - too busy working – "lets world pass him by." Lack of self-confidence; does not easily tolerate small talk; does not like group atmospheres.* Hence, strong similarities can be seen between the two surveys although separated by thirteen years and relate to different working environments and different people. So is this 'who I am'?

The main issue here is to reflect on these perceived attributes and assess in what ways such personal traits could vitiate the proposed research. Certainly, my quiet persona and lack of social contact with staff members suggests I have limited influence on them or perhaps even the department's activities; except within delivery of my own BTEC Units and those I deliver concurrently with other lecturers. However, my 'introverted tendencies' and 'unapproachable persona' may cause interviewees to view me with a degree of caution and perhaps be less than forthcoming when interviewed? It should be noted that some lecturers interviewed were considered in the 'peer' category, and some from Line Management roles. The interviewing of peers, where participants are *"not anonymous"* and have a *"shared norm"*, requires careful consideration and execution (Platt, 1981, p. 77).

Furthermore, could fellow lecturers' perception of the educational research per se, impinge on the data gathering? The following are a few of the anecdotal comments received from several sources during the initial years of my EdD studies and research: *"Most people do not understand what you are doing"*; there may be a *"jealousy factor"* and *"whatever your findings there will be a way to rubbish them and overturn them."* Indeed, educational research in general is seen as, "*belly-button analysis"*; not *"macho"* as no maths contents and *"not what engineers are trained to do."* Certainly, such perspectives could affect the collating and analysing of any qualitative data gathered, as they may directly impinge on validity of the research? However, during the course of the study, I felt some lecturers developed respect for the EdD studies I was undertaking, with several commenting that my research had made them think about their own assessment practice in a new light.

Appendix G

Developing lecturers' interview schedule (2007)

Figure 12: Lecturers' interview schedule draft 1: Formative assessment (May 2007)

	Question
1.	How do you define the terms formative assessment, summative, ipsative and diagnostic assessment? *[Unlikely lecturer will understand these terms, thus may require to be defined – note response to definitions]* *[Hint, How do you differentiate formative and summative assessment in practice?]*
2.	In what ways do you think you undertake 'formative assessment' within your teaching? • Clearly defined assessment criteria [Y/N] • Asking questions in class? [Y/N] • Use of homework? [Y/N] • Short tests? [Y/N] • Peer assessment? [Y/N] • Group work [Y/N] • Accommodating different learning styles? [Y/N] • Using appropriate modes of assessment? [Y/N] • Developing critical autonomy? [Y/N] • Formative use of summative tests [Y/N] • Apply rigid deadlines [Y/N] • Chose of mode of assessment [Y/N] • Use diagnostic/ipsative assessment [Y/N]
3.	What do you think are the salient issues that impact on your approach to formative assessment?
4.	In what ways do you offer feedback to students and how often? • Is your feedback timely? • Is your feedback sufficient? • Is your feedback tailored to individual needs? • Do your students use the feedback?
5.	Do you consciously ensure that feedback is aimed at promoting learning and looking at the next steps?
6.	Do you see the assessment process as a student/lecturer collaboration?
7.	Do you see your assessment practice as 'assessment of learning', 'assessment for learning' or 'assessment as learning'?
8.	Do you think formative assessment enable your students to operate at a 'surface', 'deep' or 'procedural' level of learning?
9.	Do you think the referral system promotes learning, increases student success or is 'dumbing-down' in action?
10.	How does the BTEC grading criteria impact on your approach to formative assessment?
11.	What impact do you think your formative assessment practice has on a student's progression through your unit and on their proficiency of the subject matter?
12.	What do you think of the current student culture and work ethic? • Why do some students not seem interested in working for higher-grades? • Why do students not do any homework set?

Figure 13: Lecturers' interview schedule draft 2: Assessment practice (June 2007)

	Question	Hints?	Interviewee response
i)	What do you see as the functions and purposes of assessment within the BTEC programme?	•	[Determines lecturers' holistic perspective on assessment – what does it mean to them in a BTEC context? Look for convergent or divergent assessment practices.]
ii)	Could you outline the way you teach and assess a particular BTEC National units? Do you generally endeavour to develop 'procedural learning'?	•	[Endeavour to determine if assessment practice dictates teaching and if so why? Does assessment practice differ across different use and if so why is this – influences and impacts? Is the assessment essentially based on procedural learning activities]
iii)	What are the salient issues that impact on your current BTEC assessment practice? How do these impact on your practice?	• Ideological, epistemological, political, institutional, personal? e.g. Lecturing/ engineering experience, IV/EV, Colleagues, student culture, students' previous assessment history, management, etc. • Do you think the onus is on to pass the students?	[Endeavour to determine what are the main issues that impinge on their current practice? Why are these issues to prominent? What is the direct significance of these issues on their compilation of assessments?]
iv)	What are your principle considerations when you write an individual assessment?	•	[Endeavour to determine the detailed decision-making underpinning the choice of questions on an assessment? Again the influences on choosing one question over another or the way the questions is worded, broken down, relationship and relevance to grading criteria. How easy is to assess the question against the grading criteria? Will a degree of compensation be required?
v)	How much support and guidance do you provide within the written assessment itself?	•	[Can students pass the assessments by regurgitating classroom examples, simply referring to handouts or searching through stated textbooks? Do lecturers provide the answers by incremental improvement?]
vi)	How do you currently employ the practice of referrals within your assessment practice? How much 'coaching' do you do during the duration of the assessment?	• How much drafting and redrafting do you permit? • Do you think the referral system promotes learning, increases student success or is 'dumbing-down' in action?	[Endeavour to determine how the referral system is applied to the cohort as a whole or tailored to an individual student? The vagaries in the approach, i.e. unlimited attempts at the same assessment; incremental improvement; issuing of another assignment – when? ; rigidity of submission dates - sanctions for not submitting on time?]

vii)	What do you consider to the effect of the current referral system on a student's progression and proficiency within your unit?	•	[Endeavour to determine lecturers' perception of the BTEC system and the application of BTEC policy?]
viii)	How do you quantify the definition of a 'pass' grade in a BTEC unit?	• Is it given for working hard? • Is it the right of a student enrolled on the course	[How does a lecturers judgement correspondence with …. "….a judgement of pupil's work or progress takes into account such things as effort put in, the particular context of the pupil's work and the progress that pupil has made over time." (Harlen and James, 1997, p. 370)]
ix)	Do you feel that your assessment practice provides a motivational tool that assists students in taking ownership of their work and enhances their opportunities for learning? If so in what ways?	•	[Although the lecturer is not likely to perceive the concept of 'formative assessment' per se, what aspects of the current practice are recognisable under the heading of 'formative assessment'? How is feedback used in this context?]
x)	Do you see your assessment practice as 'assessment of learning', 'assessment for learning' or 'assessment as learning'?	•	[How do lecturers perceive BTEC vocational assessment in terms of traditional as opposed to modern practices? Reasons for this perception?]
xi)	How do you define the terms formative assessment, summative, Ipsative and diagnostic assessment? *[Unlikely lecturer will understand these terms, thus may require to be defined – note response to definitions]*	• How do you differentiate formative and summative assessment in practice?	[Determine if conflation exists between formative and summative assessment? How does the interviewee differentiate the two activities? Do they make use of summative assessment for formative purposes?]
xii)	In what ways do you think you undertake 'formative assessment' within your teaching?	• Clearly defined assessment criteria [Y/N] • Asking questions in class? [Y/N] • Use of homework? [Y/N] • Short tests? [Y/N] • Self-assessment? [Y/N] • Peer assessment? [Y/N] • Group work [Y/N] • Accommodating different learning styles? [Y/N] • Using appropriate modes of assessment? [Y/N] • Developing critical	[Check list formative assessment practice with lecturers' current pedagogy and assessment practice?]

		autonomy? [Y/N] • Formative use of summative tests [Y/N] • Apply rigid deadlines [Y/N] • Chose of mode of assessment [Y/N] • Use diagnostic/ipsative assessment [Y/N]
xiii)	In what ways do you offer feedback to students and how often?	• Is your feedback timely? • Is your feedback sufficient? • Is your feedback tailored to individual needs? • Do your students use the feedback?

Figure 14: Lecturers' interview schedule draft 3: Assessment practice (July 2007)

	Question	Sub-questions / hints	Interviewee response
		SUMMATIVE ASSESSMENT	
i)	**"Could you outline the way you plan, deliver and assess a particular BTEC National unit?" ["Could you outline the way you assess a particular BTEC National unit?"]**	• How do you approach your assessment practice? • Does it differ dependent on unit considered? • How do you ensure alignment between teaching, assessment and learning outcomes?	[Endeavour to determine if pedagogy is teacher centred or student centred; if assessment practice dictates teaching and if so why? Does assessment practice differ across different units and if so why – influences and impacts? Is the assessment essentially based on 'procedural learning' activities]
ii)	**"What do you see as the functions and purpose of assessment within the BTEC programme or your unit of study?"**	• Do you see assessment as a learning vehicle (formative), or to assess leaning purely against the grading criteria? • How do you ensure validity and reliability of assessment?	[Determines lecturers' holistic perspective on assessment – what is the role of assessment in a BTEC context? Look for convergent or divergent assessment practices- what about the importance of validity and reliability issues to lecturers?]
iii)	**"What are the considerations influencing your general approach to assessment practice?"**	• Are you influenced e.g. Lecturing/engineering experience, IV/EV, Colleagues, student culture, students' previous assessment history, management, etc. • Do you think the onus is on lecturers to pass the students? • What influences your mode of assessment? • What do you see as the strength and weaknesses of your mode of assessment?	[Endeavour to determine what are the main issues that impinge on their current practice? Why are these issues to prominent? What is the direct significance of these issues on their compilation of assessments? by ideological, epistemological, political, institutional, moral, personal, vocational considerations?]
iv)	**What are your main considerations when you draft an individual assessment? [Can you talk me through the examples of assessment you have brought with you?]**	• Do you consider the assessment as a learning tool? • Do you account for the ability of the cohort when writing the assessment?	[Endeavour to determine the detailed decision-making underpinning the choice of questions used within an assessment? Do they look for mastery of techniques? Again the influences on choosing one question over another or the way questions is worded, broken down, relationship and relevance to grading criteria, vocational relevance, etc. How easy is to assess the question against the grading criteria? Will a degree of compensation be required?]
v)	**In your opinion, what characteristics underpin a Pass grade, Merit grade and a Distinction grade student?**	• Is pass grade given for working hard? • Is it the right of a student enrolled on the course expecting a pass? • How do you support distinction grade work? Is	[How does a lecturers judgement correspondence with …. "….a judgement of pupil's work or progress takes into account such things as effort put in, the particular context of the pupil's work and the progress that pupil has made over time."

		formative assessment avoided?	(Harlen and James, 1997, p. 370)]
		FORMATIVE ASSESSMENT	
vi)	**In what ways do you assess and give student's feedback on their progress prior to formal (summative) assessment?** **Give examples and explain** **How often during a unit?** **What is the purpose?** **How do you think your current teaching encompasses the use of 'formative assessment'?** *[make reference to BTEC policy]* *[Formative assessment ...."to contribute to student learning through the provision of information about performance" (Yorke, 2003, p. 478)]*	• In what ways do you review a student's learning and progress? • How do you use this information to enable a student to develop/improve/learn? • How do you differentiate your formative and summative assessment? • Is it informal/formal feedback? • What is the primary source of feedback? • Is your feedback timely? • Is your feedback sufficient? • Is your feedback tailored to individual needs? • Do your students use the feedback? • Does it assist the learning process?	[Do they know what formative assessment is? If not, given the Yorke definition, can they illuminate their formative assessment practice? Do they practice explicit or implicit formative assessment?] How much emphasis do lecturers place on providing feedback to students and what variety of methods do they use? How effective is their approaches?]
vii)	**Do you encourage students to treat assessments as learning opportunities?**	• Is your assessment practice, student led or teacher led? • Are students proactive in their learning and assessment? • Are the students involved with self and/or peer assessment? • Do assessments involve a dialogue between lecturer and student?	[are they effectively using 'assessment for learning' or 'assessment as learning'. Has the student ownership of the assessment process?]
viii)	**In what ways do you offer feedback to students and how often?**	•	
ix)	**In what ways do you assist students within your assessment practice?**	• What are the generic level expectations of pass grade?	[Can students pass the assessments by regurgitating classroom examples, simply referring to handouts or searching through stated textbooks? Do lecturers provide the answers by incremental improvement?]
x)	**How do you currently use the referral system within your assessment practice?**	• How much drafting and redrafting do you permit? • Do you revert to other modes of assessment for a referral? • How do you ensure authenticity? • Do you think the referral system promotes learning, increases student success or is 'dumbing-down' in action?	[Endeavour to determine how the referral system is applied to the cohort as a whole or tailored to an individual student? The vagaries in the approach, i.e. unlimited attempts at the same assessment; incremental improvement; issuing of another assignment – when? ; rigidity of submission dates - sanctions for not submitting on time?]

PROGRESS			
xi)	• **In what ways do you use assessment to evaluate students' progress?** • **What does progress look like, what does it mean for you when a student makes progress?** • **Is it about proficiency and what does proficiency mean in your subject area (examples)?** • **How do students know they are making progress?** **[How do you think your current assessment practice impacts on a student's progression and learning within your unit?]**	• Does it provide for progression without the expected proficiency?	[Endeavour to determine lecturers' perception of the BTEC system and the application of BTEC policy on assessment? How do lecturers' perceive the learning that is taking place with regards to 'assessment for learning'?]
PROFICIENCY			
xii)	• **Where do you expect the students to move to at the end of the National course?** • **Do you see your assessment practices as preparing students for progression and in what ways?**	•	
xiii)	**Do you think generally endeavour to develop 'surface', 'deep' or 'procedural learning'?**	• Is pass grade associated with a surface approach to learning? • In what ways do you think deep learning is possible within your approach to assessment?	

Appendix H

Student College course timetables – September 2006 to July 2008

All National Diploma engineering students study a common first year, having a mix of electrical and manufacturing units. The full-time Diploma typically requires three days' attendance at Sophwort classrooms/laboratories, and one day a week in the workshops developing practical skills. All students study six core units, with specialist units, chosen by the programme area, making up the rest of the programme. Most BTEC units are designed to be delivered and assessed within *60 guided learning hours*. In the first year of this programme, due to classroom limitations of computer workstations, two National Diploma groups were timetabled designated ND1a and ND1b, both studying the same units although having different lecturers for some units. This particular cohort had semesterised timetables, which was unusual for the department, but was a trial requested by several lecturers to determine possible benefits. This resulted in most units timetabled for two, two-hour sessions per week, per 18-week semester.

Figure 15: National Diploma (A) - First Semester Timetable 2006-07 (Year 1)

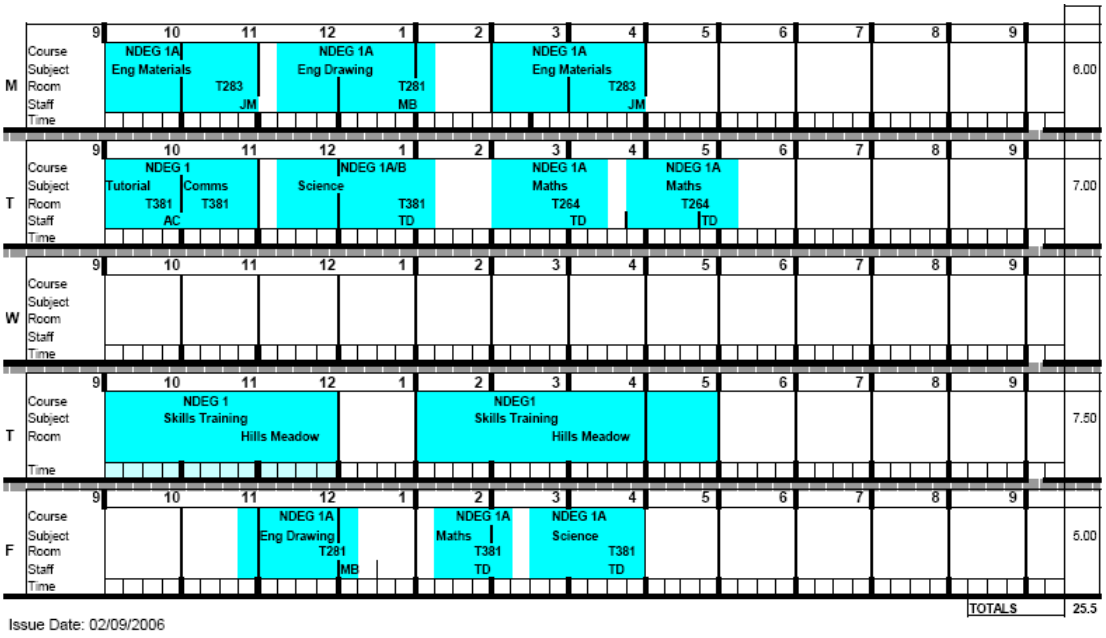


Figure 16: National Diploma (A) - Second Semester Timetable 2006-07 (Year 1)

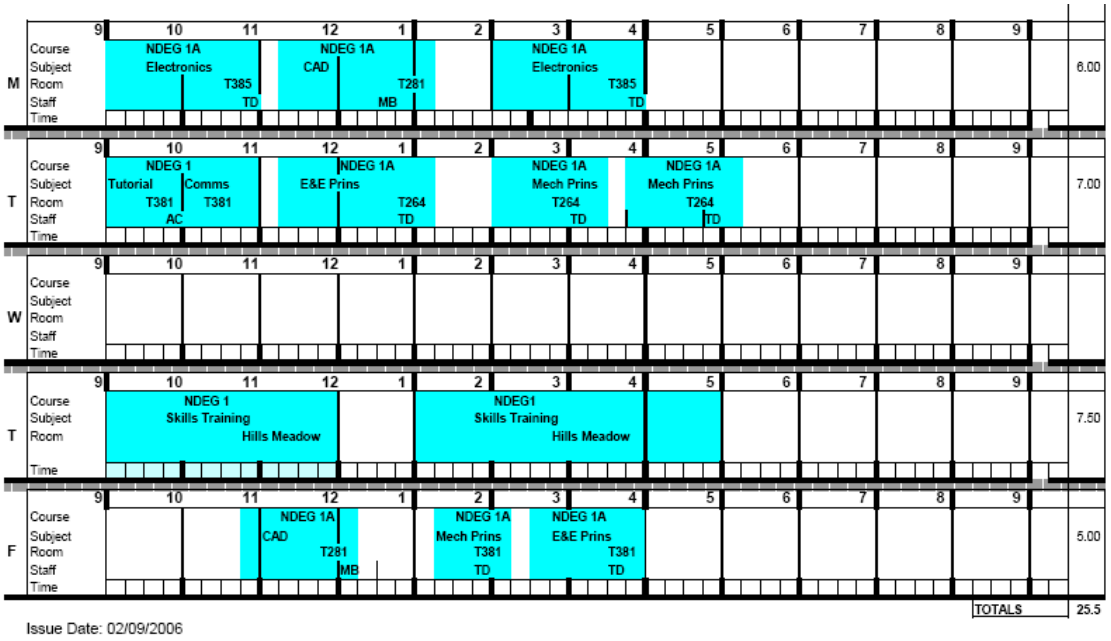


Figure 17: National Diploma (B) - First Semester Timetable 2006-07 (Year 1)

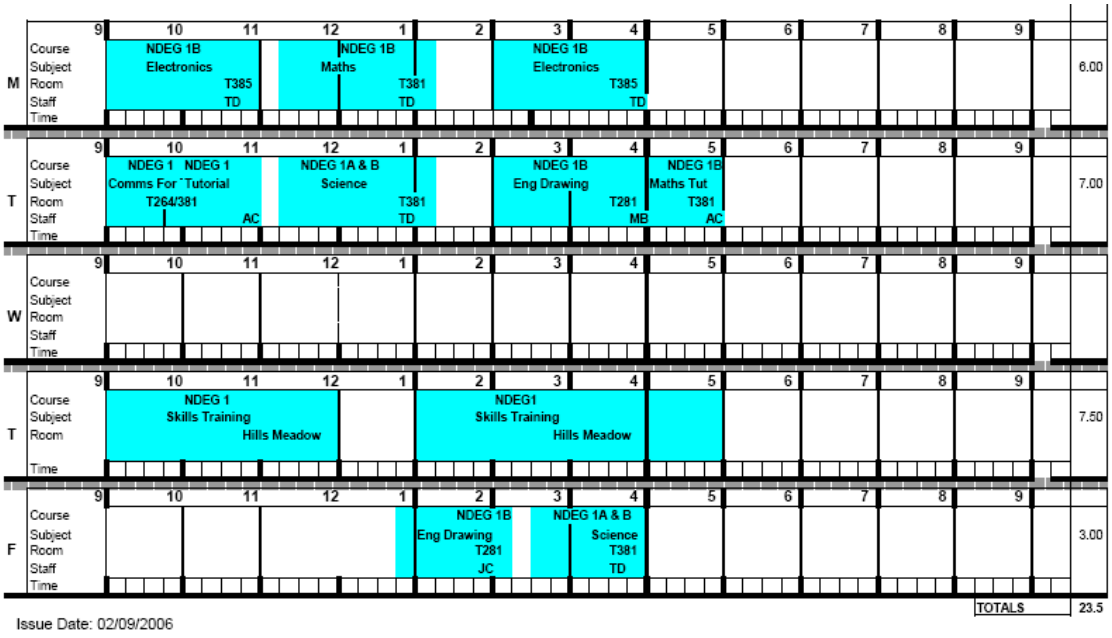


Figure 18: National Diploma (B) - Second Semester Timetable 2006-07 (Year 1)

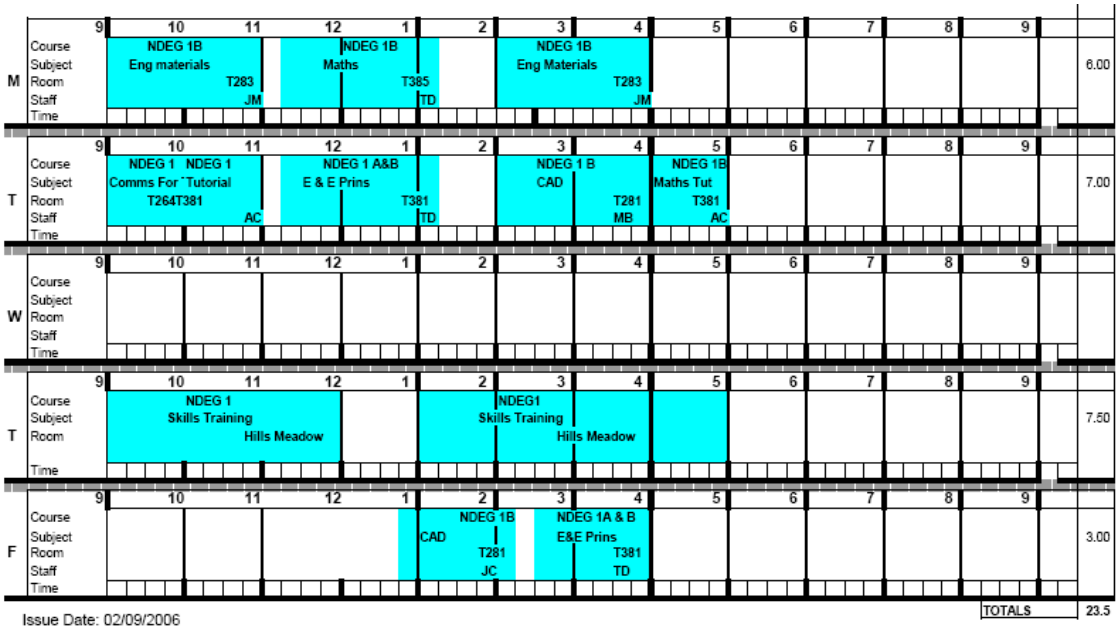


Figure 19: National Diploma (Elec) - First Semester Timetable 2007-08 (Year 2)

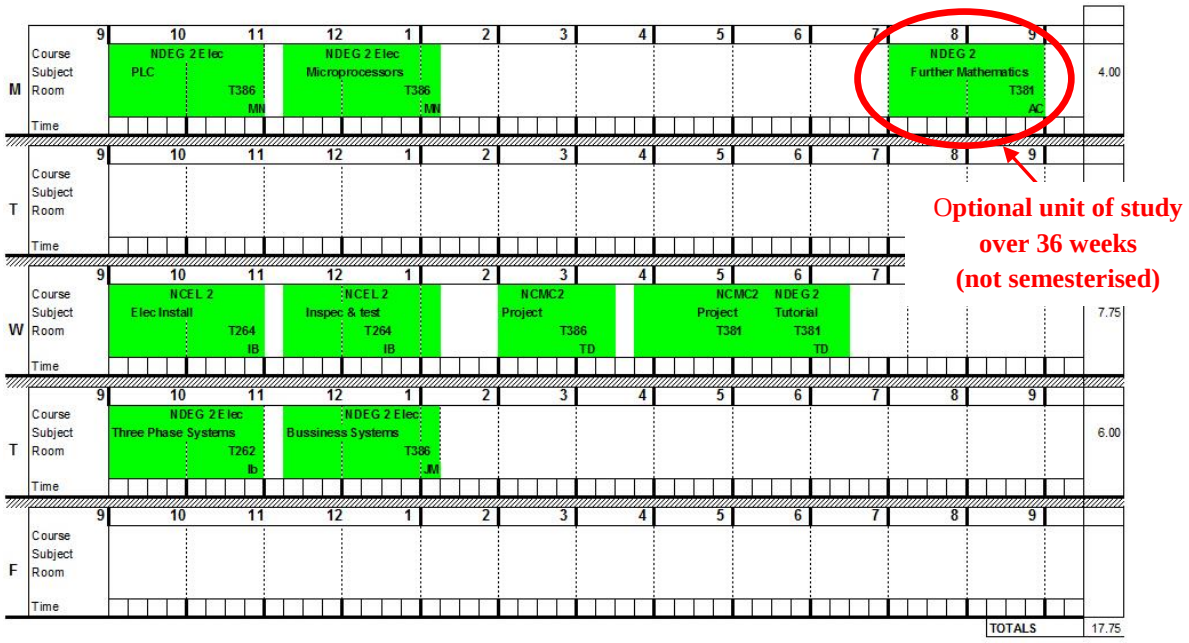


Figure 20: National Diploma (Mfg) - First Semester Timetable 2007-08 (Year 2)

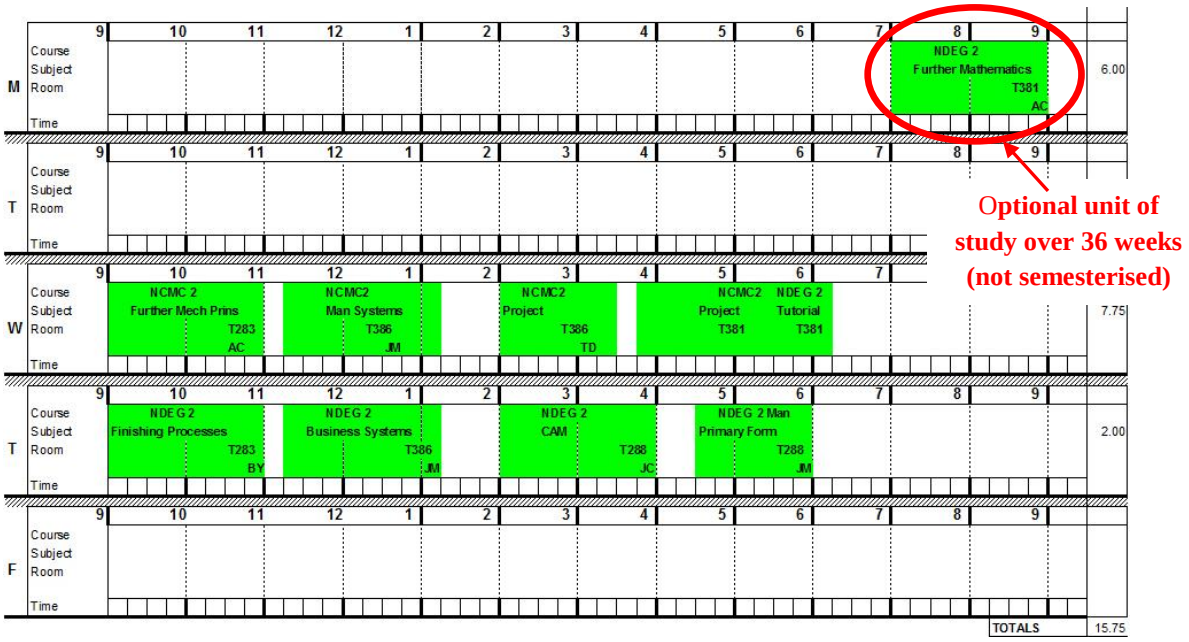


Figure 21: National Diploma (Elec) - Second Semester timetable 2007-08 (Year 2)

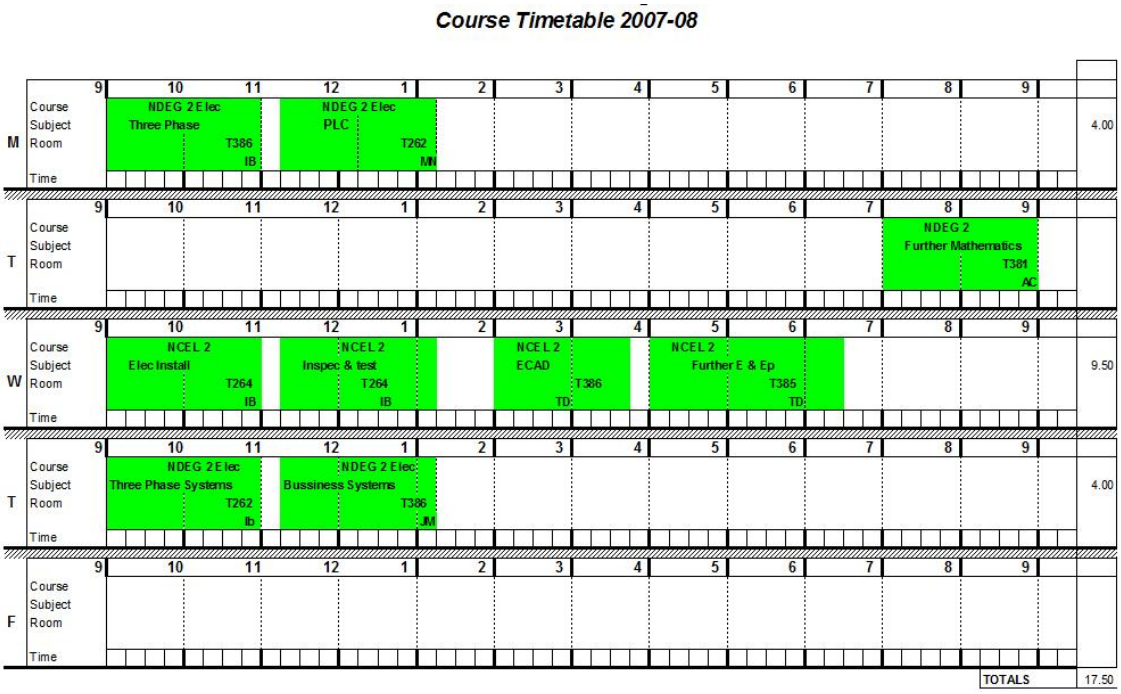


Figure 22: National Diploma (Mfg) - Second Semester timetable 2007-08 (Year 2)

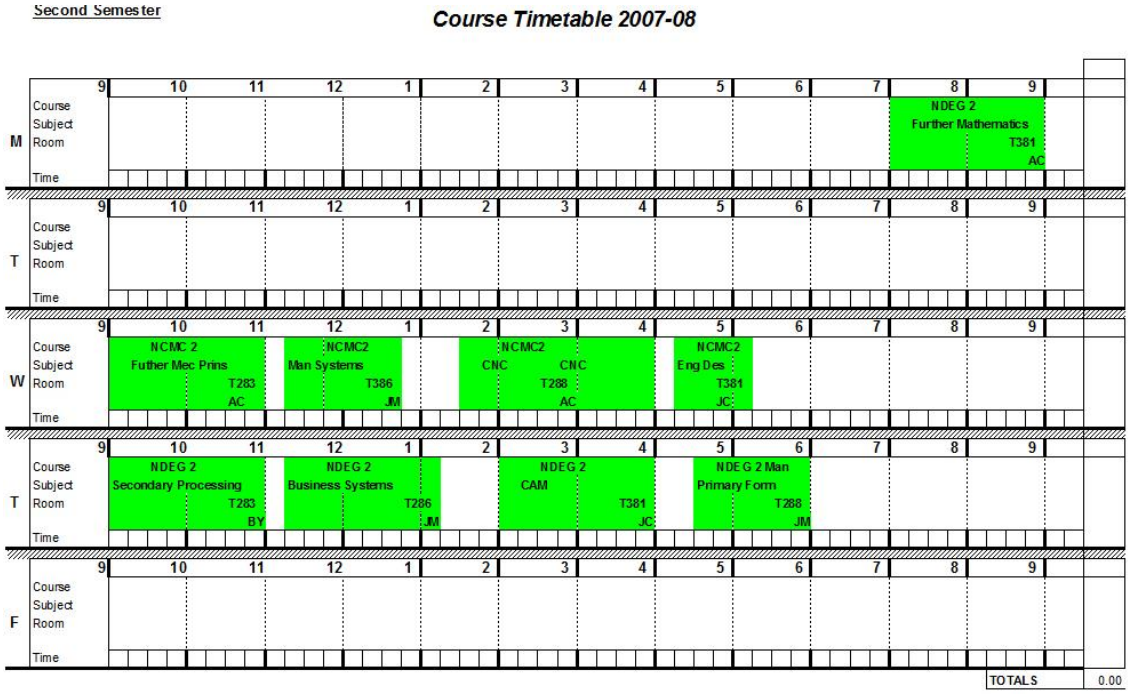


Table 11: Sophwort-on-Sea BTEC National Diploma 2006 to 2008 - Units studied

2006-07 Units (Year 1) Common programme	**2007-08 Units (Year 2) 'Electrical' programme**	**2007-08 Units (Year 2) 'Manufacturing' programme**
Computer-Aided-Des. *I (3 Open-assignments)	**Business Systems** *B (3 Open-assignments)	**Business Systems** *B (3 Open-assignments)
E&E Principles *F (6 controlled assignments)	Comms & Project *F& H (Ongoing project work)	Comms & Project *F & H (Ongoing project work)
Electronics *F (4 Controlled assignments)	ECAD *F (3 Controlled assignments)	CNC Machining *A (2 open/controlled assignments)
Engineering Drawing *I (3 Open-assignments)	Electrical Installation *J (4 Open-assignments)	**Computer-Aided-Mfg.** *A (5 'in-course' assignments)
Engineering Materials *B (3 Open-assignments/Workbook)	Further E&EP *F (6 predominantly open-book tests or controlled assignments)	Engineering Design *K (Based on work from 'Project' unit)
Maths for Tech. *F & K (6 Open-book tests, 1 assignment)	**Microelectronics** *C (2 open-assignments)	Further Mech. Principles *K (Optional unit, 4 open-assignments)
Mechanical Principles *K (6 Open/controlled assignments)	PLCs *C (3 Open, practical assignments)	**Manufacturing Systems** *B (3 open-assignments)
Science for Tech. *F (6 predominantly open-book tests, and controlled assignments)	**Three phase Systems** *J (4 written open-assignments)	Primary Forming *B (4 open-assignments)
	Inspection & Testing *J (2 open-assignments/practical)	**Secondary-Finish Pro.** *G (4 open-assignments)

'Core units' that all students had to study are shown shaded

Note: *X – indicates units taught by same lecturer.

Appendix I

Research timeline – December 2006 to December 2011

Below I have outlined a time-line my research process, which highlights the disjointed and iterative nature of my progress. To reflect on this process, I have revisited the twenty supervisory sessions I attended, spanning from December 2006 to February 2011. Living three-hundred miles away from the university, and due to problems with College cover, I had to fly on the day of supervision to the university, relying on e-mail contact in between times.

Timeline	Focus
Dec 06 to May 07	• Considering assessment practice on National and Higher National programmes. • Using data already existing from student College tutorials undertaken *prior to* research commencing. • Research questions lacked focus with an emphasis on trying to fit them around data already collected.
Apr-Jun 2007	• Students interviewed at the end of their 1st year study
	Requested a change in Director of Studies
May/Jun 2007	• Re-evaluated research questions. • Limited focus to National programme and one cohort of students • Decided to collect lecturer data in addition to the student tutorial data. • Developed interview schedule to use with Engineering Lecturer and determine their approach to BTEC assessment.
Jul 07	Lecturers interviewed on a one-to-one basis.
Nov 07 to Jan 08	• Developed a critical contextualisation of the history of technician engineering education, and a critical literature review relating to assessment practice. • Considered theoretical framework as a lens for understanding data.
Jan/Feb 2008	• First tentative approach to data analysis was to use a framework by Colley and Jarvis Colley et al. (2003), which considered characteristics based on four clusters termed *'process, location and setting, purposes, and content'* (Colley et al., 2003, p. 30-31).
Feb/Jul 2008	• Produced a synopsis of this review for both student' and lecturer' transcripts using the Colley and Jarvis framework. • Due to structure of this EdD programme had to attend four 'De-briefing seminars' which centred around reflections on our philosophical positioning as educational researchers.
Jun 08	• Students interviewed at the end of their 2nd year study
Aug/Sep 2008	• Following 'Debriefing sessions', developed philosophical positioning as a potential thesis chapter.

Oct 08	• Returned to data analysis and produced a synopsis of 2008 ND2 student interview transcripts under the headings of the interview schedule. .
Nov 08	• Again due to structure of this EdD programme, I was required to study an 'Evaluation and Change' (part 2) module. • This required a reflection on the journey so far and a taking stock of where we were.
Jan 09	• The latter part of the 'Evaluation and Change' module, reviewed data analysis methods. • As part of this exercise, I used the original 150 pages of lecturer raw transcripts, first reviewed in Jan/Feb 2008. • Read literature on data analysis and the revisited lecturer transcripts looking for 'key themes'.
Feb-Mar 2009	• Reviewing literature on thematic analysis
Apr-May 2009	• Data analysis of lecturer and student transcripts, searching for analytical codes.
Jun-Jul 2009	• Drafted BTEC history chapter
Aug 09	• Data analysis of ND1 & ND2 student tutorial searching for descriptive codes, using data-driven coding (using Gipps 2007 (p. 47-48))
Sep 09	• Due to similarity between ND1 and ND2 transcripts merged and again re-read looking for codes in-line with Gipps 2007 (p. 47-48), and Miles and Huberman (1994, p. 61.)
Oct 2009	• From student transcripts re-occurring themes were considered to be 'work ethic', 'procedural learning' and 'method of assessment'. These themes seemed influential on assessment practice and setting the standard, and to have a backwash influence on the lecturers' constructs of assessment.
Nov-Dec 2009	• From data analysis of lecturers' transcripts, cultural considerations arose as a significant influence. • Reviewed 'learning cultures' theory to help explain this influence and revisited data again.
Dec 09 to Jan 10	• Drafting data analysis chapter
Feb-Apr 2010	• Drafting data presentation chapter • Drafting literature review chapter
May-Jun 2010	• Completed draft of data analysis chapter. • Drafted Discussion and Conclusion chapters
Jul-Nov 2010	• Drafted Discussion and Conclusion chapters • Produced a draft thesis
Dec 10 to Jan 11	Produced a Summary of Thesis

Jan-Feb 2011	Finalised thesis Chapters 1, 2, 3.
Mar 11	Producing Draft of Chapter 4 - Methodology
Apr-Jun 2011	Re-drafted (and re-drafted!) thesis Chapters 5 to 9.
July 2011	Submitted thesis.
13 Oct 2011	Attended Professional Doctorate (viva) examination with Professor Katherine Ecclestone (External Examiner) and Professor David James (Internal Examiner).
16 Nov 2011	Extract from correspondence received from UWE: **Professional Doctorate Examination** Following your recent viva examination, I am writing to confirm that the recommendation of the examiners was as follows: "that the candidate be granted the degree of Professional Doctorate (EdD) subject to 7.2i – corrections (requires amendments of presentational and typographical errors only) being made to the thesis to the satisfaction of the internal examiner".
12 Dec 2011	Submitted revised thesis for re-examination to Internal Examiner.

July 2012 - Family Graduation photo at Bristol Cathedral

University of the West of England

Appendix J

Data analysis - coding framework

Table 12: Data analysis – 'What can be coded?'

1	Specific acts, behaviours – what people do or say.
2	Events - these are usually brief, one-off events or things someone has done. It is not uncommon for the respondent to tell them as a story.
3	Activities - these are of longer duration than acts and often take place in a particular setting and may have several people involved.
4	Strategies, practices or tactics - activities aimed towards some goal.
5	States -general conditions experienced by people or found in organizations.
6	Meanings - a wide range of phenomena at the core of much qualitative analysis.
7	Participation - people's involvement or adaptation to a setting.
8	Relationships or interaction - between people, considered simultaneously.
9	Conditions or constraints - the precursor to or cause of events or actions, things that restrict behaviour or actions.
10	Consequences - What happens if?
11	Settings - the entire context of the events under study.
12	Reflexive - the researcher's role in the process, how intervention generated the data.

(Gipps, 2007, pp. 47-48)

Miles and Huberman propose Bogdan and Biklen's (1992) scheme, who divide codes into the ten categories as shown in Table 13 on page 246. Again, this listing outlines general domains in which codes can be developed inductively.

Table 13: Bogdan and Biklen's Coding Scheme (1992)

1	Setting/Context: general information on surroundings that allows you to put the study in a larger context
2	Definition of the situation: how people understand, define, or perceive the setting or the topics on which the study bears
3	Perspectives: ways of thinking about their setting shared by informants ("How things are done here")
4	Ways of thinking about people and objects: understandings of each other, of outsiders, of objects in their world (more detailed than above)
5	Process: sequence of events, now, transitions, and turning points, changes over time
6	Activities: regularly occurring kinds of behaviour
7	Events: specific activities, especially ones occurring infrequently
8	Strategies: ways of accomplishing things; people's tactics, methods, techniques for meeting their needs
9	Relationships and social structure: unofficially defined patterns such as cliques, coalitions, romances, friendships, enemies
10	Methods: problems, joys, dilemmas of the research process - often in relation to comments by observers

(Miles and Huberman, 1994, p. 61)

Appendix K

Student consent form

Declaration - please read carefully……

- Alan Carter is currently undertaking educational research related to technician engineering students' progression through college courses.
- If you are agreeable, Alan Carter may like to use data extracted during the tutorial process for research purposes.

No information will be used that could identify you personally

Your CONFIDENTIALITY and ANONYMITY will be ASSURED

- Please indicate your response by circling '**YES**' or '**NO**' in adjacent box.

Data collected during my tutorial interview <u>can be used</u> for educational research purposes, <u>providing my identity remains confidential</u>.

Please circle response …

YES **NO**

Definitions: **confidentiality:** Explicit obligation that no identifiable data of the source will be used.

anonymity: Helps to prevent unwitting breaches of confidentiality by using a false name.

Only sign below after having circled the Yes or NO response above

Student's signature: ____________ Date: ____________

Print Name: ____________

Appendix L

Edexcel NSS Report form (2008)

Below is an extract form the NSS Report Form received by Sophwort College in April 2008, after a successful audit. This extract shows the emphasis placed on assessments complying with stated unit assessment and grading criteria.

Figure 23: Extract from Edexcel NSS Report (received April 2008)

SOPHWORT-ON-SEA COLLEGE - NSS Report

MATHEMATICS FOR TECHNICIANS

Unit id: 2288U Learners: 15 Recommended number of samples: 4 Number of samples: 4

SAMPLING ASSIGNMENT BRIEF

Title/reference of assignment brief:
ALGEBRA TRIGONOMETRY

List/identify the grading criteria which are targeted and those which are actually addressed

	Targeted	Actual
Pass:	P1a, P2, P3, P5	P1a, P2, P3, P5
Merit:		
Distinction:		

Is this assignment brief fit for purpose and are appropriate activities with vocational relevance used? (Complete all appropriate questions)

The assignment brief:	Yes	No
1. has accurate unit details	◉	
2. has accurate programme details	◉	
3. has clear deadlines for assessment	◉	
4. shows all relevant grading criteria for the unit(s) covered in the assignment	◉	
5. indicates relevant grading criteria targeted against each task	◉	
6. clearly states what evidence the learner needs to provide	◉	
7. is likely to generate evidence which is appropriate and sufficient	◉	
8. is set at the appropriate level	◉	
9. has a time period of appropriate duration	◉	
10. uses suitable vocational language	◉	
11. has a clear presentation format	◉	

Has the assignment been internally verified? (Complete questions 4 and 5 only if applicable)

Completed appropriate documentation provided with:	Yes	No	N/A
1. internal verifier's name and signature	◉		
2. a date prior to distribution to the learner	◉		
3. appropriate feedback to the assessor	◉		
4. relevant action identified where necessary			◉
5. agreed actions completed and signed off			◉

Extract from Edexcel NSS Report (received April 2008) - continued

Learner's name:

Assessor's name:

Which grading criteria has the assessor awarded?		
Pass	Merit	Distinction

Indicate that the work has been assessed accurately

◉ The evidence provided has been accurately assessed through the correct application of the grading criteria

The assessment judgement is partially or wholly inaccurate

if NO, give actual grading criteria achieved

Pass	Merit	Distinction

Assessor feedback provides the learner with:	Yes	No	N/A
1. constructive feedback on assessment	◉		
2. feedback linked to relevant grading criteria	◉		
3. identified opportunities for improving performance			◉
4. agreed actions			◉

Internal Verification documentation includes:	Yes	No	N/A
1. does work show evidence of internal verification	◉		
2. internal verifier's signature	◉		
3. a date shortly after the learners' work was assessed	◉		
4. appropriate feedback to the assessor	◉		
5. relevant action identified where necessary			◉
6. agreed actions completed and signed off			◉

Feedback following summative assessment of students' work against the assessment criteria

Appendix M

Science for Technicians Unit: Test 1 (2006)

On internally verifying a colleague's National assessment relating to the 'Science for Technicians' unit, lecturer Dominick commented that it was initially written as a closed-book test, but now used as an open-book test (termed 'Controlled Assignment' below). The content of the assessment was based on coursework questions located in a workbook compiled by the lecturer and used by students in class. Dominick designed his workbooks for students to progress through at their own pace, and with the intention that once a student had undertaken all the questions, the *'test really should be easy'*.

Sophwort-on-Sea College
FACULTY OF INDUSTRY
Engineering Programme Area

Course: National Dip/Cert/Award Yr.1
Unit Title: Science for Technicians
Unit Code/Level: U3 (2287U) L3 *Ass 1*
Assessment Type: Controlled Assignment
Assessment Topics: **Static and dynamic forces**
Duration: **90 Mins**
Student Name: Harry

PERFORMANCE CRITERIA		Achieved	Assessor's Signature	DATE
P1	Solve graphically, a static force systems that involves no more than three coplanar forces.	✓		26/9/06
M1	Solve analytically, a static force system that involves no more than three coplanar forces.	R.		

Assessment Paper Written by	Date: 1/9/06	**LEARNER'S DECLARATION** I certify that the work submitted for this assessment is MY OWN
Assessment Paper Internally Verified by:	Date: 5.09.06	Signed [redacted]
Assessor's Signature:	Date: 26/9/06	Date 26/9/06
Student Script Internally Verified by:	Date:	

Information removed to maintain anonymity

On comparing the classroom-based exercises against the assessment questions, it was seen that they are essentially very similar problems, primarily differentiated by differing numerical values. Below are the classroom examples from workbook.

Pages extracted from Lecturer's workbooks re. 'Science for Technicians unit'

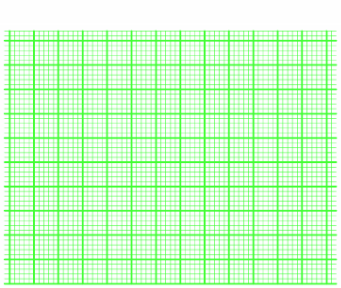
Workbook Questions 1 to 8 to be solved using a graphical method – PASS GRADE

OUTCOME 1 Sc. Nat Dip/Cert

Questions 2

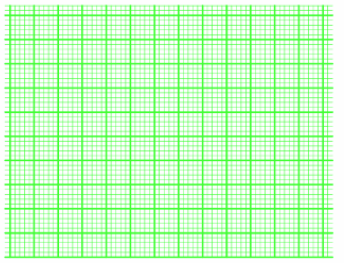
Using vector diagrams drawn to scale find the magnitude and direction of the resultant force in the following force systems:-

1) 30N, 20N Ans___



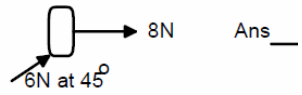
OUTCOME 1 Sc. Nat Dip/Cert

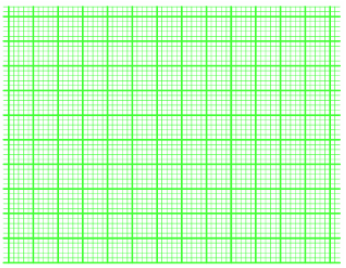
2) 60N at 45°, 100N Ans___



OUTCOME 1 Sc. Nat Dip/Cert

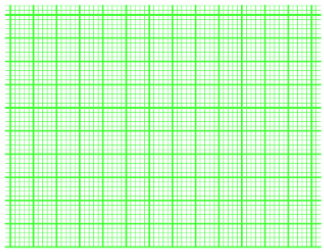
3) 8N, 6N at 45° Ans___





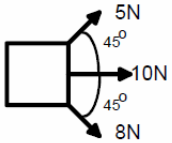
OUTCOME 1 Sc. Nat Dip/Cert

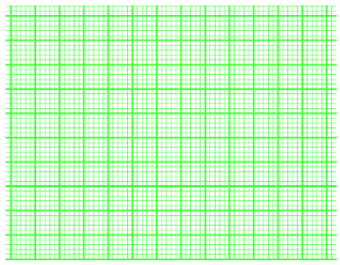
4) 1000N, 2000N Ans___



OUTCOME 1 Sc. Nat Dip/Cert

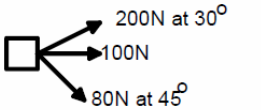
5) 5N, 45°, 10N, 45°, 8N Ans ___

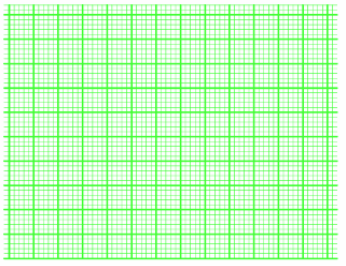




OUTCOME 1 Sc. Nat Dip/Cert

6) 200N at 30°, 100N, 80N at 45° Ans ___



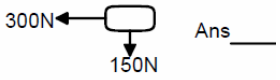


OUTCOME 1 Sc. Nat Dip/Cert

7) 10N, 15N Ans___

OUTCOME 1 Sc. Nat Dip/Cert

8) 300N, 150N Ans___



Pages extracted from Lecturer's workbooks re. 'Science for Technicians unit'

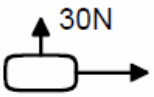
Workbook Questions 1 to 7 to be solved using an analytical method – MERIT GRADE

OUTCOME 1 Sc. Nat Dip/Cert

Questions 3

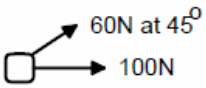
Using trig find the magnitude and direction of the resultant force in the following concurrent force systems:-

1)



Ans____

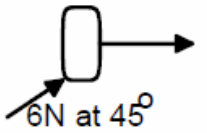
2)



Ans____

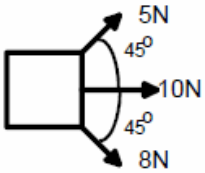
OUTCOME 1 Sc. Nat Dip/Cert

3)



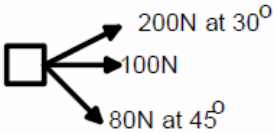
Ans____

4)

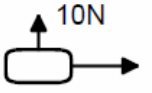


OUTCOME 1 Sc. Nat Dip/Cert

5)



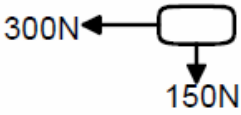
6)



Ans____

OUTCOME 1 Sc. Nat Dip/Cert

7)

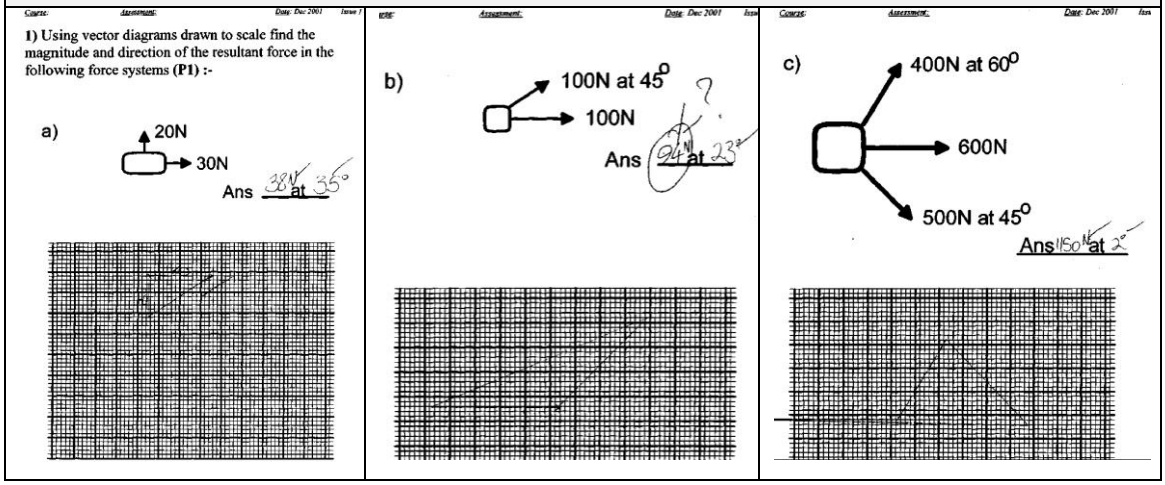


Ans____

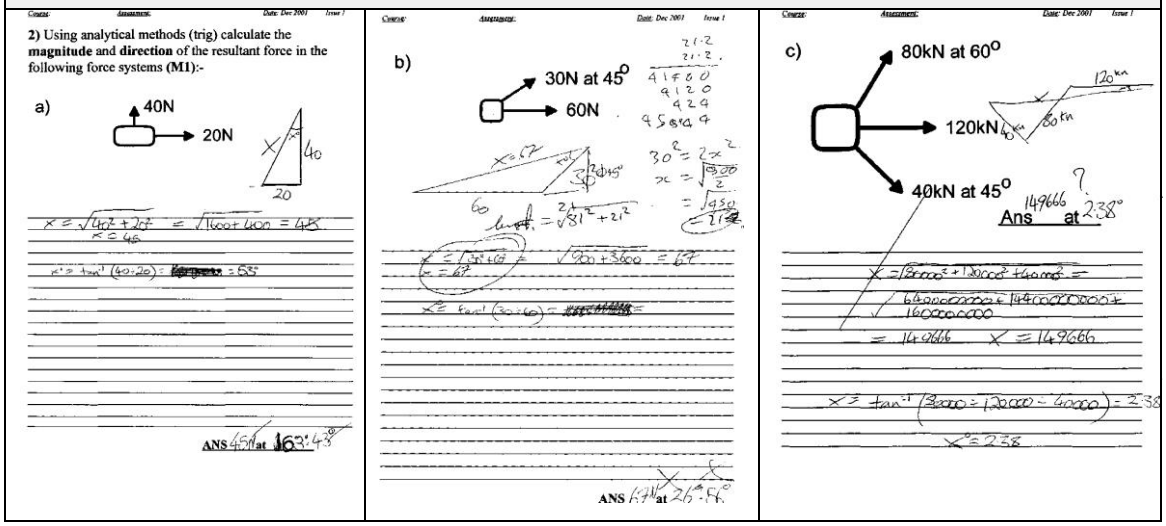
Below is the 'open-book' test used to assess this work relating to a student's script….

[Student 'Harry' achieved criterion P1, but was referred on criterion M1]

Test Question 1 (a) to (c) to be solved using a graphical method – PASS GRADE



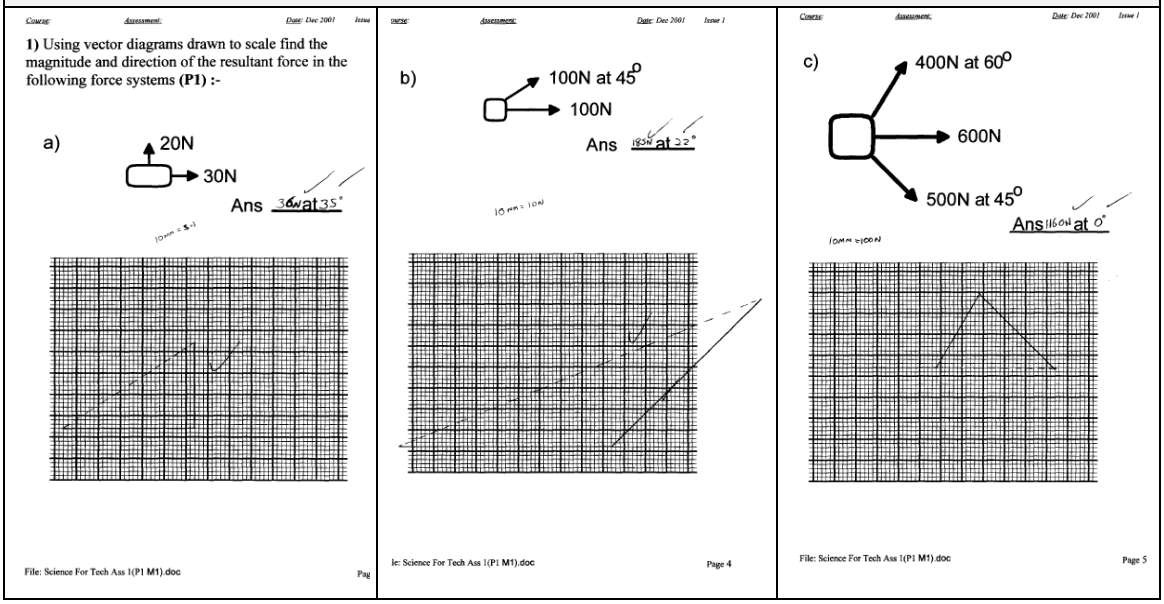
Test Question 2 (a) to (c) to be solved using an analytical method– MERIT GRADE



Below is the 'open-book' test used to assess this work relating to a student's script….

[Student 'Morris' achieved criterion P1, but was referred on criterion M1]

Test Question 1 (a) to (c) to be solved using a graphical method – PASS GRADE



Course: Assessment: Date: Dec 2001 Issue

1) Using vector diagrams drawn to scale find the magnitude and direction of the resultant force in the following force systems **(P1)** :-

a) 20N, 30N

Ans 36N at 35°

File: Science For Tech Ass 1(P1 M1).doc Pag

b) 100N at 45°, 100N

Ans 184N at 22°

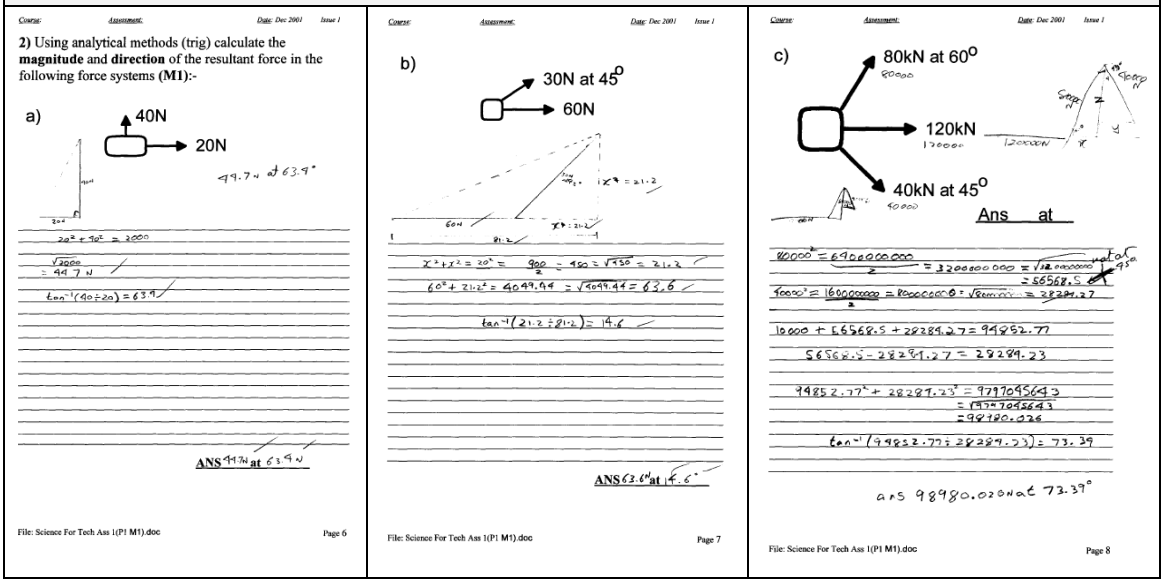
Ie: Science For Tech Ass 1(P1 M1).doc Page 4

c) 400N at 60°, 600N, 500N at 45°

Ans 1160N at 0°

File: Science For Tech Ass 1(P1 M1).doc Page 5

Test Question 2 (a) to (c) to be solved using an analytical method– MERIT GRADE



Course: Assessment: Date: Dec 2001 Issue 1

2) Using analytical methods (trig) calculate the **magnitude** and **direction** of the resultant force in the following force systems **(M1)**:-

a) 40N, 20N

49.7N at 63.9°

$20^2 + 40^2 = 2000$

$\sqrt{2000} = 44.7$ N

$\tan^{-1}(40 \div 20) = 63.9$

ANS 49.7N at 63.9°

File: Science For Tech Ass 1(P1 M1).doc Page 6

b) 30N at 45°, 60N

$X^2 + Y^2 = 20^2 = 900 \div 2 = 450 = \sqrt{450} = 21.2$

$60^2 + 21.2^2 = 4049.44 = \sqrt{4049.44} = 63.6$

$\tan^{-1}(21.2 \div 81.2) = 14.6$

ANS 63.6N at 14.6°

File: Science For Tech Ass 1(P1 M1).doc Page 7

c) 80kN at 60°, 120kN, 40kN at 45°

Ans at

$80000^2 = 6400000000 \div 2 = 3200000000 = \sqrt{3200000000} = 56568.5$

$40000^2 = 1600000000 \div 2 = 800000000 = \sqrt{800000000} = 28284.27$

$16000 + 56568.5 + 28284.27 = 99852.77$

$56568.5 - 28284.27 = 28284.23$

$99852.77^2 + 28284.23^2 = 9970956643$

$= \sqrt{9970956643} = 99780.026$

$\tan^{-1}(99852.77 \div 28284.23) = 73.39$

ans 99780.026N at 73.39°

File: Science For Tech Ass 1(P1 M1).doc Page 8

From a review of the workbook examples and the open-book test, it is clear that the first two questions in the workbook are the same as in the test with the exception of the numerical values of the forces, i.e. the questions require the same graphical construction. The third question of the test is similar to the fifth question in the workbook although one vector has a different angle and all the numerical values are changed. Even the merit grade questions are very similar to workbook examples although they require analytical solutions as opposed to the pass grade graphical methods. Thus, the Lecturer's comment, that if the students have completed the class-based questions then the *'test should be really easy'*, appear to be justified. Indeed, a question could be asked, should students be allowed access to their notes during the assessments when the questions are so similar? What is actually being tested here, hard work, organisational skills? How does such an approach impinge on the proficiency of the students? Out of the 23 National Certificate Year 1 and National Diploma Year 1 students that took this test, 74% passed criterion P1 and 48% achieved Merit grade M1 on the first attempt.

Appendix N

Science for Technicians Unit: Test 3 (2006)

Below are extracts from a lecturer's classroom workbook notes, used with students prior to a Science open-book test. The questions circled can be compared to the student's assessment scripts, and seen to be essentially the same questions but with different numerical values. Within one question, the workbook context related to a space vehicle, which was changed to a large oil tanker in the test question. The scripts shown below relate to a student's three separate attempts at the same open-book test.

OUTCOME 1 Sc. Nat Dip/Cert

Questions 12

1) Calculate the velocity after 12 seconds if the initial velocity is given as 20m/s, and the acceleration is given as $2m/s^2$.

2) Calculate the acceleration of a body if it is displaced by 200m in a time of 4 seconds, when its initial velocity is 5m/s.

Note: this classroom question is the same as Pass grade Question 1 on the open-book test, except the unit of displacement is changed from metres to kilometres and the unit of time has been changed from seconds, to minutes and seconds in the open-book test question. The information is presented in the same order in both classroom and assessment question.

Pages extracted from Lecturer's workbooks re. 'Science for Technicians unit'

OUTCOME 1 Sc. Nat Dip/Cert

3) Calculate the time taken for a body to accelerate from 50m/s to 80m/s, if the acceleration is $3ms^{-2}$.

4) Calculate the time taken for a body to be displaced a total of 20 km, if its initial velocity is 40 km/hr and its finial velocity is given as 120 km/hr.

Note: this classroom question is the same as Pass grade Question 2 on the open-book test, except the order in which the information is given is different. There were no changes to the units used between class work and test questions.

Pages extracted from Lecturer's workbooks re. 'Science for Technicians unit'

OUTCOME 1 Sc. Nat Dip/Cert

Questions 14

1) Calculate the force used to accelerate a body at $4m/s^2$, if its mass is 40 kg.

2) If a spaceship has a mass of 4000 kg, and is accelerated from rest to a velocity of 24000 km/hr in a time of 8mins, calculate the force required.

Note: this classroom question is the same as Pass grade Question 3 on the open-book test, except the 'spaceship' has become a 'large oil tanker' and the time is stated in minutes in the classroom question, and in hours and minutes in the open-book test. The information is presented in the same order in both questions.

First attempt at the 'Science for Technicians' open-book test – Newton's laws

Sophwort-on-Sea College

FACULTY OF INDUSTRY

Engineering Programme Area

Course: National Dip/Cert/Award Yr.1

Unit Title: Science for Technicians

Unit Code/Level: U3 (2287U) L3 ***Ass3***

Assessment Type: Controlled Assignment

Assessment Topics: **Newton's laws.**

Duration: 1 Hour

Student Name: Morris

PERFORMANCE CRITERIA		Achieved	Assessor's Signature	DATE
P3	Solve linear motion problems involving Newton's laws.	R		
M2	Solve angular motion problems using Newton's laws.			

Assessment Paper Written by	Information removed to maintain anonymity	***Date:*** 20/9/06	**LEARNER'S DECLARATION** I certify that the work submitted for this assessment is MY OWN
Assessment Paper Internally Verified by:		***Date:*** 03.10.06	**Signed** [signature]
Assessor's Signature:		***Date:*** 3/1/07.	**Date** 19/12/06
Student Script Internally Verified by:		***Date:***	

First attempt at the 'Science for Technicians' open-book test – Newton's laws

(continued)

1) [P3]Calculate the acceleration of a body if it is displaced by 3.5km in a time of 1 min: 20 seconds, when it has an initial velocity of 20m/s.

$u = 20\ m/s$

$t = 80\ secs$

$s = 3500\ m$

$s = ut + \frac{1}{2}at^2$ ✓

$= 3500 = 20 \times 80 + \frac{1}{2} a \times 80^2$

$= 3500 = 1600 + [redacted] a \times 6400$

$= 3500 = 1600 + 6400a$

$= 3500 - 1600 = 6400a$

$= 1900 = 6400a$

$\frac{1900}{6400} = a = 0.296\ m/s^2$ ✗

2) [P3] A car has an initial velocity of 50km/hr, and a final velocity of 160km/hr, calculate the time that it takes for the car to travel a distance of 45km.

$u = 50\ km/hr$

$v = 160\ km/hr$

$s = 45$

$s = \frac{(u+v)t}{2}$

$45 = \frac{(50+160)t}{2}$

$45 = \left(\frac{210}{2}\right) \times t$

$45 = 105 \times t$

$\frac{45}{105} = t$

$t = 0.428\ hrs$ ✓

First attempt at the 'Science for Technicians' open-book test – Newton's laws

(continued)

3) [P3] A large oil tanker has a mass of 300,000 Tonne, it is accelerated from rest to a velocity of 20km/hr in a time of 2hrs: 30mins, calculate the force required.
(Note 1000kg = 1Tonne)

M = 300000000kg

V = 20 km/hr

t = 2.30 hours

a = 8.695

$F = M \times a$

$F = 300000000 \times 8.695$

$= 2608500000$ N

$a = \frac{(V - U)}{t}$

$a = \frac{20 - 0}{2.3} = 8.695$ X

Second attempt at the 'Science for Technicians' open-book test – Newton's laws

Sophwort-on-Sea College

FACULTY OF INDUSTRY

Engineering Programme Area

Course: National Dip/Cert/Award Yr.1

Unit Title: Science for Technicians

Unit Code/Level: U3 (2287U) L3 ***Ass3***

Assessment Type: Controlled Assignment

Assessment Topics: **Newton's laws.**

Duration: **1 Hour**

Student Name: Morris

PERFORMANCE CRITERIA		Achieved	Assessor's Signature	DATE
P3	Solve linear motion problems involving Newton's laws.	R.		
M2	Solve angular motion problems using Newton's laws.			

Assessment Paper Written by	Information removed to maintain anonymity	***Date:*** 20/9/06	**LEARNER'S DECLARATION** I certify that the work submitted for this assessment is MY OWN
Assessment Paper Internally Verified by:		***Date:*** 23-10-06	**Signed**
Assessor's Signature:		***Date:*** 15/2/07	**Date** 13/02/07
Student Script Internally Verified by:		***Date:***	

Second attempt at the 'Science for Technicians' open-book test – Newton's laws

(continued)

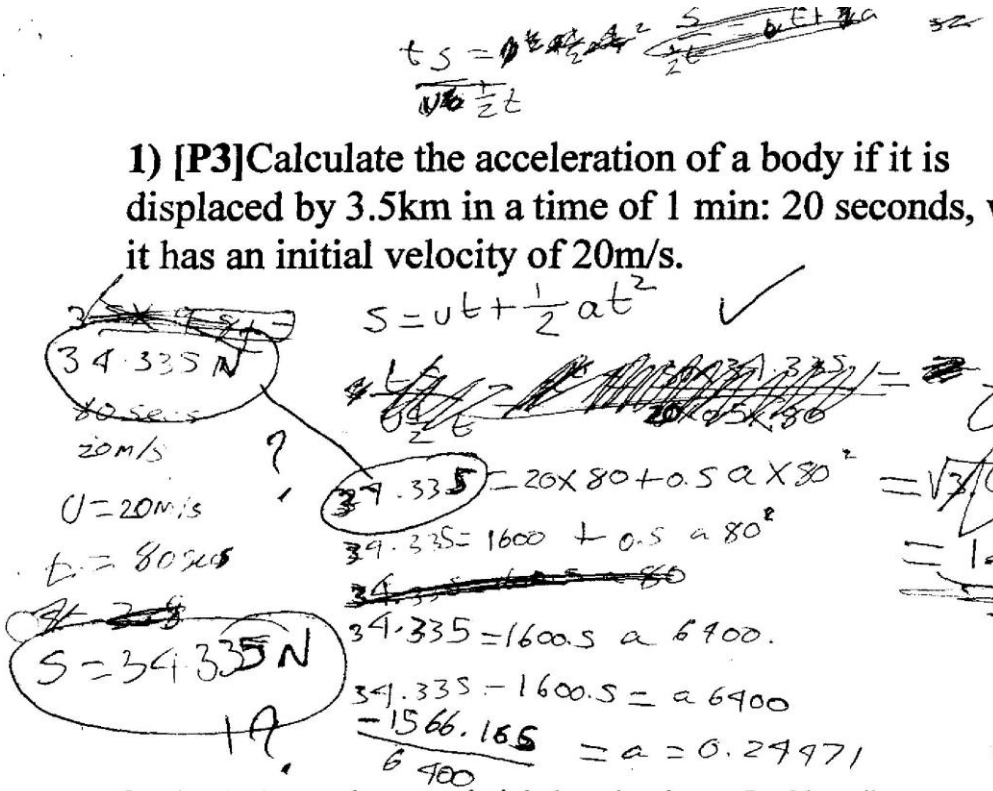
Complete Q1 Parts a, b & c for PASS grade.
Complete Q2 Parts a, b & c for MERIT grade.

Assessors Comments

We will need to speak about this, I will need to see your work Book.

Second attempt at the 'Science for Technicians' open-book test – Newton's laws

(continued)



1) [P3]Calculate the acceleration of a body if it is displaced by 3.5km in a time of 1 min: 20 seconds, when it has an initial velocity of 20m/s.

$s = ut + \frac{1}{2}at^2$

34.335 N

20m/s

$u = 20 m/s$

$t = 80 s$

$s = 34.335 N$

$34.335 = 20 \times 80 + 0.5 a \times 80^2$

$34.335 = 1600 + 0.5 a 80^2$

$34.335 = 1600.5 a 6400.$

$34.335 - 1600.5 = a 6400$

$\frac{-1566.165}{6400} = a = 0.24471$

2) [P3] A car has an initial velocity of 50km/hr, and a final velocity of 160km/hr, calculate the time that it takes for the car to travel a distance of 45km.

$u = 50 km/hr$

$v = 160 km/hr$

$s = 45$

$t = ?$

$s = \frac{(u+v)t}{2}$

$45 = \frac{(50 + 160)t}{2}$

$45 = \frac{210}{2}t$

$45 = 105 \times 6$

$\frac{45}{105} = t \quad t = 0.42857$ hours

Second attempt at the 'Science for Technicians' open-book test – Newton's laws

(continued)

3) [P3] A large oil tanker has a mass of 300,000 Tonne, it is accelerated from rest to a velocity of 20km/hr in a time of 2hrs: 30mins, calculate the force required.
(Note 1000kg = 1Tonne)

$M = 300,000,000\,kg$ ✓

$V = 20\,km/hr$

$t = 2:30$

$V = \frac{20 \times 1000}{360}$

$V = 55.55\,m/s$

~~150~~

$t = 2:30h = 150\,mins$

$= 9000$ ~~s~~ Secs

$a = \frac{(V-U)}{t}$

$a = \frac{55.55 - 0}{9000}$

$= 6.17222 = a$

Third attempt at the 'Science for Technicians' open-book test – Newton's laws

Sophwort-on-Sea College

FACULTY OF INDUSTRY

Engineering Programme Area

Course: National Dip/Cert/Award Yr.1

Unit Title: Science for Technicians

Unit Code/Level: U3 (2287U) L3 ***Ass3***

Assessment Type: Controlled Assignment

Assessment Topics: **Newton's laws.**

Duration: **1 Hour**

Student Name: Morris

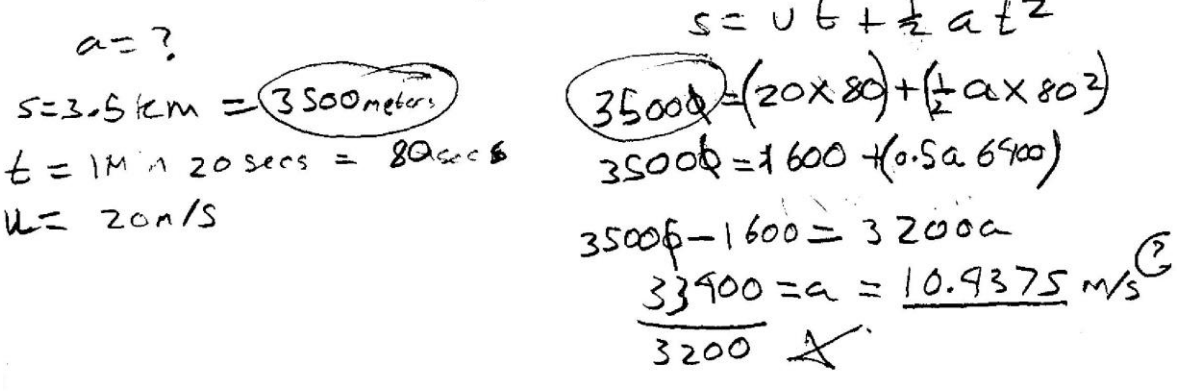
PERFORMANCE CRITERIA		Achieved	Assessor's Signature	DATE
P3	Solve linear motion problems involving Newton's laws.	✓		3/3/07.
M2	Solve angular motion problems using Newton's laws.			

Assessment Paper Written by	Information removed to maintain anonymity	***Date:*** 20/9/06	**LEARNER'S DECLARATION** I certify that the work submitted for this assessment is MY OWN
Assessment Paper Internally Verified by:		***Date:*** 03-10-06	**Signed** 2/3/07 **Date**
Assessor's Signature:		***Date:*** 3/3/07.	
Student Script Internally Verified by:		***Date:***	

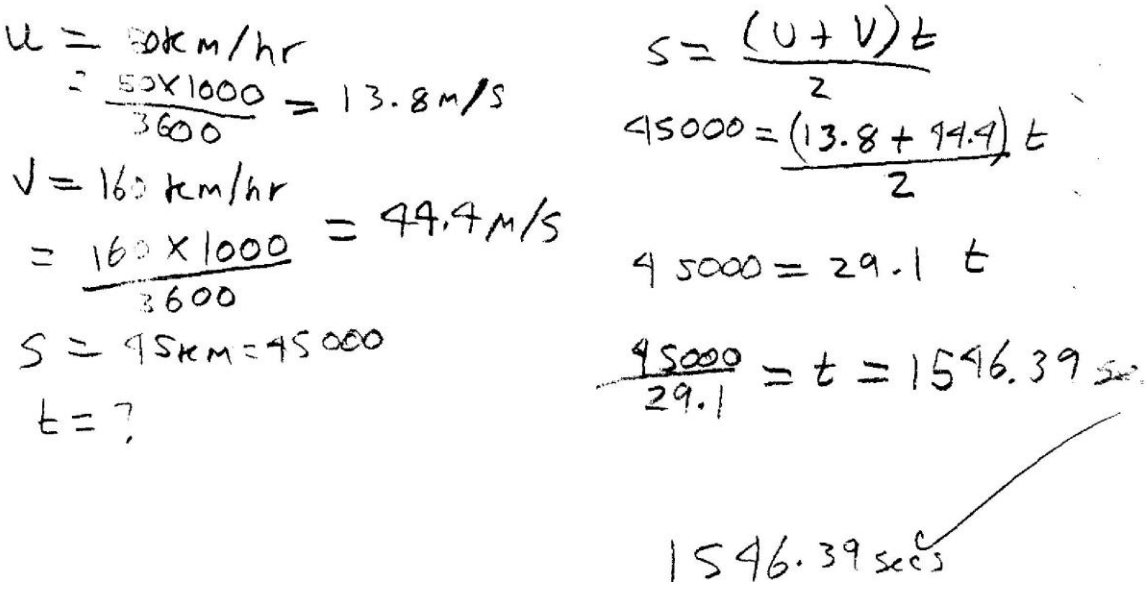
Third attempt at the 'Science for Technicians' open-book test – Newton's laws

(continued)

1) [P3]Calculate the acceleration of a body if it is displaced by 3.5km in a time of 1 min: 20 seconds, when it has an initial velocity of 20m/s.



2) [P3] A car has an initial velocity of 50km/hr, and a final velocity of 160km/hr, calculate the time that it takes for the car to travel a distance of 45km.



Third attempt at the 'Science for Technicians' open-book test – Newton's laws

(continued)

3) [P3] A large oil tanker has a mass of 300,000 Tonne, it is accelerated from rest to a velocity of 20km/hr in a time of 2hrs: 30mins, calculate the force required.
(Note 1000kg = 1Tonne)

M = 300000000

$V = \frac{20 \times 1000}{3600} = 5.55 m/s$

t 2hrs 30mins $2 \times 60 = 150 \times 60$
$= 9000$

F ?

$a = \frac{(v - U)}{t}$

$a = \frac{5.55 - 0}{9000} = 0.0006166$

~~AA~~ $F = M \times a$

$F = 300000000 \times 0.0006166$

$= 184998$ units.

Below is a table outlining the success rates of all students in the cohort over the three occasions this open-book test was taken/re-taken.

Table 14: Breakdown of achievement rates in Sophwort Engineering Science Test

Student Pseudonym	1st attempt at test (19th Dec 2006)		2nd attempt at test (12th Feb 2007)		3rd attempt at test (3rd Mar 2007)	
	Pass	Merit	Pass	Merit	Pass	Merit
Cameron	**Yes**	No	-	-	-	-
Collin	No	-	No	-	**Yes**	-
Glen	No	**Yes**	**Yes**	-	-	-
Harold	No	No	No	No	**Yes*** (Q1 incorrect)	No
Harry	**Yes**	**Yes**	-	-	-	-
Hector	**Yes**	**Yes**	-	-	-	-
Lesley	No	-	No	-	**Yes**	
Mario	No	**Yes**	No	-	**Yes**	-
Morris	No	-	No	-	**Yes**	-
Rick	No	No	**Yes**	**Yes**		
Steve	No	No	**Yes**	No	-	**Yes**$^{\alpha}$ (3 Jul 2007)
Stu	No	No	No	**Yes**	**Yes**	-
Wayne	No		No		**Yes**	
Σ	3	4	3	2	7	1
Cumulative Σ	**3**	**4**	**6**	**6**	**13**	**7**

* Solution to Question 1 was still incorrect.
$^{\alpha}$ Merit grade award dated 3rd July 2007.

After the third run of the same test paper, all students had achieved the 'Pass grade' assessment criterion (P3), and seven students had achieved the 'Merit grade' criterion (M2).

Appendix P

Mechanical Principles Unit: Assessment 3 (2007)

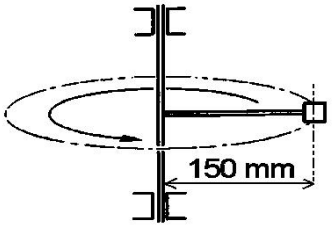
Below are the Mechanical Principles notes made by Steve, during his 1st year National Diploma. Steve's work is included here as he allowed me to have access to the classroom notes he took in my lessons. When viewed against the assessment paper I wrote, it can be seen that I gave the students a very similar question in the lesson to work through that I used in the assessment, except for a change of numbers. What did it mean to pass this assessment?

Extract of Mechanical Principles course notes supplied to students

TUTORIAL QUESTIONS relating to ANGULAR MOTION (continued)

EXERCISE 6f

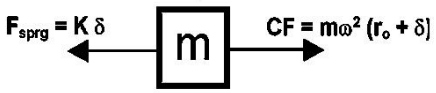
A mass 'm' of 0.4 kg is free to slide radially on a spoke, as shown in the sketch opposite. If the unstretched length of the spring is 150 mm, calculate the radius of the spring and the force induced within the spring if the system rotates at 300 rev/min and the spring rate is 1200 N/m.



Solution Procedure:

- Draw free body diagram of mass, include Spring & CF force.
- Equate forces to the left to forces to the right.
- Rearrange and solve for deflection 'δ', then determine 'r'.

Free body diagram

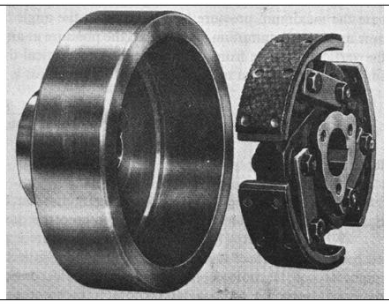


(223.5 mm ; 88.3 N)

Question 15

A 1 kg mass is attached to one end of the spring of stiffness 2 kN/m, the other end is attached to a fixed point on a smooth horizontal table. If the spring and mass rotate at 200 rev/min, calculate the radius of the path of mass 'r' and the tension force 'P' in the spring. The length of the unstretched spring is 0.35 m.

(448 mm ; 196 N)



CENTRIFUGAL CLUTCHES

The centrifugal clutch shown essentially consists of three elements:

(i) The mating frictional surfaces.

(ii) The means of transmitting the torque to and from the frictional surfaces.

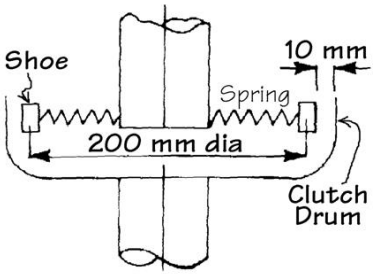
(iii) The actuating mechanism.

Question 16

The centrifugal clutch shown opposite is at rest. The clutch consists of a shoe located on the ends of spring. The springs used have a stiffness of 15 N/mm.

(a) If the clutch is to be designed so that the shoes just engage with the drum at a speed of 600 rpm, find the required mass of the shoe.

(b) If the clutch speed is now ***increased*** to 960 rpm, calculate the force exerted on the clutch drum.



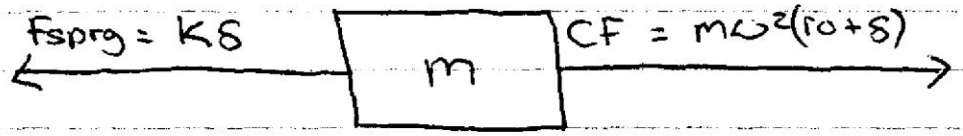
(0.345 kg ; 234 N)

Extracts from Steve's notes (Note 'Steve' is from the researched cohort)

First class work example I worked through with the students:

Exercise 6F

Mass, m = 0·4 kg
Unstretched L = 150mm x 10^{-3} m
Angular U = 300rpm x 2π / 60
= 31·4 rad/s
Spring Rate = 1200 N/m
Radius = ?



Forces to left = forces to right

$F_{sprg} = CF$

$K \times \delta = m\omega^2(r_0 + \delta)$

$\delta = \frac{m\omega^2 r_0}{K - m\omega^2}$

$\delta = \frac{0.4 \times (31.4^2) \times 0.15}{1200 - 0.4 \times (31.4^2)}$

$= \frac{59.1576}{805.616}$

$= 0.073m$

$K \times \delta = m\omega^2 r$

$\frac{K \times \delta}{m\omega^2} = r$

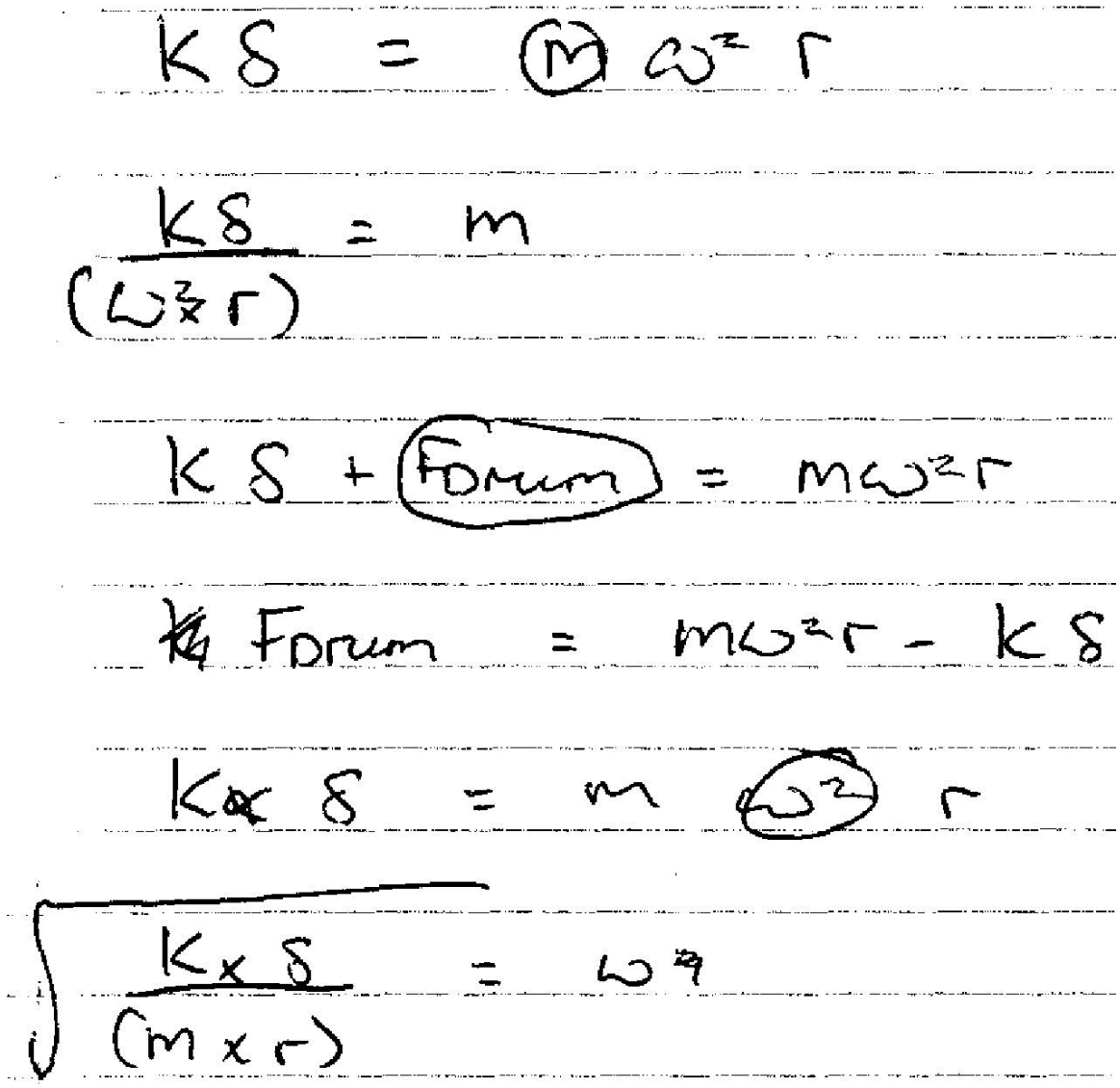
$r = \frac{(1200 \times 0.073)}{(0.4 \times 31.4^2)} = 0.22m$

$K = \frac{P}{\delta}$ $K \times \delta = P$

$1200 \times 0.073 = 87.6N$

Extracts from Steve's notes (Note 'Steve' is from the researched cohort)

Exercise 6f (continued)

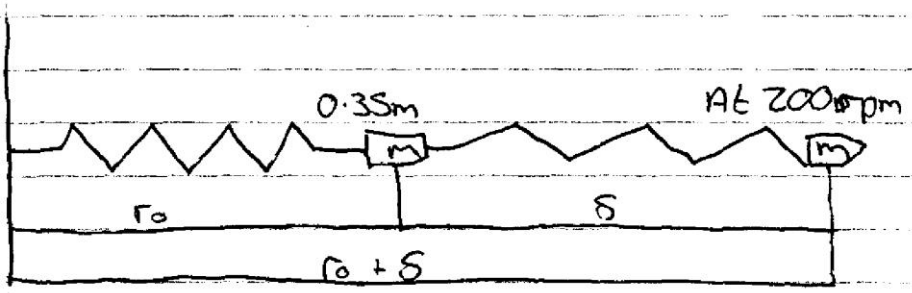


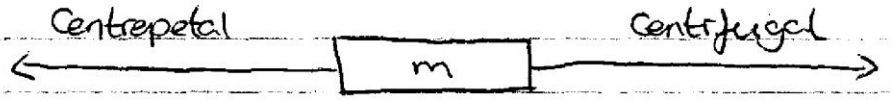
The above final part of the solution to Exercise 6f provides the transposition required for the merit grade of assignment Question 1b.

Extracts from Steve's notes (Note 'Steve' is from the researched cohort)

Question 15

Mass, m = 1kg
Spring Stiffness, k = 2 kN/m x 10^3 N/m
Angular Velocity, ω = 200rpm x 2π/60
~~Unstretched sp~~ = 20.94 rad/s
Unstretched Spring = 0.35m
Radius, r = ?





$K \times \delta = m\omega^2 r$ r

$K\delta = m\omega^2$ ~~$(r_o + \delta)$~~

$\frac{K \times \delta}{m\omega^2} = r$

$\frac{20.94^2 \times 0.098}{1 \times 20.94^2} =$

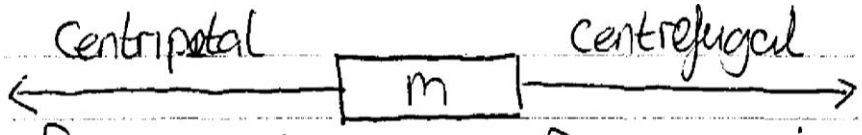
~~$K = P$~~ $\quad \delta = \frac{m\omega^2 r_o}{K - m\omega^2}$

~~$K \times \delta = P$~~ $= \frac{1 \times 20.94^2 \times 0.35}{(2 \times 10^3) - (1 \times 20.94^2)} \quad \frac{153.5}{1561.5}$

~~$\delta = \frac{P}{K}$~~ $= 0.098$

Extracts from Steve's notes (Note 'Steve' is from the researched cohort)

Question 15 (continued)



forces to left = forces to right

$F_{spring} = CF$

$kx\delta = m\omega^2 r$

$\delta = \frac{m\omega^2 r_o}{k = m\omega^2}$

$\delta = \frac{1 \times 20.94^2 \times 0.35}{2000 - (1 \times 20.94^2)}$ $\quad \frac{153.5}{1561.5}$

$\delta = 0.098$

$r = \frac{k \times \delta}{m\omega^2}$

$r = \frac{2000 \times 0.098}{1 \times 20.94^2}$ $\quad \frac{196}{438.5}$

$r = 0.45m$

$P = k \times \delta$

$P = 2000 \times 0.098$

$P = 196N$

Extracts from Steve's notes (Note 'Steve' is from the researched cohort)

Question 16

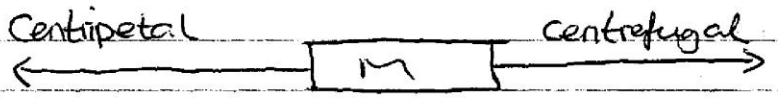
Spring Stiffness, k = 15N/mm x 10^3 m

Angular Velocity, ω = 600rpm x 2π/60

= 62.8 rad/s

Mass = ?

a) Find mass for initial contact at 600rpm

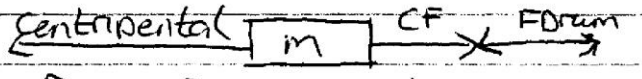


$F_{spring} = CF$

$Ks = m\omega^2 r$

$\frac{Ks}{(\omega^2 \times r)} = m$

$\frac{15000 \times 0.01}{62.8^2 \times 0.11} = \frac{150}{433.8} = 0.35\ kg$



$F_{sprg} + F_{Orum} = CF$

$Ks + F_{orum} = m\omega^2 r$

$F_{orum} = m\omega^2 r - Ks$

$= 0.35 \times 100.53^2 \times 0.11 - 15000 \times 0.$

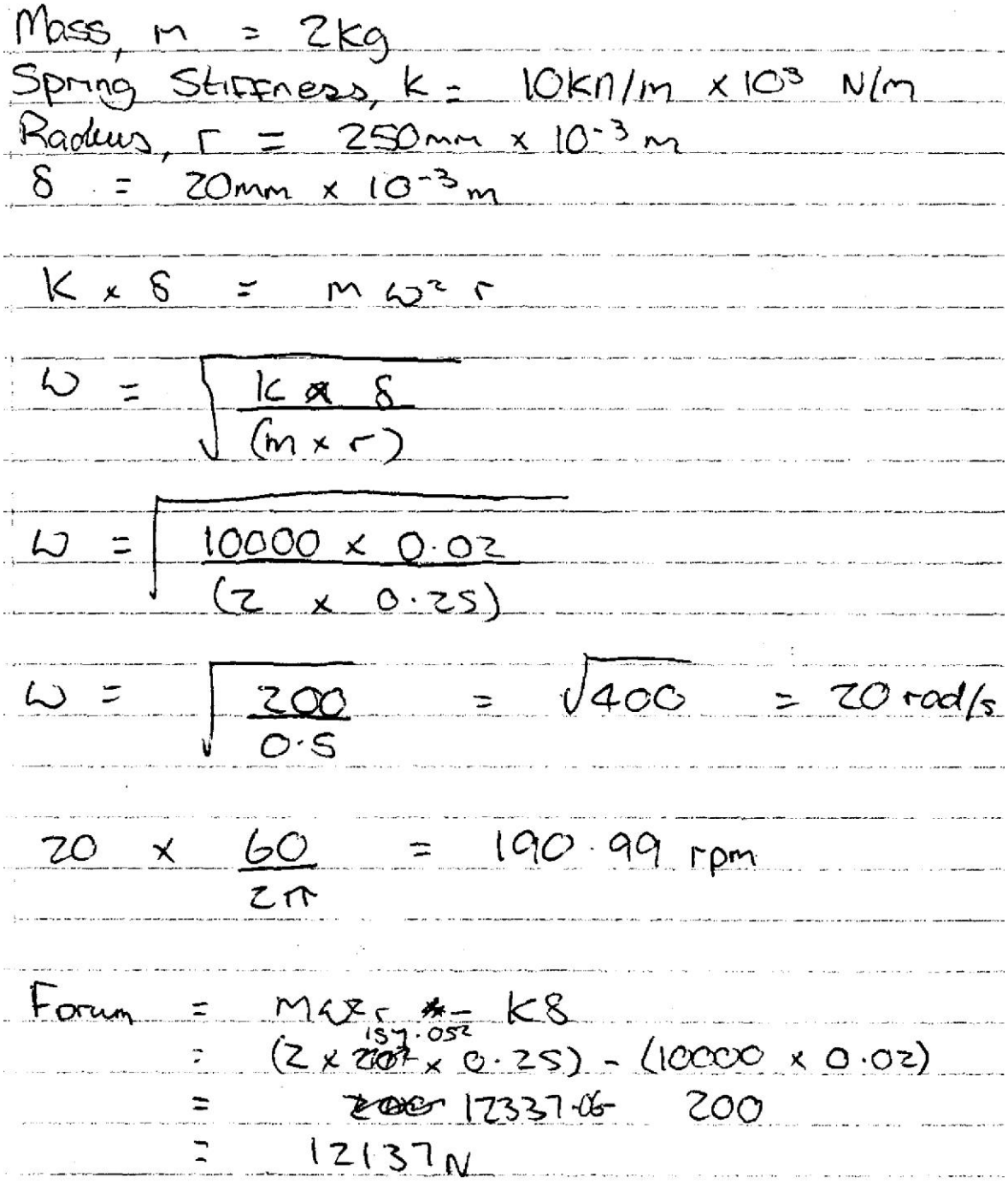
$= 389.09 - 150$

$= 239.09W$

- If the first part of the above solution to Question 16 is compared to Assignment Question 1a (see page 280), it can be seen to be the same but with different numerical values used.
- In both Question 16 and Assignment Question 1a, the mass of the clutch shoes is required, thus this example provides a structured solution essentially requiring different numerical values to be inserted into the transposed equation.
- As this assessment was an open-assignment, students could work on the assessment outside of the classroom environment and refer to this worked solution in their own time, or entering discussions with other students.

Extracts from Steve's notes (Note 'Steve' is from the researched cohort)

Question 16 (continued)



The above final part of the classroom solution to Question 16 provides the transposition required for the merit grade of assignment Question 1b.

Extracts from Steve's notes (Note 'Steve' is from the researched cohort)

Question 16 (continued)

$F_F = \mu \times F_D$

$= 0.25 \times 12137$

$= 3034.25\ N$

Torque $= F_F \times R_D$

$= 3034.25 \times 0.3$

$= 910.275\ Nm$

$P = T\omega$

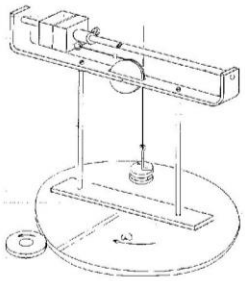
$= 910.275 \times 157.08 \times 4$

$= 571942.65\ \omega$

My National Diploma Mechanical Principles assessment

(used with all cohorts from 2002 to 2007)

Sophwort-on-Sea College
FACULTY OF INDUSTRY
Engineering Programme Area



Course: **National Diploma Year 1**

Unit Title: **Mechanical Principles**

Unit Code/Level: **Unit 29** (2508U) **- Level 3**

Assessment Type: **Assignment, N°. 29 – 3**

Assessment Topics: **Centripetal Force Experiment**

Duration/ Submission Date: 4 weeks / _____

Student Name: _____

PERFORMANCE CRITERIA		Achieved	Assessor's Signature	Date
P4	**Recognise** that **centripetal acceleration results** from a **vector change** of **velocity** in **rotational dynamic systems**.			
P5a	**Recognise** and **determine** the **effects of centripetal force** in **centrifugal clutches** and on the stability of vehicles. *(Note: P5b relates to 'Stability of vehicles' assignment)*			
M3a	**Predict** the **parameters**, which **give rise** to **centripetal acceleration** and **force** in **dynamic systems** and **evaluate their effects**. *(Note: M3b relates to 'Stability of vehicles' assignment)*			
D2	**Justify** the **selection** of a **centrifugal clutch** to **transmit mechanical power** in **given service conditions**.			

File: centripetal_ND.doc

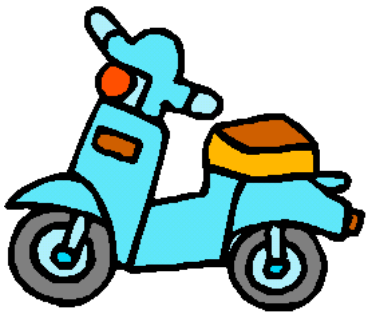
Assessment Paper Written by	***A Carter***	*Date:*	Learner's declaration:
Assessment Paper Internally Verified by:	*Name removed*	*Date:*	**I certify that the work submitted for this assessment is MY OWN**
Assessor's Signature:	***A Carter***	*Date:*	Signed: _____
Student Script Internally Verified by:		*Date:*	Date: _____

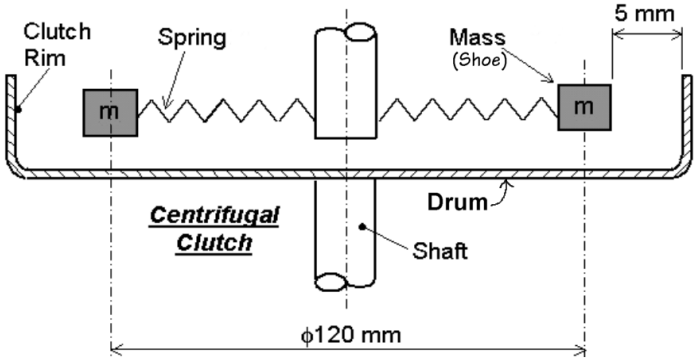
Please see overleaf for assessor's comments.

Extract from the Mechanical Principles open-assignment

(Note all students had different questions although only the numbers were changes, the method for a solution was the same for all students).

Question 1





(a) Pass Grade Question [P5a]

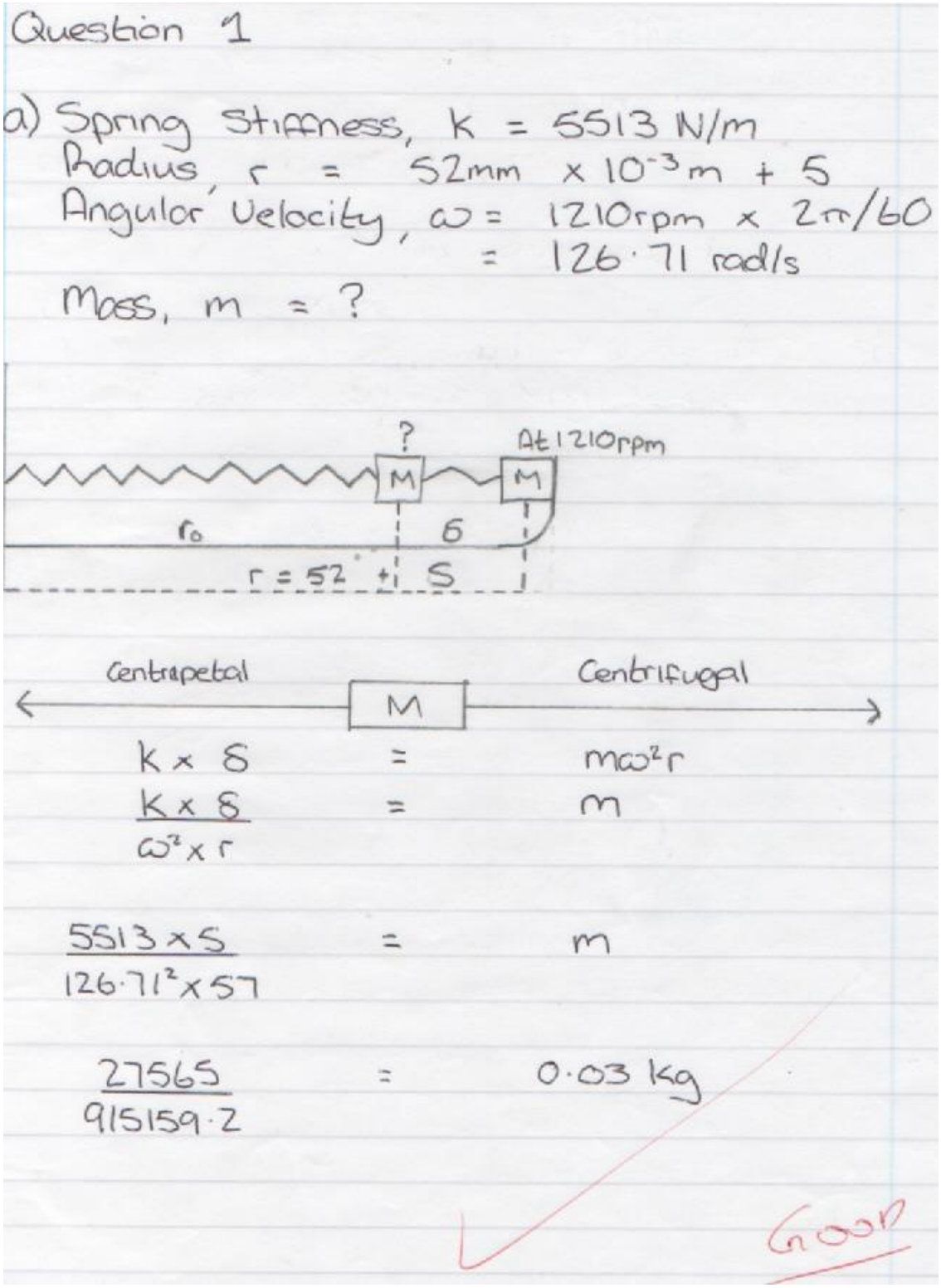
The centrifugal clutch shown in the sketch is in the stationary position. The two springs used within the clutch mechanism each have a stiffness of 5 kN/m and are each attached to a shoe of mass 'm'. The clutch is designed so that the masses will engage with the clutch rim at a speed of 1000 rpm. Calculate the magnitude of the shoe mass required.

(b) Merit Grade Question [M3a]

The clutch is to be used to drive a small moped, which when loaded, requires a torque of 150 N m to initiate movement from rest. If the actual stiffness of the springs used is 6 N/mm and the actual mass of one shoe is 0.042 kg, calculate the speed to which the engine must be raised in order to supply the required torque. Assume the friction coefficient between the shoe-linings and cast-iron clutch rim is 0.4, the radius of the drum is 68 mm and the clutch design incorporates two masses (i.e. two shoes).

Steve's first attempt at 'clutch' open-assignment 'Pass' question

(Note 'Steve' is from the researched cohort)

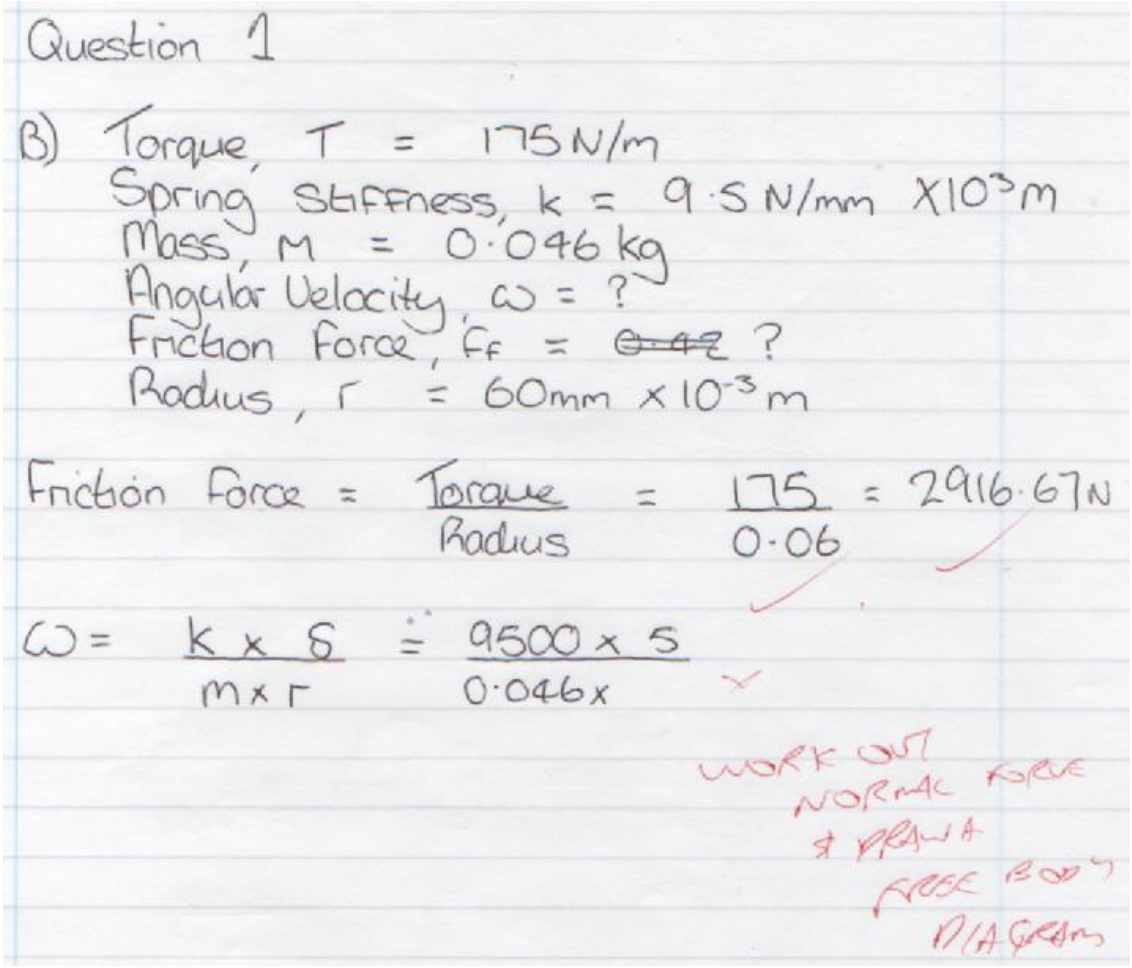


Steve passed assessment on his first submission

This solution is based on the mathematical procedure shown in class work Exercise 6f and Questions 15 and 16. This actual calculation is shown in Question 16.

Steve's first attempt at 'clutch' open-assignment 'Merit' question

(Note 'Steve' is from the researched cohort)



Question 1

B) Torque, T = 175 N/m
Spring Stiffness, k = 9.5 N/mm X10³m
Mass, M = 0.046 kg
Angular Velocity, ω = ?
Friction force, F_f = ~~0.42~~ ?
Radius, r = 60mm x 10^{-3} m

Friction Force = $\frac{\text{Torque}}{\text{Radius}} = \frac{175}{0.06} = 2916.67\text{N}$

$\omega = \frac{k \times \delta}{m \times r} = \frac{9500 \times 5}{0.046 x}$

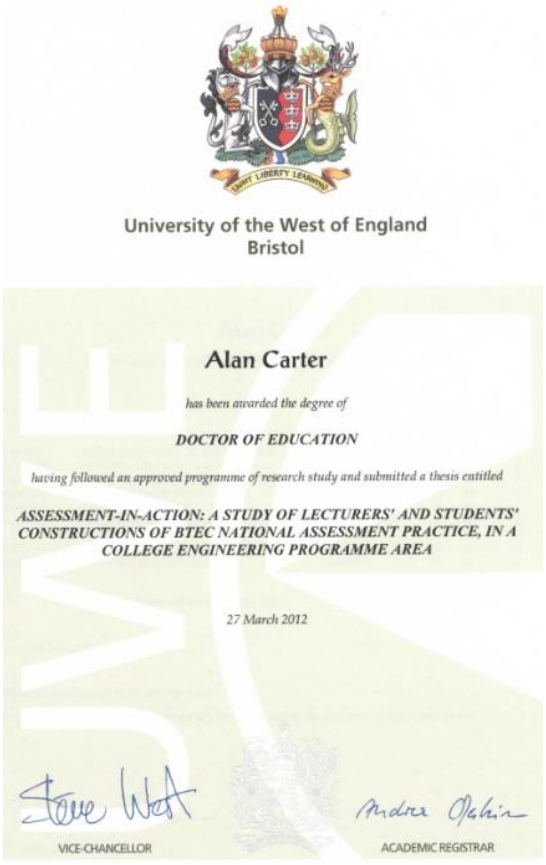
WORK OUT NORMAL FORCE & DRAW A FREE BODY DIAGRAM

Steve's attempt for merit grade was not complete and so it was 'referred'.
Steve was provided with the opportunity to re-submit, but chose to settle for achievement of the pass grade only.

This assessment question is based on the solution to class work Question 16, but requires a re-working of the process.
In the class work example, the torque and power are required to be found, whereas in the assignment question, it is the speed required to achieve a stated torque that is to be calculated. However, the transposition required is shown in both Exercise 6f and Question 16.

End of Appendices

[File: EdD Thesis - 'BTEC Assessment Practice' by Alan Carter - March 2012 (UWE)]



University of the West of England
Bristol

Alan Carter

has been awarded the degree of

DOCTOR OF EDUCATION

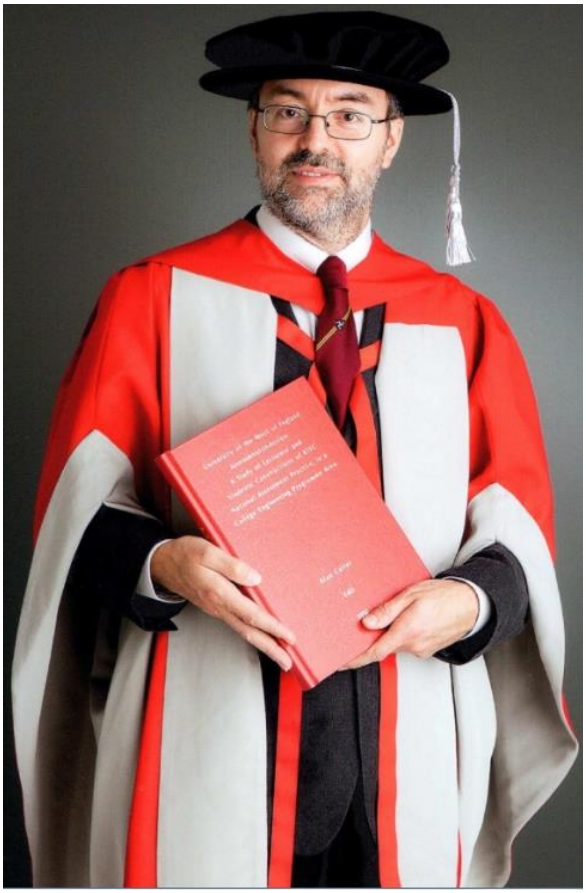
having followed an approved programme of research study and submitted a thesis entitled

ASSESSMENT-IN-ACTION: A STUDY OF LECTURERS' AND STUDENTS' CONSTRUCTIONS OF BTEC NATIONAL ASSESSMENT PRACTICE, IN A COLLEGE ENGINEERING PROGRAMME AREA

27 March 2012

VICE-CHANCELLOR

ACADEMIC REGISTRAR



Dr Carter - August 2012