CONTEXTUALISING THE DENTAL CURRICULUM

A Model for a Systematic and Comprehensive Approach to Curriculum Planning

ALLAN KALAPA MBITA

PhD Thesis

Cardiff University 2009

ProQuest LLC
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106-1346

CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD

DECLARATION

This work has not previously been accepted in substance for any degree and is not concurrently submitted in candidature for any degree.

Signed ..... (candidate) Date 06/04/2009...

STATEMENT 1

This thesis is being submitted in fulfillment of the requirements for the degree of ...**PhD**..... (insert MCh, MD, MPhil, PhD etc, as appropriate)

Signed ..... (candidate) Date 06/04/2009.....

STATEMENT 2

This thesis is the result of my own independent work/investigation, except where otherwise stated. Other sources are acknowledged by explicit references.

Signed ..... (candidate) Date 06/04/2006.....

STATEMENT 3

I hereby give consent for my thesis, if accepted, to be available for photocopying and for inter-library loan, and for the title and summary to be made available to outside organisations.

Signed ..... (candidate) Date 06/04/2009.....

Table of Contents

List of Tables ..... **XI**

List of Figures ..... **XII**

List of Appendices ..... **XIII**

Acronyms and Abbreviations ..... **XIV**

Abstract ..... **XVI**

Acknowledgements ..... **XVII**

Introduction **1**

Rationale **4**

Research Questions **5**

Outline of Chapters **7**

Chapter 1: Drivers of Contemporary Dental Curriculum

Introduction **13**

Definitions of Curriculum **13**

Trends in Dental Curriculum **17**

Paradigm Shift in Education Philosophy **18**

Curriculum Models **18**

Taylor's Behavioural Objectives Model **19**

The Process Model **20**

Competence Curriculum Model **22**

Other Curriculum Models **24**

Traditional Discipline-Based Collection Curriculum **24**

Integrated Curriculum **25**

The Spiral Curriculum **26**

Underlying Principles of the Spiral Curriculum **28**

Application of the Spiral Curriculum **29**

Changes in the External Environment **33**

Demographic Changes and Dental Disease Spectrum **33**

Economic Pressure on Dental Education **34**

Rapid Scientific and Technological Changes **35**

National and Regional Accreditation Policy on Dental Education 35
Trends in General Dental Practice 36
Gaps in Curriculum Planning 38

Chapter 2: National Context of Dental Education in the UK

Introduction 40
Evolution of the Dental Profession and the General Dental Council 41
The First Dentist Act 1878 44
Second Dentist Act 1921 45
Dental Board of the United Kingdom 46
Evolution of Dental Education 47
The Private Apprenticeship Model of Dental Education 47
Establishment of Dental Hospitals 48
Formalisation of Dental Education 50
Content and Structure of Dental Curriculum 50
Composition and Education Functions of the GDC 52
Composition of the GDC 52
The Education Functions of the GDC 56
Protecting the Public 57
Advancing the Position of Dentistry in Higher Education 58

Chapter 3: Charting the Path to Comprehensive Curriculum Change

Introduction 62
Genesis of the Welsh Dental School 63
Dental Infrastructure 65
Teaching Staff 66
Evolution of Departments 67
National and International Contribution of the WDS to Dental Education 71
Commitment to Dental Education and the Delivery of Oral Care in Wales 72
International Contribution to Dental Education 72
Collaboration with EU and Non-EU Dental Schools 73
Participation on International Forums in Dental Education 74
Curriculum Re-organisation 75

Leadership and the Curriculum Management Group 78
Taking Advantage of Available Opportunities 79
Summary 81
Evolving culture of integration 81

Chapter 4: Strategies Employed to Conduct the Research

Introduction 83
The Qualitative Research Paradigm 84
The Case Study Approach 87
Types of Case Studies 87
Selection of the Research Settings 88
Sampling Strategy 93
Recruiting Respondents 93
Participants at Dental School 97
Members of the Working Party 98
Ethical Concerns 101
Confidentiality 101
Informed Consent 103
Data Collection Strategies 104
Interviews 104
Telephone Interviews 105
Face-to-face Interviews 106
Documentary Data 107
Establishing Social Relationships with the Dental Elites 108
Data Management and Analysis 114
Recording and Transcribing of Interviews 114
Strategy for Data Management 116
Data Analysis and Interpretation 118
Data Reduction 119
Coding 120
Data Display 121
Data Interpretation 122
Narratives and Stories 122
Contrastive Rhetoric 125

Context Specificity of Participants' Accounts 126
Interpretative Repertoires and Rhetorical Devices in Interview Accounts 127
Pragmatistic and Abstractionist Repertoires 128
'Cut Your Coat According to Your Cloth' (CYCATYC) Device 129
Summary 130

Chapter 5: Conceptual Framework for Analysing the Curriculum

The Need for a Broad-based Theoretical Framework 133
Bernstein's Contribution to Education: 134
Classification and Framing 135
Classification 136
Framing 137
Collection and Integrated Curriculum 141
Application of Bernstein's Concepts 143
The Novice-Expert Continuum Model of Skills Acquisition 147
Novice Stage 151
Advanced Beginner 154
Competent 155
Proficient 157
Expert 158
Educational Implications of the NEC 159
Re-conceptualising the CIF and the NEC: A Framework for Analysis 161
Relationship between the CIF and the NEC 162
Vertical Collection-Integrated Landscape 164
Diagonal Collection-Integrated Landscape 166

Chapter 6: From Collection to Integrated Curriculum

Introduction 170
Structure of Knowledge under a Traditional Dental Curriculum 173
The Theme-Based Integrated Curriculum 179
Features of the Integrated Curriculum 181
Vertical Integration 182
Early Clinical Contact 182

Horizontal Integration 191
Social Relationships under an Integrated Curriculum 200
Barriers to Integration in Dental Education 207
Physical Structure of the Dental Hospital 207
Professional Socialisation of Academic Dentists 208
Faculty Commitment to Change 210
Discussion 211

Chapter 7: Content of the Undergraduate Dental Curriculum

Introduction 218
Influence of Education Thinking: the Competence-based Curriculum 221
Defining Competencies 222
Competence Statements 227
Comparison of the WDS, QAA and GDC Competence Domains 229
Awareness of Personal Limitations 232
Social Factors Informing the Content of the Undergraduate Curriculum 235
Demands for increased Accountability and Effective Communication 235
Public Expectations for Oral Care 237
Oral Care Delivery System and the Financial Reward 241
Demographic Changes: meeting the needs of an aging population 244
Changes in the Oral Health Status of the Public 245
Knowledge Proliferation and Advances in Science and Technology 248
Summary 251

Chapter 8: The 'How' of Dental Curriculum

Introduction 255
A Mixed Pedagogic Approach 256
Transmission of Cognitive Knowledge 258
Lectures 258
Seminars and Independent-Study 262
Variant PBL and Case Scenario 264
Projects 269
The Family Study 274

Transmission of Procedural Knowledge 277
Laboratory-based Technical Skills Training and Simulations 277
Demonstrations and Hands-on Clinical Practice 278
Briefing and Debriefing Sessions 283
Transmission of Professional Values 285
Discussion 287
Support for Mixed Pedagogy 288
Type of Knowledge Transmitted 289
Profile of Students 290
Institutional and Faculty-Related Factors 294
Professional Development 295
Education Resources and Facilities 296
Implications for Curriculum Planning 296

Chapter 9: The Clinical Education and Training Environment

Introduction 299
Technical Skills Laboratories 300
The University Dental Hospital Clinics 302
Limitations of Dental Hospital-Based Clinical Training 302
Dental Hospital Poly-Clinics 305
Community Outreach Dental Education 305
Types of Community Outreach Teaching Sites 307
General Hospital-Based Dental Units and General Dental Practice 308
Community Dental Service Clinics 309
Primary Care Dental Units 309
Advantages of Community Outreach Dental Education 310
Range of Patients and Dental Conditions 311
Facilitating the Transition to General Dental Practice 313
Team-working 316
Broadening Access to Dental Care 318
Cost-Effectiveness 321
Future Career Plans and Practice Location of Graduating Dentists 322
Challenges and Barriers to the CODE 325
Cost of Running CODE Programmes 325

Monitoring and Quality Assurance 329
Part-time Clinical Tutors in Dental Education 332
Professional and Academic Qualifications 333
Education Training and Teaching Experience 334
Discontinuity between the Dental Schools and General Dental Practice 335
Discussion 336

Chapter 10: Contextualising the Environment of Zambian

Introduction 340
The Total Education and Socio-cultural Environment 341
Institutional Context 344
Historical Background of the University of Zambia 344
Academic Staffing 345
Education System and Future Participation in Dental Education 347
Admission Policy and Curriculum Continuity 349
Cost of Education 351
Career Motivations of Students 354
Healthcare Delivery System and Access to Oral Care 357
Organization and Distribution of Health Care Facilities in Zambia 358
Healthcare Workforce 360
Oral Health Care Workforce 360
Curricular Implications 362
Dental Practice and Professional Values 364
Demographic Profile 365
Profile of Oral and Dental Diseases and Conditions 369
Cultural Beliefs and Expectations for Oral Care 374
Scientific and Technological Base 376
Socio-economic and Political Contexts 378

Chapter 11: Hybrid Curriculum Model for Zambia

Introduction 380
The Three Curriculum Types 381
Instructional Strategies 384

Structural Organisation of Topics 386
Support for a Hybrid Curriculum 387
Pragmatic Factors 391
Dental Student-pool and Prior Education Experience 393
Staff Recruitment 395
Programme of Staff Development 397
Demand on Learning Resources 397
Key Features of the Model 398
Content of the Curriculum 402
Comprehensive and Holistic Approach to Oral Care 403
Health Promotion and Disease Prevention 404
Professional Values 406
Oral Health Advocacy 407
Team-Working 407

Chapter 12: Conclusions, Reflections and Recommendations

Reflections 411
Some Limitations of the Study 412
Generalisability 413
Participants 413
Use of a Combined Theoretical Framework 414
Contribution of the Hybrid Model Approach to Curriculum Planning 416
Recommendations 418

References: 421

Appendices 484

List of Tables

Table 2.1: Composition of the GDC: 1970.....53

Table 2.2: Composition of the Restructured GDC.....55

Table 5.1: Characteristics and Educational Needs of Learners.....160

Table 7.1: Principles Underpinning the GMC and GDC Curriculum.....225

Table 8: Types, distribution and aims of the Projects at the WDS.....270

Table 10.1: Fees Charged by the University of Zambia 353

Table 10.2: Number and Type of Health Care Facilities in Zambia.....359

Table 10.3: Health Manpower in Select Southern African Countries.....361

Table 10.4: Population Distribution of Zambia.....366

Table 10.5: HIV Prevalence among Adults.....373

List of Figures

Figure 5.1: Variations in Classification.....137

Figure 5.2: Variations in Frame Strength.....138

Figure 5.3a: Integrated and Collection Curricula.....142

Figure 5.3b: Integrated and Collection Curricula.....143

Figure 5.4: The Novice-Expert Continuum.....147

Figure 5.5: Differences in the Mental Structuring of Information.....149

Figure 5.6: The Relationship between the CIF and the NEC.....163

Figure 5.7: Three-Dimension Vertical Collection-Integrated Landscape.....165

Figure 5.8: Three Dimension Diagonal Collection-Integrated Landscape.....167

Figure 6.1: Structural Organisation of Knowledge in Dental Curriculum.....175

Figure 6.2: Theme-Based Vertical Integrated Dental Curriculum.....185

Figure 6.3: Intra-disciplinary Horizontal Integration in FARP.....196

Figure 6.4: Intra-and Inter-Thematic Horizontal Integration.....197

Figure 6.5: Inter-Thematic Horizontal Integration: Patient Management.....199

Figure 6.6: Structure of Knowledge and Social Relationships.....201

Figure 7.1: Map of WDS, QAA and GDC Competency Statements.....230

Figure 7.2: Impact of Demographic Changes on Dental Curriculum.....253

Figure 8: Factors Informing the Choice of Pedagogic Methods.....297

Figure 10.1: Total Education and Socio-cultural Environment: Zambia.....343

Figure 10.2: Distribution of Population by Residence.....367

Figure 11.1: The Three Main Types of Curricula.....383

Figure 11.2: Structural Organisation of Topics in a Hybrid Curriculum.....387

Figure 11.3: Hybrid Curriculum Model Embedded in the TESE.....400

List of Appendices

Appendix A: Significant Dates in the History of Dental Education in the UK.....485

Appendix B: Significant Dates in the History of the Welsh Dental School.....488

Appendix C: Correspondence with the GDC 491

Appendix D: Loose Schedule of Interview Questions with WDS Staff.....494

Appendix E: List of Documents Consulted.....496

Appendix F: Example of Coding Interview Data.....498

Appendix G: The Dental Curriculum Tree.....500

Appendix HI: General Dental Council Dental Domains.....501

Appendix HII: QAA Benchmark Statements for Dentistry.....506

Appendix HIII: WDS Competence Statements.....511

Appendix I: Welsh Dental School Outreach Teaching Sites.....515

Appendix J: Zambia Population Distribution.....516

Appendix K: Zambia Basic Socio-Economic Indicators.....518

Acronyms and Abbreviations

ADH	Adult Dental Health
BDA	British Dental Association
BDS	Bachelor of Dental Surgery
CAQDAS	Computer Assisted Qualitative Data Analysis Software
CYCATYC	Cut your coat according to your cloth
CBoH	Central Board of Health
CDE	College of Dentists of England
CDS	Community Dental Service
CIF	Collection-Integrated Framework
CIL	Collection-Integrated Landscape
CILI	Collection-Integrated Landscape Interface
CMG	Curriculum Management Group
CODE	Community Outreach Dental Education
CPD	Continuing Professional Development
DCP	Dental Care Professional
DHD	Dental Health and Development
DICIL	Diagonal Collection-Integrated Landscape
DIWC	Dentistry in the Wider Community
DTS	Dental Training School
EU	European Union
FARP	Fixed and Removable Prosthodontics
FFYs	The First Five Years, the GDC curriculum framework document
FWW	First World War
GDC	General Dental Council
GDP	General Dental Practitioner
GMC	General Medical Council
HD	Human Disease
HEFCW	Higher Education Funding Council for Wales
HEI	Higher Education Institution
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
ICD	Interdepartmental Committee on Dentistry
ILT	Institute for Learning and Teaching

LA	Local Anaesthesia
LDS	Licentiate in Dental Surgery
MBChB	Bachelor of Medicine and Bachelor of Surgery
MOH	Ministry of Health
NEC	Novice-Expert Continuum
NECT	Novice-Expert Continuum Trajectory
OES	Oral Eco-System
OSMP	Oral Surgery, Oral Medicine and Oral Pathology
PCD	Professionals Complimentary to Dentistry
PCDU	Primary Care Dental Unit
PPCE	Professional Practice and Continuing Education
QAA	Quality Assurance Agency
RCSE	Royal College of Surgeons of England
SSA	Sub-Sahara Africa
TCMG	Transition Curriculum Management Group
TESE	Total Education and Socio-cultural Environment
THP	Traditional Health Provider
UNZA	University of Zambia
U-PPI	Undergraduate-Professional Practice Interface
UTH	University Teaching Hospital
UWC	University of Wales, Cardiff
UWCM	University of Wales College of Medicine
VECIL	Vertical Collection-Integrated Landscape
VRST	Virtual Reality Simulator Training
WAG	Welsh Assembly Government
WDS	Welsh Dental School
WHO	World Health Organisation
WNSM	Welsh National School of Medicine

Abstract

The significance of curriculum in formal education is undisputable. In dental education, the curriculum has received renewed attention in the last 15 years as a means of addressing student educational needs and perceived inequalities in access to dental care. Based on a case study of the Welsh Dental School 2001 restructured undergraduate curriculum and the General Dental Council 2002 curriculum framework, this study explores factors informing contemporary dental curriculum. The findings from the study indicate that, although it is commonly claimed that the main driver of curriculum change is to facilitate and enhance the students' learning experience, dental educators are paying attention to the need for socially responsive dental education. However, although a number of curriculum models are available, they suffer from one deficiency: they tend to put emphasis on prevailing education thinking and neglect to situate the curriculum in its wider social context. The net result is production dental graduates who are scientifically informed and technically competent but socio-culturally insensitive. This thesis contributes toward a systematic and holistic approach to dental curriculum by developing a hybrid theoretical framework, which combines Bernstein's concepts of Collection and Integrated curriculum, Dreyfus and Dreyfus' Novice-Expert continuum and Bruner's Spiral curriculum. In addition, based on findings from the case study, the concept of 'total education and socio-cultural environment' (TESE) is introduced as an organising principle for systematically contextualising the curriculum in its wider socio-cultural environment. Taking Zambia as an example, the various elements of the TESE are identified and this forms the basis for developing a hybrid dental curriculum model. The model offers a systematic and comprehensive approaching curriculum planning. It also helps to moves curriculum planning from a narrowly conceived academic exercise to a socially responsive project.

Acknowledgements

I would like to extend my sincere thanks to the following for the various roles they played during my studies. First and foremost, I would like to express my thanks to the Commonwealth Scholarship Commission for awarding me a three-year scholarship. Without their funding any hope for a PhD would have remained a mere dream.

PhD research can be a very lonely and daunting journey. I therefore consider myself very fortunate for finding myself in the very capable hands of my two supervisors, Dr Lesley Pugsley and Dr Sara Delamont. Their unrelenting support and guidance throughout my research helped to sustain me. Their supervision sessions were always challenging and highly stimulating. I could not have wished for more. I particularly appreciated their ability to inspire confidence. There were times when I doubted whether I was really 'PhD material'. It was their unwavering belief and confidence in my ability to deliver that kept me going. I cannot find words to express my deep gratitude to them.

My special thanks go to all the research participants at the Cardiff Dental School and the former members of the Education Committee at the General Dental Council, who willingly spared me some of their busy time. They were very welcoming and their contributions and suggestions were very fruitful and highly informative. It is a pity ethical concerns for confidentiality cannot allow me to mention their names without giving away their identity.

Further thanks go to all the academic and administrative staff at the School of Postgraduate Medical and Dental Education for their support and for making me feel welcome throughout my stay. Special thanks go particularly to Dr Steve Brigley for his interest in my studies and for occasionally identifying some suitable literature. I also wish to extend my thanks to Gwilym Roberts and Steve Whitcombe, director and lecturer respectively and

PhD candidates at the Department of Occupational Therapy, Cardiff University, for sharing with me some of their ideas about PBL.

I also wish to acknowledge the input of the library staff at the Aberconway, Art and Social Studies, Brian Cooke Dental, Bute, Nursing and Healthcare Studiers and Sir Herbert Duthie Libraries. I feel particularly indebted to Olwen Kemp at the Brian Cooke Library for her tireless efforts and professional approach in securing historical dental documents and other books through the inter-loan system.

My special thanks go to all the saints who gather at the Health Gospel Hall, for their brotherly love and support throughout our stay. They not only warmly welcomed us into fellowship, but they were also sensitive to our spiritual and material needs. I am particularly most grateful for always remembering us in their prayers.

Lastly, my thanks go to my loving and caring family, my wife Makulata Phiri Mbita, my children Kateya and Kalapa. When the Commonwealth scholarship came to an end, not only did Makulata take on the additional role of breadwinner, she also cheerfully singlehandedly took care of the children and carried out other house chores. I can also not forget the support and prayers of my daughter Kateya. Appendix G is a direct product of her computer graphics talent. My son Kalapa's contributions also deserve some special mention. He not only endured many days without the company of dad, but he also never forgot to remember me in his bedtime prayers. Thank you to you three. Your sacrifices were not in vain. The Lord has answered our prayers.

May the Lord richly bless you all!

Introduction

The significance of the curriculum in general and higher education is undisputed (Barnnet and Coate 2005; Kelly 2004). It is an important instrument for cultural and social change and as such it attracts attention in many planned social, cultural and political reforms (see, for example, Barnnet , Parry and Coate 2001; Chisholm 2005; Odlum 1995b; Rogers 1997; Rudolph, Chikte, Brand et al. 1996; Samarawickrama , Batchelor and Hobdell 1998; Saunders and Machell 2000; Veres and Ruck 1996). It is a tool that is used to create and fashion specific educational ends (Stengel 1997). In higher education, Barnnet et al. (2001, p. 435) observe that the curriculum is "one of the most important products" offered by education institutions to their "customers".

But as a human social construction, the curriculum is at the centre of power and social control (Bernstein 1977). As an instrument for social control, the curriculum may be used to legitimate and perpetuate social inequalities (Gellert 2005). Costa (1997, p. 310) observes that schools help to "legitimate classes and strata of social personnel through their curriculum practices." Erevelles (2005), critiquing the curriculum from an epistemological standpoint of disability studies, points to the curriculum as an instrument that is used to perpetuate segregation between normal and disabled students. But the curriculum, whether in general or professional education, is at the heart of teaching and learning (Rogers 1997). In dental education, the curriculum has attracted increased attention in the last 15 years as an important instrument for addressing perceived inequalities in access to and in the delivery of dental care (Berthold and Lopez 1995; Formicola 1991; Hobdell 1995; Hobdell, Mante, Finau et al. 1995b; Samarawickrama et al. 1998).

Although literature on dental curriculum restructuring and reforms abounds, two gaps exist. The first is the failure by many dental educators to make explicit their theoretical, epistemological assumptions and values underpinning curriculum. In higher education, Barnnet and Coate (2005) have observed that the curriculum has attracted little attention. This is in contrast to general education where reforms in the national curriculum policy have often attracted heated theoretically-informed debates (see, for example, Chisholm 2005; Daugherty and Elfed-Owens 2003; Hamilton 2001; Kelly 2004; Seddon 2001). But to achieve some meaningful progress in dental curriculum, there is need to move beyond what Cornbleth (1990) described in general education as a technocratic approach to curriculum in which one curriculum document is replaced by another without any real change.

The second gap is the general failure to situate dental curriculum in its wider socio-cultural context. Burton and McDonald (2001), Carrera et al. (2003), Schwartz (1999) and the WHO (1990) all agree on the important role played by the socio-economic, cultural, political and other contextual factors in the medical and dental curriculum. Failure to embed the dental curriculum in the wider social context may lead to the production of dentists who are scientifically and technically competent but divorced from the social realities of the communities they serve (Enwonwu 1981; Hobdell 1995; Odlum 1995a). A casual look at papers on dental curriculum reveals that most dental educators are preoccupied with the process of curriculum restructuring and the social context is only coincidental to this general agenda. Fry et al. (1998), Gaengler et al. (2002), Kerosuo et al. (2001) and Seelinger and Synman (1996) all focus on the process, while Hietala et al. (2004) and Rohlin et al. (1998) have gone a step further and offer an evaluation of the outcome of curriculum restructuring at their respective dental schools.

In the UK, literature on the GDC curriculum policy is scant and rarely grounded in theory. The reviews on the GDC curriculum guidelines of 1997 and 2002 by Clitter (1997) and Mossey (2003) respectively, and a critique of the first General Dental Council (1963) undergraduate curriculum recommendations by a working party of the British Dental Association (BDA Working Party 1973), all lack any theoretical grounding. Neither is any attempt made to ground the GDC curriculum policy in the wider social context. But failure to embed the dental curriculum in its wider social context gives the general impression that dental education is value free and independent of the structural, political, socio-economic and cultural contexts. But, in her analysis of the curriculum in education, Cornbleth (1990, p. 13) aptly pointed out that, "Curriculum as a social process is created and experienced within multiple, interacting contexts." Writing on curriculum in education, Lawton (1983, p.2) also argued for the importance of broad based discussions of the curriculum.

In dental education, the influence of current education thinking, typified by curriculum innovations such as problem-based learning (PBL) (Crawford, Adami, Johnson et al. 2007; Fincham and Shuler 2001; Saunders and Dejbakhsh 2007) and the impact social forces on the curriculum and on the delivery of oral care (Enwonwu 1981; Hobdell 2001; Hollister and Weintraub 1993; Johnson , Glick and Mbuguye 2006; Monajem 2006; Nicolau, Marcenes, Bartley et al. 2005; Petersen 2006) are acknowledged and continue to attract the attention of dental educators. However, although the role of the social environment in shaping the curriculum is acknowledged in dental education (Formicola 1991; Moreno 1991; Orzack 1981), there appears to be no model that combines the education principles and the wider social context in a systematic and comprehensive way to aid curriculum planning.

The absence of a curriculum model that takes into account the education principles and the influence of the social environment when planning the curriculum may be one of the causes of the wide gap between the planned and the implemented curriculum (cf. Robins , White and Fantone 2000; Schwartz et al. 1999). Failure to contextualise the curriculum may also lead to what may be seen as a reactive rather than a proactive approach to curriculum planning. In dental education this is illustrated by debates on the place of prosthetic dentistry in the undergraduate curriculum (see, for example, Bertolami 2001; Mojon , Thomason and Walls 2004; O'Byrne , Clark and Malakuti 1997).

Rationale

One of the reasons for undertaking this study was to develop a curriculum model that is grounded in sound education principles and, at the same time, sensitive to the socio-cultural context in which the curriculum is located. To highlight the impact of the complex interaction of social forces, I have introduced the concept of the 'total education and socio-cultural environment' (TESE) as a guiding principle to a systematic and comprehensive approach to curriculum planning.

The aim of the study is twofold. The first is to explore factors that drive contemporary dental curriculum. The second is to develop a theoretically and empirically informed curriculum model that will guide the planning of a new undergraduate dental education programme in Zambia that is responsive to the oral health needs of the country. The study was designed and the research questions formulated with three assumptions in mind:

1. Curriculum in dental education is the product of complex interaction of social forces constituting the TESE. Elements of the TESE include socio-economic, political, cultural, educational, professional values, demographic, oral disease profile and the health care system.

2. The impact of individual elements of the TESE on dental curriculum will vary from one country to another and from one historical moment to another. Consequently, the process of curriculum planning should include the identification and critical evaluation of all the relevant elements of the TESE and their likely short term and long term impact on the curriculum.

3. The best curriculum model is grounded in sound education principles and in the socio-cultural context defined by the TESE. Since elements constituting the TESE and the emphasis placed on them will differ from one country to another and from one historical moment to another, there is little to be gained in transplanting wholesale a curriculum model from one country to another. It also follows that a curriculum that is contextualised in the TESE is dynamic. It is responsive to prevailing educational thinking and it is, at the same time, sensitive to the social conditions affecting dental education and the delivery of oral care.

Research Questions

The main research question was:

What factors drive contemporary dental curriculum? How best can these factors be presented in a theoretically and empirically informed model that can be used to guide systematic and comprehensive curriculum planning?

Related questions that were specific to the case study were:

- What factors informed the 2001 Welsh Dental School undergraduate curriculum restructuring?
- What factors informed the 2002 General Dental Council review of the undergraduate framework document, *The First Five Years*?
- What were the theoretical and pragmatic perspectives underpinned the GDC curriculum framework and WDS curriculum restructuring?
- What lessons do the GDC and Welsh Dental Schools offer for a dental curriculum?
- Based on the socio-cultural context of Zambia, what curriculum model would be most suitable for Zambia?

There are two contributions which this thesis makes towards the advancement of knowledge in dental curriculum planning. The first involves developing a hybrid analytical framework for guiding data analysis, thus grounding dental curriculum in theory. The theoretical framework I have synthesised combines Bernstein's (1977) sociological concepts of collection and integrated curriculum and the Novice-Expert continuum model developed by Dreyfus and Dreyfus (1986; 1980) and applied by Benner (1984; 2004) to nursing education. The second contribution is, based on empirical findings from the case study of the Welsh Dental School 2001 restructured undergraduate curriculum and the General Dental Council (GDC) 2002 undergraduate curriculum framework, I have developed a theoretically and empirically informed hybrid curriculum model for Zambia. The model I have developed helps to move dental curriculum planning from a simple education project to a social project involving comprehensive and holistic approach to planning by systematically taking into account the wider social forces impacting on dental education and the practice of dentistry.

Outline of Chapters

The thesis consists of 12 chapters that may be grouped into three main sections. The first five chapters give the social context, the methodological and theoretical background to the study. Chapters 6 to 9 present the findings of the study. Chapters 10 and 11 are the applications chapters, while chapter 12 gives the conclusions, reflections and recommendations for future work.

Chapter 1 is a review of the literature on factors informing contemporary dental curriculum. Past and current curriculum models and their relevance to dental education are briefly discussed. The chapter then moves on to review contextual factors underlying contemporary curriculum change. These factors are identified as social, economic, political and cultural in origin. The chapter concludes by pointing to gaps in contemporary curriculum planning: the lack of a comprehensive theoretically and empirically informed model for guiding curriculum planning. The review is not intended to be exhaustive but to highlight gaps in current approaches to curriculum planning.

Chapter 2 presents the General Dental Council (GDC) curriculum policy in its national, social and historical contexts. The evolution of dental education in the UK is traced from the mid 19th century, when dentistry was practiced as an open market trade, to 1956 when the GDC was established and dentistry finally became an autonomous and closed elite profession. The chapter is divided into three sections. The first section traces the evolution of dentistry from the mid-19th century to 1956. Factors that contributed to the evolution of dentistry into a profession are identified. The second section maps out the evolution of dental education from a private apprentice model, during which students were indentured to prominent dentists, to the hospital-based

training model that it is today. The last section discusses the education functions of GDC and their implications for dental curriculum at the UK dental schools. This chapter foreshadows chapter 3, which looks at the institutional context of dental curriculum restructuring at the Welsh Dental School (WDS).

Chapter 3 discusses the historical, social and education contexts of curriculum reform and development at the WDS. The chapter traces the evolution of dental curriculum from the time the school was established in 1961 to 2001 when the restructured curriculum was implemented. It is argued that the 2001 curriculum restructuring did not occur in a vacuum but was a product of wider social contextual factors. Chapters 2 and 3 foreshadow chapters 6 to 10 in which the empirical findings of the case study are presented.

Chapter 4 is the methods chapter. The study was based on a qualitative case study of the WDS curriculum restructuring and the GDC curriculum framework. In this chapter, the qualitative method, which has informed my data collection and analysis, is briefly discussed. The two qualitative instruments for collecting data: the in-depth interview: both face-to-face and telephone; and documentary data are also discussed. The preparations, challenges encountered in recruiting participants the social relationships developed with participants, ethical dilemmas and data analysis strategies are all discussed.

Chapter 5 focuses on developing a theoretical framework for informing data analysis. The chapter turns to Bernstein's (1977) concepts collection and integrated curriculum and the Novice-Expert continuum (Benner 1984; Dreyfus and Dreyfus 1986; Dreyfus and Dreyfus 1980) to develop a hybrid analytical model. The theoretical model

developed in this chapter serves two functions. It is used to inform data analysis in chapters 6 to 10. In chapter 12, the theoretical framework developed in this chapter is further refined by incorporating Bruner's (1977) concept of spiral curriculum, the concept of the total education and socio-cultural environment (TESE) to synthesise a comprehensive hybrid curriculum model for Zambia which is empirically and theoretically informed.

Chapter 6 is the first empirical findings chapter. The rationale for the 2001 Welsh Dental School curriculum restructuring is explored using Bernstein's (1977) concepts of collection and integrated curriculum. The educational logic of moving from a collection to an integrated curriculum is explored. The concepts of horizontal and vertical integration and their educational implications are also discussed in terms of Bernstein's concept of boundary maintenance. It is noted that in the interview accounts, participants drew mainly on the pragmatistic and almost always excluded the abstractionist repertoires. Participants made sense of and supported the paradigm shift from collection to an integrated curriculum by drawing on their classroom experience and their personal biographies as former dental students. What emerges from these accounts is that the structural organisation of the curriculum and the social relationships promoted are the main drivers of change. Two possible explanations are offered. The first suggests that because most informants do not possess any education training, this may explain their inability to draw on the abstractionist repertoire. The second is that in the UK, it is the GDC which is responsible for setting the minimum curriculum standards. It is therefore at the level of the GDC where education principles and the wider social factors are articulated and incorporated into the dental curriculum.

Chapter 7 is an exploration of the education and socio-cultural factors informing the selection and sequencing of the content of dental education. Among notable factors are developments in education, particularly the competence curriculum model which is the key feature of both the restructured WDS 2001 curriculum and GDC 2002 curriculum framework. Important social factors underlying curriculum change include demographic changes, changes in the incidence of dental disease, trends in general dental practice, changes in public expectations towards oral heath and the quality of dental care. These social factors are analysed in terms of their impact on internal and external boundary maintenance between the different contents of the undergraduate dental curriculum.

Chapter 8 focuses on factors informing pedagogic approaches in dental education. It is argued that pedagogic practices at the Welsh Dental School are hybrid, with strong and weak framed instructional methods being used. It is also suggested that the education principles such as the spiral curriculum are also implied. The chapter concludes by suggesting three variables that need be considered when choosing the most suitable pedagogic method. The type of knowledge transmitted, the profile of students and institutional and faculty related factors. Drawing on the re-conceptualised diagonal collection-integrated landscape (DICIL) and the novice expert continuum trajectory (NECT), it is further argued that the planned curriculum may drift upwards towards weak framed pedagogic strategies or downwards towards strong framed pedagogic approaches as a result of the interaction of social forces related to the student profile, faculty and institutional related factors and the type of knowledge transmitted.

Chapter 9 explores the education and training environment under which procedural knowledge is transmitted. Three hierarchically structured education and training environments are identified. The technical skills laboratory, the university dental

hospital specialist clinics and the community outreach sites. It is argued that each subsequent environment builds on and consolidates the learning that has gone on earlier. The advantages, limitations of each of these environments are explored. It is suggested that the three education environments show a hierarchical progression in the education and training of dental students from knowledge acquisition to knowledge application and, finally, to knowledge integration and consolidation respectively. It is also argued that the three environments suggest some hierarchical progression from a strong classified and framed technical skills laboratory, to a strong classified but relatively weak framed dental hospital specialist clinics and finally, to the relatively weak classified and framed CODE.

Chapter 10 and 11 are the applications chapters. In chapter 10, the concept of the total education and socio-cultural environment is discussed and applied to Zambia. The concept of the TESE is elaborated on by identifying the relevant elements. The socio-cultural environment of Zambia is presented by exploring the elements of the TESE and their possible implication on dental education and the delivery of oral care. Chapter 11 foreshadows chapter 11 by giving the social context of higher education in general and possible implications on the future of dental education in particular. The central argument in this chapter is the importance of contextualising the curriculum in the TESE.

In chapter 11, a comprehensive hybrid curriculum model is developed. The model is grounded in theory and empirical findings. It draws on the theoretical framework developed in chapter 5, which is based on Bernstein's (1977) collection and integrated curriculum framework and the novice-expert continuum (Benner 1984, 2004; Dreyfus and Dreyfus 1986; Dreyfus 2004; Dreyfus and Dreyfus 1980). The chapter has two

main sections. In the first section the three main types of curricula—the traditional collection, hybrid and integrated—are briefly discussed. The three curricula are based on the re-conceptualised diagonal collection-integrated landscape and the NECT. Taking into account the socio-cultural environment of Zambia presented in chapter 11, the chapter argues for a hybrid curriculum model as the most appropriate for Zambia. The last section is a description of the main features of the model. The model is presented as two vertical landscapes—the undergraduate education and the professional practice landscapes—embedded in a hexagonal TESE. It is argued that the curriculum should be grounded in sound education principles and in the wider social context to aid a systematic and comprehensive approach to planning and implementation. This helps to move curriculum planning from a narrowly conceived exercise to a pragmatic and theoretically informed project.

In chapter 12 the main research question is revisited and some conclusions drawn. Some reflections are made on the limitations of the study and some recommendations for future research made. The chapter closes by suggesting that although it is important to take into account the potential influence of the TESE on the curriculum, there is need for further research to clarify how elements of the TESE informs dental curriculum and vice versa.

In the next chapter, a literature review of factors informing contemporary dental curriculum is carried out. The review is not meant to be exhaustive but only aims to highlight gaps in dental curriculum planning. The chapter begins with an overview of past and current curriculum models and then moves on to a discussion of wider social changes underlying contemporary dental curriculum change.

Chapter 1

Drivers of Contemporary Dental Curriculum: a review of the literature

Introduction

Underlying curriculum debates in education is the conception of the word 'curriculum'. It is argued that for any meaningful discussion, analysis or planning of curriculum to take place, the starting point must be a clear conception of the term curriculum (Cornbleth 1990; Kelly 2004; Lawton 1983). Cornbleth (1990, p. 12) argued that,

> "How we conceive curriculum and curriculum making is important because our conceptions and ways of reasoning about curriculum reflect and shape how we see, think and talk about, study and act on education made available to students. Our curriculum conceptions, ways of reasoning and practice cannot be value free or neutral. They necessarily reflect our assumptions about the world, even if those assumptions remain implicit and unexamined."

Lawton (1983, p. 4) also argues that those engaged in curriculum planning must start from some theoretical position even though they may not readily admit it, preferring rather to be considered as "a practical man". Both Cornbleth and Lawton help to draw attention to the need to clarify what we mean in our use of the term 'curriculum.' They also point to the fact that all curricula are underpinned by theory even if such theory is not made explicit.

Definitions of Curriculum

The term curriculum has several connotations in education circles and one of the challenges in researching curriculum has been the lack of a universally accepted

definition of the term (Quinn 2000; Reid 1999). The term curriculum has its roots in the Latin word meaning track or race-course. But in education the term assumes several meanings ranging from narrow definitions such as course of study or syllabus, to wide definitions embracing all the planned and unplanned "student's experiences inside and outside the School" (Sweet 2003, p. 54). Burton and McDonald (2001, p. 190) note that,

> "...the term curriculum has a number of different meanings. This is true both in the sense that it can mean very different things to different people and also that it can have a range of meanings for any given person."

It has proved difficult to arrive at a single universally accepted definition of the curriculum because the curriculum is a human construct that is subject to several interpretations (Reid 1999). Because there is no universally agreed definition, it is advised that writers should make explicit what they means in their use of the term curriculum (Kelly 2004; Reid 1999).

Kelly (2004, p. 4) cautions against limiting the definition of curriculum to the content of subjects transmitted in schools. He argues that, "Any definition of curriculum, if it is to be practically effective and productive, must offer much more than a statement about the knowledge-content or merely the subjects which schooling is to 'teach' or transmit or 'deliver'." He goes on to caution against narrowly defining the curriculum;

> "Many people still equate a curriculum with a syllabus and thus limit their planning to a consideration of the content or the body of knowledge they wish to transmit or a list of the subjects to be taught or both. ...this view of curriculum as content ...is limiting in more than one way and is likely to

> **hamper rather than to assist the planning of curriculum change and development."**

He then proceeds to offer a broader definition of curriculum as follows: "...curriculum is the totality of the experiences the pupil has as a result of the provision made" (Kelly 2004). In this definition, the focus is on the total education experience of the students.

Stenhouse (1975, p. 5), on the other hand, defines curriculum as, "...an attempt to communicate the essential principles and features of an educational proposal in such a form that it is open to critical scrutiny and capable of effective translation." He then goes on to specify the basic features of a curriculum. That is, the curriculum should offer guidance in the selection, sequencing, delivery and assessment of the content of an education programme.

Both Kelly and Stenhouse definitions of curriculum offer a good starting point in curriculum planning. However, the two writers differ in their focus. There are three types of curriculum: the planned, the delivered and the experienced curriculum (Quinn 2000). The planned curriculum is also known as the curriculum on paper. It is the blue print of what is intended to be achieved in an educational programme. The delivered or implemented curriculum is what is actually delivered by the teachers, while the experienced or learnt curriculum refers to what students actually internalise as result of exposure to an educational programme. Whereas Kelly is concerned with the experience of the recipients of the curriculum, the students; like Schwartz (2006), Stenhouse is concerned with the users of the curriculum, the teachers. Differences in focus in the two definitions also help to highlight the multifaceted nature of the curriculum.

The focus of this study was to explore factors informing contemporary dental curriculum and for a working definition, I have turned to Bernstein (1977, p. 47) who offered the following definition: "Curriculum defines what counts as valid knowledge." The Oxford dictionary defines 'valid' as "actually supporting the intended point or claim". Based on Bernstein's definition, the starting point is a clear definition of the intended goal of the curriculum. If it is argued that curricula are social constructions, it follows that what counts as valid dental knowledge is socially constructed.

If the primary aim of dental education is the production of dentists with requisite knowledge, skills and professional values who, on graduation, are willing to take up the responsibility for the delivery of oral health care to whole communities and not just those who have the means to meet the cost of care (ADEA Commission on Change and Innovation in Dental Education, Haden, Andrieu et al. 2006a; General Dental Council 2002), valid dental knowledge will promote these values. But factors that affect dental education and the provision of dental care vary across different communities. It follows therefore that what is defined as valid dental knowledge will differ from one community to another. To arrive at what is deemed as valid dental knowledge may require unpacking the various contextual factors impinging on the dental curriculum and the delivery of oral care in a given community.

Kelly (2004, p. 4) argues that failure of past curricula in general education can be traced to piecemeal approach to curriculum planning. He introduces the concept of a "total curriculum" to emphasise the need for a broad based approach to curriculum planning. He argues that,

> "...some of the inadequacies of previous attempts at curriculum planning can be attributed to the fact that it has tended to proceed in a rather piecemeal way within subjects rather than according to any overall rationale. This dimension of curriculum development is, of course, important, but it is the rationale of the total curriculum that must have priority. ...At the very least, the total curriculum must be accorded prior consideration, and a major task that currently faces teachers and curriculum planners is to work out a basis on which some total scheme can be built."

There are two implications of Kelly's suggestion. The first is the importance of identifying the relevant factors affecting a given educational programme. For dental education, these factors are educational and contextual in origin. The second is the need to develop a curriculum model in which educational principles and social factors driving contemporary dental education are brought together in a coherent manner.

Trends in Dental Curriculum

The last two decades have been characterised by curriculum restructuring at most dental schools around the world (Hendricson and Cohen 2001; 1998; Seelinger and Synman 1996). These restructurings may be seen to be in response two social forces:

1. A paradigm shift in education philosophy marked by focus on integrated student-centred rather than traditional discipline-based teacher-centred curriculum models (Crawford et al. 2007; Reed 1990). These shifts are best seen in the curriculum models guiding the planning and transmission of dental knowledge.
2. Changes in the wider social environment in which dental education and the delivery of oral care takes place. Among the most commonly acknowledged social

factors are national and regional accreditation policy (cf. Boyd, Gerrow, Chambers et al. 1996; Moreno 1991; Orzack 1981), rapid advances in science and technology, demographic changes and changes in dental disease profile (Bertolami 2001; Mojon et al. 2004; O'Byrne et al. 1997; Zarkowski, Gyenes, Last et al. 2002) and funding pressures (Buchanan, Goldberg, Groeneveld et al. 2002; Kerosuo et al. 2001; Murry 2002). Many dental schools have responded by restructuring their curricula in order to produce dentists who are professionally and socially responsive, capable of adapting to a constantly changing external environment.

Paradigm Shift in Education Philosophy

Changes in education thinking are commonly reflected in the prevailing curriculum models. What follows is a brief summary of the most commonly encountered models. The review is not exhaustive and only the models which are most relevant to the thesis are discussed.

Curriculum Models

Curriculum models are an attempt to represent the nature of curriculum in a physical or conceptual form. The process of conceptualising curriculum models is not value free but reflect the theoretical, ideological and philosophical position of curriculum planners (Gray , Griffin and Nasta 2000). According to Lawton (1983, p. 3), "It is impossible to discuss curriculum in a meaningful way without first establishing some kind of 'philosophy' of education including discussion of the values involved." A wide range of models attempt to encapsulate the nature of curriculum. These models are important in helping to organise thinking about the practice of curriculum design and

direct attention to the need for reflection on the part of the practitioner. But as Gray et al. (2000) note, models are abstractions, and it is sometimes difficulty to make formal distinctions among the different curriculum models.

There are a wide range of curriculum models. Some of these models guide the planning and selection of the content, while the others guide the structuring of an educational programme. Examples of curriculum planning models include behavioural objectives model, commonly associated with Tyler (1949); and the process model (Stenhouse 1975). These two models are generally associated with childhood education and have been criticised as not suitable for the health care professions (Quinn 2000). The other model which has gained popularity in professional and vocational education is the competence curriculum.

Behavioural Objectives Model

The behavioural objectives model is associated with Ralph Tyler and is based on behaviourist learning theory. It is one of the most familiar models and most widely used in education. Taylor (1949, p. 5) defined education as "a process of changing the behaviour patterns of people, using behaviour in the broad sense to include thinking and feeling as well as overt action". The starting point in planning curriculum under the behavioural objectives model is a clear statement of the overall aims of education followed by a statement of appropriate learning objectives, methods and forms of assessment and evaluation. Tyler (1949, p. 1) advised that when developing any curriculum, four fundamental questions must be answered;

1. What educational purposes should the school seek to attain?

2. What educational experiences can be provided that are likely to attain these purposes?
3. How can these educational experiences be effectively organised?
4. How can we determine whether these purposes are being attained?

That is, the behavioural objectives model of curriculum planning consists of four main components: objectives, content, method and evaluation and places emphasis on students achieving the set objectives. Tyler (1949, p. 44) stressed the importance of stating objectives in terms of student behaviours. He argued that, "Any statement of the objectives of the school should be a statement of changes to take place in students."

The behavioural objectives model has been among the most widely used models in education. Evidence of the prevalence of the educational thinking based on the model is found especially in the first General Dental Council (1963) dental curriculum policy document. Although Tyler's behavioural objectives model may seem to be falling out of favour in the thinking of many contemporary educators, nevertheless the key principle underpinning this model, that is, starting with a statement of the overall aim of an education programme from which specific behavioural objectives are derived, is a common practice in curriculum models such as the competence curriculum.

The Process Model

The process model was developed by Stenhouse (1975) in order to counter what he saw as the weakness in the behavioural objectives model. He was critical of the objectives model because he saw it as an instrument for power and control. He argued

that the behavioural objectives model acted as a filter that distorted knowledge in schools;

> "The filtering of knowledge through an analysis of objectives gives the school an authority and power over students by setting arbitrary limits to speculation and by defining arbitrary solutions to unresolved problems of knowledge. This translates the teacher from the role of the student of a complex field of knowledge to the role of the master of the school's agreed version of that field" (Stenhouse 1975, p. 86).

Stenhouse's central argument is based on the logic of organising a curriculum without specifying in advance behavioural changes anticipated in learners. He argues that the function of education should not be to make students outcomes predictable. This is in contrast to the behavioural objectives and competence curriculum models. In the competence model, Beltran-Neira and Beltran-Aguilar (2004) have gone as far as proposing a six-level taxonomic classification of dental competencies starting with professional profile of graduates followed by a detailed specification of functions, tasks, steps, etc, in decreasing order of complexity.

Another important aspect of the process model is that students are perceived as actively engaged in the construction of knowledge, while the role of the teacher is seen as that of critical appraisal of students' work. Emphasis is also placed on developing self-appraisal skills in students. According to Stenhouse,

> "The worthwhile activity in which teacher and student are engaged has standards and criteria immanent in it and the task of appraisal is that of improving students' capacity to work to such criteria by critical reaction to work done" (Stenhouse 1975, p. 95).

The principles self-assessment and self-critique and the need to encourage students to work towards attaining set standards are among some of the qualities that have been identified as desirable in contemporary dental education (cf. Tedesco 1990). Reed (1990) stresses the importance of curriculum models that actively engage both students and teachers in the learning process. Crawford et al. (2007) also assert that for dental curriculum change to be consistent with modern learning theories it must actively engage students.

Competence Curriculum Model

There has been a general trend in contemporary curriculum restructuring towards competence curriculum in medical and dental education at all levels (Chambers 1993, 1994; Davis and Harden 2003; O'Byrne et al. 1997), including at the global (Baum, Scott, Bickel et al. 2002; Institute for International Medical Education 2002), regional (Plasschaert, Holbrook, Delap et al. 2004), national (American Dental Education Association 2005; Boyd et al. 1996; General Dental Council 2002) and at institutional levels. At the Welsh Dental School, the restructured 2001 curriculum is based on the competence curriculum model (University of Wales College of Medicine 2001).

The competence curriculum is based on a five-stage incremental skills acquisition model developed by Dreyfus and Dreyfus (1986; 1980) from their study of stages in skills acquisition of Air-force pilots and adapted by Benner (1984) to nursing education. The model has since found wide application in other professional fields including dentistry and medicine (Chambers 1993, 1994; Davis and Harden 2003; Plasschaert, Boyd, Andrieu et al. 2002). The stating point in developing a competence-based curriculum is a statement of broad basic knowledge, skills and values

(competencies) that constitute professional performance. These are referred to by various terms. For example, the General Dental Council refers to them as "key principles" (General Dental Council 2002, p. 2), the Quality Assurance Agency (QAA) calls them simply as "skills and attributes of the graduating dentist" (Quality Assurance Agency 2002, p.4), the General Medical Council (2003, p. 4) has termed them as "principles of professional practice", while Plasschaert et al. (2004, p. 24) have termed them more broadly as "profile for the new European dentist", while Hietala et al. (2004) have termed them as dental key competencies (DKCs). These broad statements of professional practice form the basis for defining specific learning outcomes, structuring teaching and learning experiences, assessment and evaluation (Davis and Harden 2003; Institute for International Medical Education 2002; Plasschaert et al. 2002; Prescott , Hurst and Rennie 2003; Simpson, Furnace, Crosby et al. 2002).

After identifying competencies, they are presented in a form of a list and they may or may not be grouped into broad categories of professional activity called domains. The American Dental Association (2006) has presented competencies simply as a list without categorising them, while the General Dental Council (2002), Plasschaert et al. (2004) and Simpson et al. (2002) have all grouped competencies into domains.

Although the general advice is to state competencies in broad terms, some ambitious educators present competencies in the form of specific measurable knowledge, skills and behaviour that learners are expected to display at the end of a programme for them to qualify (Grant 2006). This practice reduces the competence curriculum to the same level as the behavioural objectives model.

Other Curriculum Models

A characteristic feature of education and training in professional fields such as engineering, medicine and dentistry is that these fields draw on knowledge from a wide range of disciplines such as the biomedical, behavioural and social sciences. This presents two challenges. The first is how to organise and present this knowledge in a way that avoids overloading students with isolated facts. The second is how to organize and sequence this knowledge in a coherent manner that allows for linkages to be made between different discipline-based knowledge. Three commonly encountered models in this category include the traditional discipline-based collection (Bernstein 1977), integrated and spiral curricula. Collection and integrated curricula are only discussed briefly here because they are covered in more detail in chapter 6. The spiral curriculum is discussed in a little more detail here because it forms a component part of the hybrid curriculum model proposed in chapter 11.

Traditional Discipline-Based Collection Curriculum

Under a traditional discipline-based modular curriculum, the content of the curriculum is organised and presented as discrete blocks. These blocks are presented as distinct specialised bodies of knowledge under the control of a department or discipline. Each discipline is responsible for controlling the knowledge and skills that is made available to students. Because under the traditional discipline-based curriculum, knowledge is compartmentalised into disciplines, in dental education there is dichotomy between pre-clinical basic sciences, laboratory-based technical skills training and clinical training.

One of the problems arising from compartmentalising knowledge is that students find it difficulty to relate theory to real-life problems. This problem is compounded further by dichotomising the undergraduate curriculum into pre-clinical and clinical phases. In this model almost all the theoretical knowledge is presented during the pre-clinical phase while professional skills training is relegated to the clinical phase of the curriculum. There is usually a large time lag between knowledge acquisition and its practical application in the clinical context. In addition, the traditional curriculum tends to be teacher-centred with students cast in the role of passive recipients of predetermined factual knowledge. This leads not only to work overload but also to low motivation among students and to production of graduates who may be proficient in technical skills but lacking in problem-solving, teamwork and communication skills. There are, however, increasing calls among dental educators for curriculum models that best meet students' learning needs and produce graduates who are not only intellectually and technically competent but also critical, socially responsive and capable of adapting to the ever changing external environment.

Integrated Curriculum

The integrated curriculum is usually portrayed as the polar opposite of the traditional discipline-based curriculum. It is characterised by central control of the curriculum and blurring of boundaries between disciplines and subject areas (Bernstein 1977). In dental and medical education, two types of integration are identified: vertical and horizontal integration (Plasschaert, Lindh, McLoughlin et al. 2006; Snyman and Kroon 2005; Watad and Ospina 1999). Vertical integration attempts to blur the boundary between pre-clinical theoretical knowledge and laboratory-based technical skills training and clinical training (Boyd 1988; Camara 1988; Snyman and Kroon 2005). In

the discipline-based traditional curriculum, there is usually a large time lag between knowledge acquisition and its application in the clinical context. Vertical integration narrows the gap between the time when theoretical knowledge and technical skills are transmitted and their application. That is, vertical integration attempts to blur the temporal boundary between theory, laboratory-based psychomotor skills training and clinical practice.

Horizontal integration, in contrast, involves the blurring of spatial boundaries between clinical disciplines and is aimed at achieving "comprehensive and holistic approach to patient care" (Snyman and Kroon 2005, p. 26). In the dental curriculum, vertical integration seems easier to achieve than horizontal integration. This is because both the physical structure of the dental hospital and disciplinary loyalties of academic staff act as barriers to horizontal integration.

The Spiral Curriculum

The spiral curriculum was first conceived by Bruner in 1960 following the conference at Wood Hole on Cape Cod, USA, in September 1959 which was convened in order "to seek fresh ways of transmitting to a new generation the fund of learning that had been growing at such a rapid rate" (Bruner 1977, p. ix). The underlying principle in the spiral curriculum is the emphasis on teaching the structure of a subject in a way that gives students the fundamental ideas of a discipline instead of focusing on transmitting factual knowledge. This is achieved by breaking down knowledge into its basic structure of underlying theorems and paradigms. Bruner (1977, p. 12), pointed out that,

> "The teaching and learning of structure, rather than simply the mastery of facts and techniques, is at the center of the classic problem of transfer. There are many things that go into learning of this kind, not least of which are supporting habits and skills that make possible the active use of the materials one has come to understand. If earlier learning is to render later learning easier, it must do so by providing a general picture in terms of which the relation between things encountered earlier and later are made as clear as possible".

The spiral curriculum has since found application in many professional fields. Dowding (1993, p. 21) defines the spiral curriculum as "a process of selecting the scope and sequence of the technical content covered by the curriculum." While Waks (1992, p. 13) defines it as "an organizing framework to help educators identify, select, organize and sequence learning experiences." Although both definitions point to the importance of having some framework for selecting and sequencing the content of the curriculum, this is only part of what the spiral curriculum involves. Harden and Stamper (1999, p. 141) have defined the spiral curriculum more elaborately as,

> "A curriculum in which there is an iterative revisiting of topics, subjects or themes throughout the course. It is not simply the repetition of a course. It also requires the deepening of it, with each successive encounter building on the previous one."

This definition underscores the other underlying principle of the spiral curriculum. That is, the revisiting of topics at increasing levels of complexity throughout the programme. This is intended to promote depth of understanding by building on previous learning and/or experiences (Harden and Stamper 1999).

Underlying Principles of the Spiral Curriculum

There are two basic principles underpinning the spiral curriculum. The first is that any field of study can be reduced to its basic structure which then becomes the focus for learning. In order to facilitate learning, Bruner advised that teachers should aim at giving their students an understanding of the fundamental structure of their subject. He argued that, "This is the minimum requirement for using knowledge, for bringing it to bear on problems and events one encounters outside classroom or in classrooms one enters later in ones training" (Bruner 1977, pp. 11-12).

The second principle is the need to recognise that students are active agents in the learning process. They come to class either already in possession of prerequisite knowledge or with experiences upon which further learning can be founded. Bruner (1977, p. ix), therefore, admonished for an approach to knowledge transmission,

> "...in the spirit of making it accessible to the problem-solving learner by modes of thinking that he already possessed or that he could, so to speak, assemble by combining natural ways of thinking that he had not previously combined. One starts somewhere—where the learner is. And one starts *whenever* the student arrives to begin his career as a learner."

From a practical point view, the starting point in the spiral curriculum is the breaking down of knowledge into basic principles and concepts which then become the foundation for learning more complex tasks and knowledge later.

Application of the Spiral Curriculum

Although Bruner's spiral concept was conceived with the education of children in mind, it has since found application across a wide range of disciplines and professional fields. These include vocational and technical training (Cornford 1997; Dowding 1993) and Science-Technology-Society (Waks 1992). The concept has also found use in professional fields such as engineering (Collura, Aliane, Daniels et al. 2004; DiBiasio, Clark, Dixon et al. 1999) and medicine (Harden and Stamper 1999; Jira and Kaba 1998; Jones and Oswald 2001; Kabara 1972; Malik and Malik 2004).

In vocational training Cornford (1997) has proposed the use of a spiral curriculum to address the weaknesses in modular course designs in which the course content is packaged into shorter self-contained units. This, Cornford argues, tends to fragment knowledge leading to many students failing to integrate the various components of the programme into a meaningful whole. He therefore sees the solution to lie in sequencing modules in a spiral of increasing complexity, with earlier modules supporting learning of later modules. He argues that the spiral concept helps to focus teachers and students on integrating knowledge from different modules.

Dowding (1993) saw two advantages in the spiral curriculum. The first is that presenting topics from simple to complex ones enabled students acquire prerequisite knowledge and skills needed to tackle successive lessons. Secondly, exposing students to lessons of steadily increasing level of difficulty and complexity, which were embedded within a job-based setting, helped to prepare students for on-the-job performance. In addition, Dowding (1993, p. 25) argued that, "This type of learning environment also facilitates problem solving abilities in students."

DiBiasio et al. (1999) reported the use the spiral concept in their restructured chemical engineering curriculum. They found the traditional curriculum inadequate in meeting today's demands and expectations of engineering graduates. They argued that in today's rapid changing environment, engineering educators are expected to produce engineers who are not only intellectually and technically proficient, but who also possess a range of other skills such as the ability to apply conceptual material, team-working, good communication skills, etc, skills which are best acquired under a spiral curriculum. When DiBiasio et al. (1999) compared the performance of students on the traditional and the restructured spiral curriculum, they discovered that students and staff rated highly the spiral curriculum. In addition, they found that although students from both groups did not show any significance difference in their technical proficiency, those from the spiral curriculum were more skilled in working in teams, were better communicators and readily identified themselves with their professional field.

Collura et al. (2004) have also found the spiral curriculum to be a more viable approach in the education of engineers. They note two challenges in engineering education. The first is that of attracting and retaining talented students to the engineering field. The second is the need to produce graduates with the breadth and depth of professional knowledge and skills essential to succeed in a rapidly changing environment. They see the spiral curriculum as an important tool for achieving multidisciplinary teaching. They argue that breakthroughs in science and technology are driven by the convergence of multiple fields requiring a multidisciplinary approach to engineering education, which is best achieved under a spiral curriculum.

In medical education the earliest reference to the spiral curriculum was made by Kabara (1972) in the restructured medical programme at Michigan State University. He saw the use of the spiral curriculum as the best way to counter what he described as the dichotomy of the medical programme into basic sciences and clinical medicine and the fragmentation into departments. He identified disciplinary loyalties as the main barrier to curriculum innovations in medical education. He bemoaned that,

> "It is this dichotomy, fragmentation and resulting schizophrenia within medical education that is causing havoc at most campuses. Even where there is an agreement among members of the curriculum committee, one finds that the individual professor's behaviour in the classroom little changed" (Kabara 1972, p. 314).

Under the restructured spiral curriculum, the content of the medical curriculum was centrally controlled, with departments assuming the role of "resource provider instead of originator of course content" (Kabara 1972p. 314). Kabara has identified two benefits of the spiral curriculum. The first is that by spreading out basic sciences throughout the clinical programme and by applying basic sciences to specific medical problems, this helped to reinforce previous learning. He argued that,

> "This 'spiral of information' approach to education gives rise to constant re-enforcement of learned skills and facts and becomes productive repetition—which is, of course a fundamental sound technique of learning" (Kabara 1972, p.315).

The second is that the spiral curriculum helped students develop problem-solving skills. Kabara reported that the restructured spiral curriculum was rated highly by teachers, students and clinicians as a sound approach to teaching and learning.

Harden and Stamper (1999) have also identified one of the benefits of the spiral curriculum in medical education be reinforcement of learning. They argue that as a result of revisiting topics at an increasing level of difficulty; students are helped to go beyond factual recall to application of knowledge and skills. This facilitates deepening of understanding and reflection. They describe the approach as more flexible because it allows students to transfer directly from one level of the spiral to the next once they have mastered the first level. They also note that the spiral curriculum facilitates the breaking down of departmental barriers.

Other health care educators such as Jira and Kaba (1998) and Malik and Malik (2004) have also reported using the spiral concept in undergraduate medical education. The spiral concept has also been applied in postgraduate and continuing professional development. Jones and Oswald (2001, p. 136) propose the use of the spiral concept as "the most helpful way of conceptualising the continuous curriculum for general practice."

Although the spiral curriculum does not seem to have found wide application in dental education, nevertheless the basic principle of breaking down knowledge into its basic units which are iteratively revisited at progressive levels of complexity throughout the programme, has found application in most restructured dental curricula. In the restructured integrated curriculum at Malmo, Davies and Warfvinge (2003) report that basic biology has been spread throughout the programme with basic concepts

introduced early in the programme, while more complex ones are introduced and applied to clinical situations later in the programme. In the revised first year integrated bio-molecular science course at Glasgow Dental School, Beeley (2003) reports that the course has been broken into several units in order to broaden the base. These units form the foundation upon which later topics in dental and medical sciences are grounded.

Changes in the External Environment

Several contextual factors are identified as significant drivers of the dental curriculum. These include the need to respond to the state of flux in higher education, including dental education (Allen 1988), the need to remain abreast in the face of a rapidly expansion in scientific and technological knowledge upon which clinical dental practice is founded (Allen 1988; DePaola and Slavkin 2004; Rohlin et al. 1998); the need to develop critical thinking and analytical skills in learners in the of face knowledge explosion (Rohlin et al. 1998), responding to changes in demographic and dental disease patterns (cf. Bland, Starnaman, Wersal et al. 2000, in relation to medical education; DePaola and Slavkin 2004; Formicola 1991; Katz 1986), and funding pressures affecting all sectors of social service delivery including dental education (Kerosuo et al. 2001; Murry 2002).

Demographic Changes and Dental Disease Spectrum

Kerosuo et al. (2001) have pointed to changes in the dental disease spectrum, including decline in dental caries among children and adolescents and decrease in loss of teeth (edentulousness) among all age groups to be among factors that led to a review of the

dental curriculum at the University of Helsinki in Finland. Another significant factor identified by Kerosuo et al. is demographic changes, which are characterised by an increase in senior citizens with chronic conditions requiring greater medical knowledge to manage.

Formicola (1991) has also pointed to demographic changes and the rapid changing world in which dentists operate to be among external factors driving the dental curriculum. He reports that one of the features of the restructured curriculum at the University of Columbia is an increase in the medical content. The need for dental graduates to posses an increased medical knowledge is in response to the challenge of managing a growing number of elderly patients, who often present with chronic medical conditions, and the need to strengthen the role of dentists as members of health care teams.

Economic Pressure on Dental Education

Kerosuo et al. (2001) have also pointed to economic pressure on dental education. They report that the undergraduate dental programme at the University of Helsinki was threatened with closure as a result of economic pressure. They further report that because of funding cuts, the faculty of medicine embarked on a restructuring programme in which the dental programme suffered unfavourable funding cuts in comparison to the medical programme, resulting in a significant reduction in dental staff numbers. The negative impact of funding cuts on dental education has also been noted in the UK (Daley 1985; Murry 2002). Samarawickrama et al. (1998) observe that during periods of funding pressures, dentistry receives low priority.

Rapid Scientific and Technological Changes

In their paper on the problem-based learn curriculum introduced at the Faculty of Odontology in Malmo, Rohlin et al. (1998, p. 104) have identified the dynamic state of society, rapid changes in science and technology and changing patterns of diseases as important drivers of dental curriculum. They argue that to ensure that future health workers are adaptable to the changing environment, education of health care professionals should encourage the "development of critical thinking, decision making, active and autonomous learning and problem solving."

National and Regional Accreditation Policy on Dental Education

Other factors driving dental curriculum include national and regional policy changes in dental education and changes in general dental practice. In the UK, in their interim account of a new curriculum at St Barthlomew's and the Royal London School of Medicine and Dentistry, Fry et al. (1998), pointed to changes in the 1997 undergraduate curriculum policy of the General Dental Council, economic pressures and curriculum restructuring at other dental schools as some of the factors that led to curriculum restructuring at their school. At the regional level, Moreno (1991) observed that the dental curriculum restructuring at Spanish dental schools from the stomatological to the odontological model was in response to the European Union (EU) directives. Orzack (1981) reported similar curriculum changes in Italy in response to the political pressure from the EU for all member countries to harmonise their curricula (see also, Scott 1990).

Trends in General Dental Practice

The need for the undergraduate curriculum to provide students with educational experiences close to those found in general dental practice has been emphasised by Crawford et al. (2007). This concern arises from the observed discontinuity between undergraduate education and general dental practice. Over thirty years ago, Silversin, Shafer, Sheiham et al. (1975) conducted a comparative study of aspects of endodontic treatment used by students and practising dentists in the UK. They found wide disparities between dental schools and general dental practice. They noted that dentists were not using what they were taught and raised the question of communication between dental schools and the profession. In another study, Silversin, Shafer, Smales et al. (1978) compared complete denture construction techniques used by general dental practitioners and students. They found that students spent longer chair-time with patients on average than practising dentists. They also noted that dental practitioners eliminating some steps taught in dental school in denture construction.

More recently, discontinuity between what is taught in dental schools and what is actually practised by dentists has been observed by others. In a comparative study of the proportion of dental procedures carried out by Texas general dental practitioners and graduating dental students at the three Texas dental schools, Solomon, Murray, Dodge et al. (2006) have found a reasonable match between the amount of time devoted to all procedures carried out by the two groups except for complete denture education. They have observed significant disparity between the curriculum time devoted to complete denture education and the actual practice time spent by general dentists on denture procedures. They note that students carry out complete denture procedures at frequencies of between 15 to 25 times greater than that found in general

dental practice. They, therefore, advise that faced with overcrowded curricula, when defining the breadth and depth for programs, dental schools should take time to find out what was prevailing in professional practice.

In a similar survey carried out by Clark Oyen and Feil (Clark , Oyen and Feil 2001) on the utilisation of denture techniques by graduates of Midwestern Dental School, USA, they found some discrepancy between what was taught in the undergraduate dental programme and what was practised. They note that, although undergraduate dental students acquired some level of competence in certain denture techniques, "most general dentists tended to either discontinue their use and/or apply different techniques learned outside of dental school" (Clark et al. 2001, p. 764). They, therefore, advise dental educators to take time to examine procedures traditionally taught in dental schools and those commonly employed in general dental practice.

Discontinuity between what is deemed as valid knowledge in undergraduate dental education and what is actually valued in general dental practice is not limited to technical procedures but may include a wide range of other professional activities. In a validation survey of national competencies for beginning general dentists in Canada, Gerrow, Murray and Boyd (2006) report that all the forty-six competencies specified in the national competency document (see also, Boyd et al. 1996) were generally rated highly by all participants. But they noted a rank order of competencies. Among the most highly ranked competencies were professional activities commonly carried out by dentists in general dental practice. These included diagnostic skills, patient management, treatment planning and technical treatment procedures. Among the lowest ranked competencies were those involving procedures not commonly carried out in general practice because they fall under specialist care. Examples include the

management of growth and development abnormalities, management of trauma of the dento-facial complex, management of surgical procedures related to oral soft and hard tissues and diagnosis and management of malocclusion. Other lowest ranked competencies included tasks and procedures normally delegated to dental auxiliaries. These include assessment of patient's dietary intake and oral hygiene status, taking and processing radiographs, assessing and evaluating preventive procedures including application of topical agents, mechanical plaque control methods and instructions.

The findings from the survey by Gerrow et al. (2006) suggest that some knowledge areas are more valued in general dental practice than others. This gives further support to the suggestion that dental educators should take time to examine areas of emphasis in the undergraduate curriculum in order to meet the real needs of general dental practice. This also renders support to calls by some members of the profession for an integrated approach in the education of dentists and professionals complimentary to dentistry (Anneroth 1989). A team approach is seen as the most economic way of dental education and the logical approach in the provision of dental care in the face diminishing funding to dental education (Dreyer 1989; Jeboda 1997; Moreno 1991; Samarawickrama et al. 1998).

Gaps in Curriculum Planning

There are two gaps in curriculum planning which this study seeks to address. The first is the tendency among dental educators to unquestioningly use a prevailing education model when planning the curriculum. This leads to polarisation of curriculum models. Yet both social and educational issues underlying dental education cannot adequately be addressed by a single curriculum model. This study proposes a more comprehensive

approach to curriculum planning by suggesting a hybrid curriculum model that combines Bernstein's (1977) collection and integrated curriculum, Bruner's (1977) spiral curriculum and Dreyfus and Dreyfus (1986; 1980) novice-expert continuum models. This helps to capture the educational principle underpinning the three models.

The second gap is that although there is an increasing appreciation of the importance of the wider social contextual factors in shaping dental curriculum, there is no systematic approach for appraising these factors when planning curriculum. In an extensive review of important landmarks in dental education in the USA, Tedesco (1995) advises that in order to advance dental curriculum it is important to pay attention to factors impacting on dental education. Whereas there are education models for guiding curriculum planning, there are no models for that systematically contextualise the curriculum in the wider social environment. To address this gap, the concept of 'total dental education and practice environment' (TESE) is introduced as a guiding principle to a systematic and comprehensive approach contextualising the curriculum in its social environment.

This chapter has carried out a review of drivers of dental curriculum. These have been categorised into two broad groups: educational and social factors. Two gaps in current curriculum planning approaches are also identified and suggestions to remedy them are briefly outlined. In the next chapter, dental education in the UK is situated in its wider historical and social contexts. The aim of the chapter is to give some historical background to the evolution of dental education and the dental profession in the UK.

Chapter 2

Historical and National Policy Context of Dental Education in the UK: The General Dental Council undergraduate dental curriculum policy

Introduction

In the previous chapter a review of the literature was carried out. I identified two major forces in shaping contemporary dental curriculum—prevailing education principles and the socio-cultural environment. I also argued for the importance of grounding the curriculum not only in sound education principles, but also in the wider social context in which the curriculum is located. The focus of this chapter is on the historical and policy contexts of the dental curriculum in the UK. Formicola (1984) argued that in order to explore the dental needs of the public, it is important to situate the development of dental education in its historical context.

There are three sections in this chapter. The first section traces dentistry in the UK from the mid 19th century when "first definite steps" were made to reform dentistry from an open market trade dominated by tradesmen from the lower social class, to the mid 20th century when dentistry finally evolved into an elite profession (Lewis-Payne 1924, p.139). This period is marked by three milestones—the passing of the first and second Dentist Acts in 1878 and 1921 respectively and the establishment of the General Dental Council in 1956, which marked the final stage in the transformation of dentistry into a fully autonomous profession. The second section looks at the formalisation of dental education from a privately organised apprentice model to an institutionalised model of dental education that began with the establishment dental hospitals (Senior 1948). The

last section discusses the educational functions of the GDC and their implications for undergraduate curriculum policy in the UK. This section sets the national context of dental curriculum in the UK. It also foreshadows the next chapter in which the institutional context of the Welsh Dental School curriculum restructuring is discussed.

The chapter draws mainly from secondary literature on the history of dentistry in the UK. This is supplemented with accounts from my interviewees from the GDC. I have especially relied on interview accounts on the advocatory function of the GDC—advancing the position of dentistry in higher education.

Evolution of the Dental Profession and the General Dental Council

During the early 19th century there was no formal system of dental education in the UK. The practice of dentistry was also open to sundry and all (British Dental Association 1979; Campbell 1958, 1981). But by the mid 19th century, three contending groups of dental practitioners emerged. The first comprised a small but highly influential group of reputable dental practitioners with medical and surgical qualifications. The second equally small group was made up of practitioners with some technical qualification, mainly in mechanical dentistry, which they acquired through apprenticeship. The third and largest group was made up of the much despised 'instant dentists' (Richards 1979). These were mainly uneducated tradesmen and included blacksmiths, jewellers and hairdressers. They conducted their business through what Lewis-Payne (1924, p. 138) described as "blatant charlatanism" and through highly misleading advertising (Campbell 1958, 1981). They were considered to be men of low ethical standing who employed "clumsy and ignorant methods of quackery and ill-repute" to achieve their personal ends (Lewis-Payne 1924, p.137). They were despised and considered a dangerous group that urgently needed to be eliminated or brought under control if

dentistry was to gain a good public image. Consequently, early attempts at reforming dentistry were directed at getting rid of this group.

The small group of dental practitioners with medical and surgical qualifications practised dentistry mainly as a pastime for financial gain (Richards 1979). However, because of wide spread unethical practices at the time, most dental practitioners belonging to this group did not want to be openly identified as dentists (Lewis-Payne 1924). Members of this group were instrumental in formalising dental education and in the elimination of unethical behaviour. They established code of conduct and set up standards fro dental education. They wanted to see dentistry develop into a specialty of medicine on par with such medical specialties as ophthalmology or gynaecology (Donaldson 1979). To advance their cause, they founded a scientific society: the Odontological Society in 1856. In 1858 the odontological Society founded an independent dental institute, the London School of Dental Surgery and Dental Hospital (Lewis-Payne 1924; Smith and Cottell 1997).

A parallel group consisting of those who entered dentistry through the apprentice route formed the Dental Reform Committee. This group wanted dentistry to develop as a stand alone profession with its own independent Royal College of Dentists (Rymer 1855). The group also wanted the use of titles 'dental surgeon' and 'surgeon dentist' restricted only to those with the qualification of Licentiate in Dental Surgery (Donaldson 1979). In 1857, the Dental Reform Group founded the College of Dentists of England (CDE) and in 1861 the CDE inaugurated the National Dental Hospital in Great Portland Street in London (Lewis-Payne 1924).

At first the odontological society and the CDE were bitter opponents. This can be seen the exchanges in the *Lancet* between Cartwright (1876; 1877) of the odontological society and Rymer (1858; 1860) the chairman of the CDE. However, in 1863, the CDE dissolved and joined the Odontological Society of Great Britain (Lewis-Payne 1924).

Before the emergence of organised pressure groups, early attempts at reforming dentistry in the UK were carried out by individuals, many of whom possessed medical and surgical qualifications. Among notable proponents of dental reform were such men as George Waite, James Keene and Samuel Rymer (Lewis-Payne 1924). In 1841 George Waite made an appeal to Parliament, the medical profession and the public to legislate the practice of dental surgery, arguing that as a legitimate branch of medicine, dentistry should only be practised after adequate training (Lewis-Payne 1924). Two years later, in 1843, a London dentist wrote to the Secretary of State for Home Department requesting an amendment to the Bill before Parliament in order to provide for, within the charter of the Royal College of Surgeons, a course in dentistry similar to that in surgery. On 13th September 1851, in a letter to the *Lancet* (1851, p. 263), James Keene appealed for the establishment of a chair in dental surgery at every hospital. He argued that this would help revamp the image of dentistry and serve as the first step towards the establishment of a dental college:

> "I consider, by insisting upon the formation of chairs of dental surgery in each hospital, that our present degraded profession will be brought to its proper position, and by the instrumentality of such lectureships we shall secure to our branch men of science, and be the means, I expect, of founding a dental college, where dentists must pass an examination to become respected members of our rising and important profession."

In a similar letter to the *Lancet* (1855) on August 25, Samuel Rymer called for the founding of a college of dental sciences where successful candidates could be awarded a

diploma in dental surgery. However, the first major break through in attempts to reform dentistry came in 1878 with the passage of the first Dentist Act.

The First Dentist Act 1878

The first Dentist Act 1878 made provision for registration to practice dentistry in the UK only to qualified dentists (Lancet 1922). The Act also restricted the use of the titles "dentist" and "dental practitioner" only to registered practitioners. Among those recognised under the Act to legally practice dentistry were holders of a diploma of licentiate in dental surgery, medical physicians, surgeons and pharmacists engaged in the practice of dentistry or dental surgery (Goldstein 2002). However, it was soon discovered that the wording of the Act was flawed (Hindley-Smith 1970, 1981; Lowndes 1997; Noble 2000). In a court ruling in 1909, the House of Lords decided that although the Act protected the use of the titles 'dentist' and 'dental practitioner', it did not prevent the unregistered from practising as long as they avoided the use of the protected titles (Donaldson 1979; Lancet 1922).

The court ruling on the Act had three consequences on the practice of dentistry. The first was that following this ruling unregistered practitioners flaunted the Act by using even more impressive titles such as 'dental specialist', 'dental consultant' and 'dental expert' (Campbell 1958). Secondly, because the unregistered were not under the control of the Act, they were free to engage in unscrupulous advertising and canvassing for patients (Lancet 1922). This created unfavourable competition for registered practitioners. Third, the court ruling dampened the spirit of dental reform (Donaldson 1979) and the numbers of those wishing to obtain formal qualification to practice dentistry diminished (Lancet 1922). It was not until the First World War (FWW) that

further attempts to reform dentistry were made. This followed the appointment of a commission of inquiry in 1918.

Second Dentist Act 1921

The war helped to bring to the public attention the extent of the dental condition in the UK. Several recruits were turned down for military service on grounds of being dentally unfit (Murry , Murry and Hill 1995). In 1918 a Departmental Committee, under the chairmanship of Mr F. D. Acland, was appointed to investigate the extent and gravity of unqualified dental practice. The Committee published its findings in 1919 and recommended amendment of the Dentist Act 1878. Following recommendations of the Acland Committee, in 1921 the second Dentist Act was passed.

The Dentist Act 1921 made it illegal for anybody who was not on the dentist register to engage in the practice of dentistry. This Act marked the beginning of the final step in transforming dentistry into a profession. However, some compromises were made in the Act in order to accommodate the untrained practitioners (Campbell 1981). The Act made some provision for the registration of pharmacists who, prior to the passage of the Act, were engaged in the practice of dentistry. Provision for registration was also extended to all those practising dentistry without any formal qualifications. In order to be registered, these category of 'dentists' had to meet three conditions: they had to be of good character, 23 years old and they had to demonstrate that they had sufficient experience of dentistry. Dentists with no formal qualifications were placed in the Dentist Register with the designation 'Dentist Act 1921' against their names to distinguish them from those with formal qualifications (Hindley-Smith 1970). The Act allowed all registered practitioners to use the titles 'dentist' or 'dental practitioner'.

Dental Board of the United Kingdom

The second Dentist Act, 1921 also provided for the establishment of the Dental Board of the United Kingdom, a forerunner to the General Dental Council. Membership of the Dental Board comprised the Chairman appointed by the Privy Council; 3 members of the GMC; 3 lay members appointed by the Minister of Health, the Scottish Board of Health, and the Lord Lieutenant of Ireland; and 6 dental practitioners elected by national constituency (Hindley-Smith 1981). The Board was responsible for registration of dentists and co-jointly responsible with the GMC for disciplinary cases involving dentists. It conducted disciplinary inquiries into cases of malpractice committed by dentists. But it was the GMC which had power to discipline members. In addition to its statutory functions, the Board also played an important role in advancing dental education. It set up a bursary to help needy students meet the cost of dental education and was actively involved in recruitment campaigns aimed at attracting sufficient applicants to dental schools.

Members of the Dental Board began lobbying for the autonomy of the dental profession and advocated for the establishment of an independent regulatory body similar to the GMC. Calls by the Dental Board for an independent regulatory body for dentistry were supported by the Inter-Departmental Committee on Dentistry (1946), which was appointed to advise on the legislation and governance of the dental profession. In the words of the Committee, dentistry had come of age and deserved to be granted full autonomy. Finally, on 15th March 1956 an Act of Parliament was passed that brought into being the General Dental Council. This marked the attainment by the dental profession full self-governance on par with medicine (Hindley-Smith 1981).

Evolution of Dental Education

The evolution of the dental profession went hand in hand with the evolution of dental education. Dental education served two important functions in the evolution of the profession. Following the passage of the first and second Dentist Acts, possession of formal dental qualification was used as means of weeding out quackery by denying those without formal qualifications entry on the dentist register. In addition, all those who had engaged in unethical practice of advertising were blocked from sitting for the licentiate in dental surgery (LDS) examinations. The LDS was the only route available for registration as a dentist in the UK (British Dental Association 1979; Donaldson 1979). Since then, dental education has continued to serve as an important tool in the regulation of both the quality and quantity of entrants to the dental profession. During the mid- and late 20th century when the dental profession was overwhelmed by demand for dental care, dental schools were called upon to increase intake of students (Inter-Departmental Committee on Dentistry 1946; Ministry of Health 1956). During the 1980s when the dental market was thought to be getting saturated, dental schools were called upon to reduce the intake of students (see, for example, DHSS 1981, 1983, 1987) and some dental schools were either closed or merged (Chaudhry and Scully 1998).

The Private Apprenticeship Model of Dental Education

Before dental education was formalised, the only route open to those wishing to acquire some training in dentistry was by apprenticeship to a private practising surgeon specialised in dentistry. The period of apprenticeship was usually five years (Campbell 1958; Goldstein 2002; Wilson 1985). Campbell (1981, p. 343) reports that,

> "A youth was indentured to a practitioner for five years as an apprentice. An impressive legal document was drafted, signed and stamped, wherein it was stated that he must: obey his master faithfully; behave himself; never reveal secrets; not haunt taverns or gaming houses; not contract matrimony; not unlawfully absent himself by day or night from his master's service. So that the preceptor could be assured of an adequate return throughout the tuition, the boy's father covenanted to provide him with sufficient food and wearing apparel, as well as lodging and other necessities."

The training that a student received under the private apprenticeship model was limited mainly to technical skills of denture construction. Students had little or no exposure to dental surgical skills because the dental surgeons were very busy and did not always have time to offer their students instructions in clinical procedures such as filling and extraction of teeth (Campbell 1981). But with the founding of dental hospitals, students started to receive practical training in dental surgical skills.

Establishment of Dental Hospitals

Dental hospitals in the UK were founded as charities for the provision of care to the poor (Murry et al. 1995; Smith and Cottell 1997; Wilson 1985). These hospitals were usually located in poor areas and were funded through donations of private individuals. However, the type of care offered was mainly limited to extractions and the relief of pain (Wilson 1985). In addition to the provision of care, dental hospitals became important sites for the provision of practical instructions in surgical skills to students under the tutorship of dental surgeons serving as volunteers at these hospitals (Smith and Cottell 1997). When finally dental schools began to be established, dental hospitals became an established and integral part of dental education in the UK. In fact the establishment of a dental school was always preceded by a dental hospital.

The dental hospitals of the 19th and early 20th century were radically different from modern day university-based dental hospitals at least in two areas—funding and setting. As charities, dental hospitals were funded through donations. But with expansion in the services offered and in the intake of dental schools they served, these hospitals could no longer be run as private concerns (Murry et al. 1995). By 1946 two models of dental hospitals emerged. In the first model, most dental schools and their dental hospitals were affiliated to or were wholly part of the university. In the second model, some dental hospitals became departments of general hospitals (cf. Inter-Departmental Committee on Dentistry 1946, par 48; Murry et al. 1995).

One of the most fundamental differences between these early dental hospitals and the modern university-based dental hospitals lies in the structural organisation and setting of the hospital. The early dental hospitals were located in areas of dental need and were run, more or less, as primary care units. Consequently, they offered students a very rich clinical environment were they experienced firsthand dentistry as most of the patients attending these hospitals had active dental disease. This is in contrast to the clinical environment offered in modern day highly segmented, superstructures of the university dental hospitals. The modern university dental hospitals are organised into discipline-specific specialist clinics. They only offer secondary and tertiary dental care to a specialised type of patient—the referrals from general dental practice (cf. General Dental Council 2002, par. 45). Consequently the clinical experience they offer to students does not does not reflect what is found in general dental practice.

Formalisation of Dental Education

Definite steps to formalise dental education began with a petition by a group of eminent London practitioners to the Royal College of Surgeons of England (RCSE) in 1855. these practitioners petitioned the RCSE to conduct examinations in and to establish a department of dental surgery (British Dental Association 1979). Three years later a clause in the 1858 Medical Act allowed the RCSE to conduct examinations leading to the qualification of Licentiate in Dental Surgery (LDS) and to grant certificate of fitness to practice dental surgery. The first LDS examination was conducted in 1860 in England, followed by Scotland and Ireland in 1877.

Initially, eligibility for the LDS examination was open to all engaged in the practice of dentistry. Only those who had engaged in the unethical practice of advertising were burred from these examinations. Later candidates were required to show proof that they had engaged in professional studies for at least 4 years of which 2 years must have been spent at a dental hospital. Candidates were also required to show that they had done 300 fillings, 40 gold and 40 in-lays, 4 orthodontic cases, 12 metal or porcelain crowns during this period of study (Campbell 1958).

Content and Structure of Dental Curriculum

The composition of content of the dental curriculum was not very different from what it is today. It comprised basic sciences courses in anatomy with dissections, physiology, pathology, physics and chemistry; and training in general medicine and surgery comprising courses in *materia medica* and the practice of surgery. Clinical dentistry had a strong component of prosthetic dentistry, which continued to dominate curriculum time until around the 1980s. This component of the course comprised practical training

in materials and techniques involved in the production and fitting of dentures and courses in metallurgy and mechanical dentistry. The second component of clinical dentistry involved practical and theoretical training in dental surgery.

To meet the RCSE requirements for the LDS examinations, a student was expected to engage in over four years of professional studies of which three years must have been spent in acquiring skills in mechanical dentistry under the apprenticeship of a competent dental practitioner; two years at a recognised dental hospital or a dental department at a recognised general hospital and six months of training in general anatomy, physiology, general medicine and surgery at a general teaching hospital (Smith and Cottell 1997).

Much of the early dental curriculum was devoted to the manufacture of dentures. Attempts by the Irish Dental School in 1894 to reduce curriculum time for dental mechanics from three to two years attracted stern warning from the GMC (Lancet 1894). However, towards the end of the 19th century and the early 20th century, there were calls for better harmonisation of curriculum time between mechanical dentistry and surgical and medical training. In the inaugural address on dental education, Canton (1896) called for balance in curriculum time allocated to mechanical and surgical dentistry. He argued that, "The object should be to see to it that neither one side nor the other preponderates." An article in the *Lancet* (1911), called for an increase in curriculum time devoted to surgical and medical training and a reduction for mechanical training. Similar, sentiments were echoed by others such as Shaw (1916) and Eason (1938). Eason called for balance in curriculum time between technical skills, surgical skills training and sound grounding in academic and scientific knowledge.

Mechanical dentistry continued to dominate the dental curriculum apparently for two reasons. The establishment of the NHS in 1948, which supported a dental care scheme which limited dental treatment mainly to extractions of teeth and their replacement with dentures (Campbell 1958). The prevailing scientific theories on disease transmission in the early and mid 20th century supported multiple extractions (Dussault and Sheiham 1982). Both factors promoted a dental curriculum devoted to mechanical dentistry and oral surgery. Serious calls for reduction in curriculum time for denture dentistry has only occurred in recent years in response to demographic changes, decline in dental disease levels (Mojon et al. 2004; O'Byrne et al. 1997; Zarkowski et al. 2002) and changes in the public expectations for oral care (Douglass and Sheets 2000) and the quality of dental care.

Composition and Education Functions of the GDC

The GDC was established by an Act of Parliament in 1956. The newly established GDC took over three functions: undergraduate dental education from the GMC; registration from the Dental Board; and professional discipline previously jointly carried out by the GMC and the Dental Board.

Composition of the GDC

When the GDC was first constituted it had 44 members of whom almost half were appointees from the universities with dental schools and the Royal Colleges that conducted examinations in dental surgery. The rest were crown appointees, members elected by national constituencies and GMC representatives who only participated in education matters. Table 3.1 shows the composition of the GDC in the 1970s.

Table 2.1: Composition of the GDC: 1970

Member Category		Total No.
University and Royal College Nominees		20
• University Nominees	16	
• Royal Colleges Nominees	4	
Dental Professionals		14
• Members Elected by National Constituencies	11	
• Crown (Government) Appointees	3	
Lay Members (Crown Nominees)		4
GMC Nominees (For educational business only)		6

The dominance of university and Royal College nominees on the Council was justified on the grounds that councils were originally conceived in order to deal primarily with matters relating to professional education (Hindley-Smith 1970). It was argued that, because dental academics were directly involved in everyday issues affecting dental education, they were best suited to articulate and assume responsibility over policy related to dental education.

The GDC underwent some significant reform in 2001 which brought into being a much reduced Council and in which nearly all appointed positions were abolished in preference to elected positions. One of the reasons for reforming the GDC is the argument that a Council largely dominated by the dental profession is retrogressive and incapable of meeting the ever changing patient expectations;

> "Outdated concepts of regulation and assumptions that the profession alone knows best must be set aside if the regulation of dentistry is to keep in-step with ever-increasing patient expectations and developments in healthcare provision and regulation" (Wilson 2003, p. 7).

But it is also true that these reforms were triggered by increased calls by the general public for accountability in the way the professions conducted their business. Tragic events such as the Shipman scandal (Shipman Inquiry 2005), The Bristol Royal Infirmary case (Bristol Royal Infirmary Inquiry 2001) and the organ retention scandal at the Royal Liverpool Children's Infirmary (Royal Liverpool Children's Inquiry 2001) that rocked the medical profession in the late 1990s and early 2000 led to widespread questioning of the ability of professions to self-regulate and protect the public in the face of glaring anomalies from their members (Armstrong 1990; Jago 1984; Klein 1998; Salter 2000; Stacey 2000). This led to calls for more accountability measures including calls to reform the professional regulatory bodies. Although dentistry has remained relatively free from serious cases of professional misconduct (Goldon 2004) and, in comparison to medicine, has only experienced minor cases of professional misconduct (DHSS 1986; Jago 1984), it has, nevertheless, not been exempt from calls for reform.

There are two significant changes in the newly restructured 2001 GDC. In the restructured GDC, membership of the Council has been reduced from 44 to 29. In addition, all nominated positions previously reserved for universities, the royal colleges and the dental profession have been abolished. Membership to the Council is now through elections according to a predetermined number of constituencies comprising England, Isle of Man and Channel Islands; Scotland; Wales; and Northern Ireland. The other important change is the increase in crown appointed lay members from 4 to 10.

From 2006 the NHS became the appointing authority of lay members. Table 3.2 shows the composition of the restructured GDC.

Table 2.2: Composition of the Restructured GDC: 2001

Composition of Members		Total No.
Dentists by Constituency		15
• England, Isle of Man and Channel Islands	11	
• Scotland	2	
• Wales	1	
• Northern Ireland	1	
Dental Care Professionals (DCP)		4
Lay Members (Crown Nominees)		10

One of the practical implications of the 2001 GDC reforms is that the dominance of dental academics at the GDC has finally come to an end. The abolition of nominated places which previously worked in favour of the university and Royal College academics, and the introduction of elections has effectively ended the dominance of universities and Royal colleges on the Council. This is reflected in the composition of the 2005 Education Committee. Out of a total of 8 members, 2 were lay members. Both had strong backgrounds in higher and general education. Among the 6 dental professionals, only 2 were engaged in undergraduate dental education, while the remaining 4 were engaged in postgraduate and vocational training (See, General Dental Council 2005). This is a marked change in the composition of the Education Committee, which previously was a preserve of university dental academics.

Since it is inevitable that the GDC undergraduate curriculum framework policy will be revised at some point in the near future, it is perhaps logical to assume that when that time comes the Council will appoint members from outside the Education Committee to help with the revisions. This would not be a totally new practice. The team that conducted visitations of dental school on behalf of the GDC during the 2004/5 cycle comprised appointees from outside the Education Committee and nearly all of them had some background in undergraduate dental education.

The Education Functions of the GDC

The statutory functions of the GDC, as stipulated in the Dentist Act 1984, are threefold: registration, professional education and professional conduct. However, my focus is only on the education function. Readers interested in the other two functions are referred to the paper by Hindley-Smith (1970) and the GDC publication on professional standards (General Dental Council 1997). The paper by Jago (1984) also offers some informative and critical sociological analysis of the disciplinary function of the GDC.

There are four important areas in which the Education Committee is engaged—postgraduate education, continuing professional development (CPD), conducting examinations for foreign trained dentists wishing to practice in the UK, and undergraduate education. In the area of postgraduate education, the Education Committee's work is limited to sampling various aspects of postgraduate education. In CPD, the Education Committee's role is to ensure that all practising dentists are abreast with developments in dentistry for the benefit of the patients.

The Education Committee also conducts examinations for foreign trained dentists wishing to practice in the UK before they can be registered. These examinations are conducted in order to ensure that foreign trained dentists possess the same breadth and scope of knowledge as UK trained dentists. However, the main education function of the GDC is seen as that of regulating the undergraduate dental education in the UK.

The educational function of the GDC arises directly from the legal requirement to register all students graduating from the UK dental schools without subjecting them to further external licensing examinations as is the practice in many countries such as the USA (ADEA Commission on Change and Innovation in Dental Education, Haden, Andrieu et al. 2006b; Boyd et al. 1996; Yeager 2004), Japan and Korea (Heo, Kim, Kawamura et al. 2004; Japan Dental Association).

The educational mission of the GDC may be broadly grouped into two: ensuring high standards of dental education and promoting and protecting professional interests in a highly competitive higher education market. While the altruistic function of protecting the public through the production of dentists with requisite knowledge and technical skills is readily acknowledged, the self-serving role of promoting professional interest in higher education remains largely tacit.

Protecting the Public

The educational mission of the GDC has been unequivocally stated in all its past and current undergraduate policy documents since 1963 (see, for example, General Dental Council 1963; General Dental Council 1980; General Dental Council 1997, 2002). It is stated as that of ensuring "high standards of dental education at all its stages" at all UK dental schools (General Dental Council 2002, par. 1). The significance of this statutory

responsibility was not lost to all my interviewees, who repeatedly referred to the legality of the GDC as the custodian of dental education in the UK.

Underpinning the statutory responsibility of maintaining high standard of dental education at all dental schools in the UK (see also, General Dental Council 2005) is the obligation placed on the GDC to register all those graduating from the UK dental schools. Unlike their counterparts in medicine, newly qualified dentists are allowed to carry out independent and unsupervised dental practice after qualifying. This places greater responsibility on the GDC to ensuring that all dental graduates are capable of safely carrying out dental care unsupervised.

There are two ways in which the GDC safeguards the public in dental education. It establishes minimum curriculum standards, which all dental schools are expected to meet. These standards are set out in the GDC undergraduate policy framework document. The second function follows from the first. To ensure that standards sets for dental schools are followed, the Council conducts visitations to dental schools and final examinations. These visitations are important because unlike in other countries such as the USA and Japan where newly qualified dentists sit for externally set pre-registration examinations before they are eligible to practice dentistry, in the UK dental graduates have the right to full registration on graduation.

Advancing the Position of Dentistry in Higher Education

In order to enforce standards in dental schools, the GDC conducts visitations. Although primarily these visitations are a means of ensuring that dental schools are delivering quality education, they also tacitly serve to advance the position of dentistry in the highly competitive university sector. Because of the legal standing of the GDC,

university authorities have usually not hesitated to act on what is recommended by the GDC during visitations. This ability to move authorities into action have particularly been put to good use in advancing the special needs of dental education, especially at institutions where it was felt dentistry was not getting a fair share in the allocation of resources.

The GDC's ability to influence authorities in favour of dental education arises from the legal standing of the Council. In the undergraduate curriculum policy, the Council directly addresses itself to the universities, the Departments of Health and Education and the NHS Trusts, reminding them of their responsibility towards promoting dental education (see, General Dental Council 2002). The role of advocacy for dental education is couched in the rhetoric of promoting an educational and clinical environment that supports student learning. Universities, for example, are reminded to be transparent in the distribution of funds from central government to dental schools:

> "The GDC expects universities to have a transparent system for transmitting funding from the Higher Education Funding Councils through their central administration to the dental schools" (General Dental Council 2002, par. 29).

Universities are also reminded to provide library and information technology facilities for the use of dental students (General Dental Council 2002, par. 31) and adequate dental staff accommodation and facilities for teaching and research (General Dental Council 2002, par. 32). The Departments of Health and Education are expected to, "...ensure that clinical teaching of students on patients is not compromised by other demands" (General Dental Council 2002, par. 40) while the NHS Trusts are expected to cooperate with dental schools in order to ensure that "...clinical teaching of dental students on patients proceeds in a satisfactory manner" (General Dental Council 2002, par. 39).

The ability of the GDC to move relevant authorities to act in ways that helped to advance dental education was illustrated by Prof. Coleman with an example of what transpired at one of the dental school in the early 1960s:

> AK: [...] just putting it in a general way, has there been any school that has been found wanting in their performance?
>
> BC: Oh, yes!
>
> AK: And what has been the reaction from the GDC?
>
> BC: The General Dental Council makes recommendations. On four occasions we said we need to revisit again in one year. They haven't just ticked the box and said, 'yes you are fine'. [...]I can tell you what happened at the Fountain Dental School [FDS] in 1961... What had happened there over 40 years ago, there had been a big expansion but there were not enough dental chairs. When the General Dental Council visited they said, "We are very, very concerned about the shortage of chairs and the large number of students. We demand that you cut your intake next year to 35 until you have sorted it out." That is what they told FDS to do 40 years ago. As a result, 15 years later, there was a new dental school (Interview excerpt with Prof. Brushwell Coleman, retired professor of child dental health and dean, co-chairman of Education Committee and former chairman of the 2002 Working Party, GDC. 21/05/2004).

The ability to enhance the position of dentistry in the highly competitive higher education sector is perhaps of much more significance to the profession than any other function. This has been put most candidly by Prof. Morgan Maples who saw the most satisfying aspect of serving on the GDC to be the opportunity to work for the advancement of dentistry:

> *AK:* When you look back at all these contributions, what would you say was the greatest achievement in relation to dental education?

MM: I don't think I came up with any great achievement. I have never thought of myself as doing that.

AK: May be to re-phrase. Which area would you say you were most satisfied with in relation to dental education? I know it is difficult to talk about yourself. But I believe with all these immense contributions you made, there must be something which, when you look back you can say, 'Yes, I think that satisfies me a lot'.

MM: I suppose in a way of trying to get people working together for the common good of dental education. In a small way if I was of influence or chairing committees to try and get people working for the common good to improve dental education and to ensure that outside bodies—bodies outside dentistry—recognised the importance of dental education and thought about dentistry as well as, for example, thinking about dentistry. So those who had the responsibility of coming up with policies and funding did in the end recognise the particular demands of dentistry and that we didn't have to continue to remind them of it. If at the meeting they came and said, 'Oh now we must see how that influences the dentists'. If that would come without my probing them, I thought that was quite a good thing. That is, improving, hopefully, the position of dentistry within higher education and of getting everyone to think in the same direction and to play a small part in developing the undergraduate curriculum (Interview excerpt with Professor Morgan Maples, professor of prosthetics and member the 1997 GDC Working Party. 28/02/2005).

This chapter has discussed the evolution of dentistry and dental education and the education functions of the General Dental Council. It may be argued that the evolution of dentistry into profession and dental education from a private apprenticeship model to a full university programme were shaped by and are products of wider social, political, scientific and demographic changes. In the next chapter, the institutional context of curriculum development at the Welsh Dental School is discussed.

Chapter 3

Charting the Path to Comprehensive Curriculum Change: The institutional context of the WDS curriculum restructuring

Introduction

Chapter 2 situated dental education in the UK in its wider historical and social contexts. The aim of this chapter is to contextualise curriculum restructuring at the institutional level. Significant developments at the Welsh Dental School (WDS) are traced from the time when the Interdepartmental Committee on Dentistry (1946) recommended that a new dental school should be opened in Wales to the time when the new curriculum was implemented in 2001. Like in the last chapter, the intention is to situate the WDS curriculum restructuring and key features of the new curriculum in their wider historical and social contexts. Chisholm (2005, p. 193) rightly observes that curriculum is a social product that is shaped by the "dynamic interaction" of multiple contextual factors.

The WDS is one of 28 academic schools at Cardiff University and is the only dental school in Wales. Before 2004, the WDS belonged to the University of Wales College of Medicine (UWCM). However, on 1st August 2004, the University of Wales, Cardiff (UWC) merged with UWCM and became Cardiff University. Before the merger both institutions were full members of the federal University of Wales. Cardiff University, however, still retains affiliate membership of the University of Wales.

The dental programme at the WDS has always been provided collaboratively by three schools: the School of Biosciences; the Medical and Dental Schools. Before the merger, the School of Biosciences belonged to UWC. The newly merged Cardiff

University has twenty-eight academic schools which are located at Cathays Park, the Heath Park and along NewPort Road. It has a staff of around 5,280 and a student population of around 30,685. The Dental School and Hospital and the Medical School and University Hospital of Wales are located at the Heath Park campus, while the School of Biosciences is located close to the city centre at the Cathays Park campus, some two miles to the south east of the Heath Park. Apart from the planned dental school in Hampshire (University of Southampton 2005), the WDS is the most recent dental school in the UK.

Genesis of the Welsh Dental School

The WDS was first established as a department of dentistry in 1961 at the Welsh National School of Medicine (WNSM). It was temporarily housed at Cardiff Royal Infirmary along Newport Road (Cooke 1997). It moved to its present and permanent site when construction of the building that houses the dental school and hospital at the Heath Park was completed in October 1965. It was officially opened on 7th July 1966 by the Duke of Edinburgh (Cooke 1997; WNSM 1966).

Although the WDS was established in 1961, its history can be traced back to 1946 when the Interdepartmental Committee on Dentistry (ICD) was appointed to find ways of meeting the rising demand for dental care in the UK. The ICD recommended expansion of existing dental schools and establishment of new ones. The Committee argued that if the demand for comprehensive dental care was to be met, a total of 20,000 dentists would be required. To achieve this target, it recommended expansion of existing dental schools and opening up new schools (Inter-Departmental Committee on Dentistry 1946, par. 61). The Committee suggested that four new dental schools could be set up at the Universities of Oxford, Cambridge, Aberdeen and Wales.

The ICD, however, expressed some reservations on the likelihood of opening new dental schools at the universities of Oxford, Cambridge and Aberdeen but was more optimistic about the University of Wales. The Committee predicted that establishing a dental school at Cardiff would be received with enthusiasm because it would offer Welsh students a chance to pursue a career in dentistry by cutting down the extra cost in accommodation incurred in attending English dental schools. They pointed out that:

> "So far as the University of Wales is concerned, we have formed the impression that favourable consideration would be given to the establishment at Cardiff of complete courses of training for a degree in dentistry, to include the setting up of a clinical department within the medical school, provided that the University is enabled to meet the expenditure involved. A dental school at Cardiff might not only attract those who would have gone to English dental schools at great expense, but also many who would not otherwise have taken up the career at all. We do not wish the effect of establishing a Welsh dental school to be simply to take students who would otherwise have gone to neighbouring schools, for example, Bristol" (Inter-Departmental Committee on Dentistry 1946, par. 65).

The Committee, however, identified two obstacles that were likely to impede early establishment of a dental school at Cardiff. These were the absence of an established dental infrastructure and the shortage of academic staff at the WNSM. They argued that,

> "We gather, however, that, on account of a shortage of teaching staff and accommodation, it may be some years before a school could be established in Cardiff: nevertheless, we have no hesitation in recommending that the matter should be explored as soon as possible" (par. 65).

Dental Infrastructure

Historically, dental schools in the UK were started as voluntary service to the poor at large general hospitals with established dental departments (Campbell 1958, 1981; Cooke 1997; McGowan 1999; Murry et al. 1995; Smith and Cottell 1997). Dental surgeons known as honoraries volunteered part of their time, either early in the morning or late afternoons (cf. Murry et al. 1995; cf. Smith and Cottell 1997), to offer free dental care to the poor and to instruct their dental students in dental surgery (Cooke 1997; Smith and Cottell 1997). But Cardiff lacked both the dental facilities and honoraries to facilitate the establishment of a dental school. It was not surprising that the ICD thought it would take a long time to establish a dental school in Wales.

It took 20 years from the time the ICD recommended for a new dental school in Wales to the time when finally the WDS was officially opened at Cardiff in 1966 (Cooke 1997; WNSM 1966). But far beyond what the Committee had imagined, a whole new dental school and hospital was built from scratch. The new dental school and hospital was part of a modern hospital complex which included the medical school and teaching hospital at the new site at the Heath Park campus (Cooke 1997; Lancet 1960).

Plans to establish a dental school at Cardiff were accelerated because they coincided with plans to expand the Cardiff Royal Infirmary and the WNSM. In 1952 the University of Wales acquired 53 acres of land at the Heath Estates from Cardiff Council where it planned to build a new medical teaching centre complex comprising the hospital, medical school, dental school and hospital, and residential quarters (Cooke 1997). Construction of the complex was carried out in two phases. Work on the dental school and hospital was given first priority and was completed five years earlier than the rest of the hospital and medical school (Cooke 1997; WNSM Dental School 1979).

A year before construction of the dental school was completed; the first cohort of 23 dental students commenced their pre-clinical studies at the University College, Cardiff in 1964. In October 1965, they began their clinical studies at the newly built dental school. But for five years the new dental school existed in "comparative isolation" (WNSM 1970, p. 52) from the medical school which continued to operate from Cardiff Royal Infirmary until 1970 when finally the medical school and hospital complex were opened at the Heath. During this period, dental students commuted from the Heath Park to Cardiff Royal Infirmary for their medical science lessons.

Teaching Staff

One the problem faced by the new dental school at Cardiff was that of attracting suitably qualified young dentists into teaching. This problem continues to be an enduring issue (Treasure 2004), but was acute especially during the mid 1970s and early 1980s and affected all dental schools in the UK. The problem was exacerbated during this period because of the economic crisis which led to funding cuts to universities (Cooke 1997; Daley 1985; WNSM 1980). The shortage of academic staff was more challenging at the newly established WDS because it could not compete with established dental schools such as those in London which offered better postgraduate education opportunities in various branches of dentistry to junior staff (WNSM 1975). But Cooke (1997) notes that at a time when academic staff at most dental schools in the UK were leaving for opportunities abroad, the staff at WDS stayed on and devoted themselves to the advancement of dental education and dental services in Wales.

Evolution of Departments

When the dental school was established in 1961 it had only one department—the department of dentistry. In 1967 the department of dentistry was replaced by two departments: the department of oral medicine and oral pathology and the department of dental surgery (Cooke 1997; WNSM 1967. See also Appendix 4.2). The Department of Oral Medicine and Oral Pathology comprised five disciplines: oral biology, oral medicine, oral pathology, periodontology and oral surgery. The Department of Dental Surgery was also made up of five disciplines: children's dentistry, preventive dentistry, orthodontics, restorative dentistry, conservative dentistry and dental materials. In 1969, the Department of Dental Surgery was split into three departments: restorative dentistry, conservative dentistry and children's dentistry and preventive dentistry (WNSM 1969). This marked the beginning of a period of departmental segmentation which culminated in nearly all the major clinical disciplines of dentistry existing as autonomous departments (WNSM 1969, 1970, 1971, 1975). This process began with the establishment of a chair in orthodontics in October 1970 (WNSM 1971), followed by periodontology (WNSM 1975). At the end of 1982 the school had a maximum of 8 departments (WNSM 1983). Although it is difficulty to say with certainty the reasons for department proliferation, it is possible that the creation of new departments may have helped to attract senior academics to the School as heads of departments.

From 1983 to 1985 nearly every major discipline of dentistry at WDS existed as a department. This was followed by a period of departmental amalgamations. This started with the merging of the Department of Children's Dentistry with the Department of Orthodontics to form the Department of Child Dental Health (WNSM 1986). In 1996 when the UWCM developed a division management structure, the dental school was divided into four divisions: the Departments of Basic Dental Sciences; Child Dental

Health; Oral Surgery, Oral Medicine and Oral Pathology; and Restorative Dentistry (UWCM 1996). Apart from the Department of Dental Sciences, each division was made up of more than one department. The division of Restorative Dentistry, for example, was the product of amalgamation of the Departments of Conservative Dentistry, Periodontology and Prosthetic Dentistry.

There were two developments at WDS, which had implications on the departmental structure. These are the granting of NHS Trust status to the University Dental Hospital on 1st April 1995 and the dual appointment of the Dean as Chief Executive of the Trust. In line with the seamless approach already initiated in the management of the dental school and hospital (UWCM 1995), heads of academic divisions/departments were also appointed heads of the Dental Hospital Trust clinical directorates (UWCM 1996, 1997) leading to further blurring of boundaries between dental education and patient care.

To reflect the wide range of activities covered under the new seamless 'departments' (UWCM 1997), the Department of Restorative Dentistry was renamed Division of Adult Dental Health (ADH), while the Department of Child Dental Health was renamed Division of Dental Health and Development (DHD). At the time the new curriculum was implemented, the dental school comprised four departments as follows:

1. Division of Oral Surgery, Medicine and Pathology (OSMP). This department encompassed the disciplines of oral surgery, oral medicine, oral pathology and dental radiology;
2. Division of Basic Dental Science. This was structurally the smallest and mono-discipline department;

3. Division of Adult Dental Health. This by far was the largest department. It was made up of several disciplines including the specialty of restorative dentistry and the mono-specialties of endodontics, periodontics and prosthodontics and the disciplines of cariology and operative dentistry, conscious sedation, special care dentistry and implantology; and
4. Division of Dental Health Development incorporating the disciplines of paediatric dentistry, orthodontics, dental public health and dental audio-visual aids.

The Divisions of Basic Dental Science and DHD later merged to form the Division of Dental Health and Biological Sciences. The new division comprised three dental disciplines: paediatric dentistry, orthodontics and dental public health and two research sections—biomaterials and biomechanics; and matrix biology and tissue repair.

The fluidity of departmental boundaries exhibited by variations in the component disciplines and sub-disciplines of dentistry that constitute departments partly point to the fact that departments are social constructions and their composition and the names by which they are known, will change from time to time and from one dental school to another (cf. Fiehn 2002; Scott 1990). The 'shifting alliances' (Hafferty and Light 1995, p. 133) between disciplines also point to variations in classification (Bernstein 1977) over time. These two points are best illustrated by periodontology which, between 1967 and 1974 was classed under the Department of Oral Medicine (WNSM 1967), a department which also comprised the disciplines of oral biology, oral surgery, oral medicine and oral pathology. This suggests relative weak boundary maintenance between periodontology and the other four disciplines. In 1975, however, periodontology and other disciplines became standalone departments (WNSM 1975), suggesting a shift in boundary maintenance from weak to strong classification. But,

following restructuring aimed at bringing the School's academic departments in line with the Dental Hospital NHS Trust directorates, the departments of periodontology, conservative dentistry and prosthetic dentistry amalgamated to form a new multi-discipline Department of Restorative Dentistry (UWCM 1995), a shift back to a relative weak boundary maintenance between periodontology and other disciplines.

Another noticeable development in the evolution of departments at the WDS is the emergence of a multi-discipline department model which is closely linked with the three core disciplines of dentistry: Children's Dentistry, Restorative Dentistry and Oral Medicine/Surgery. These three traditional disciplines of dentistry also form the backbone of primary care dental practice. Although these three departments were known by different names at different times of the School's history, their core disciplinary base was readily identifiable. For example, the Department of Children's Dentistry emerged from the department of dental Surgery in 1969 (WNSM 1969) and comprised the disciplines of paediatric dentistry, dental public health and orthodontics. But over the years it changed names from Children's Dentistry and Preventive Dentistry (UWCM 1985; WNSM 1969) to Child Dental Health (UWCM 1986, 1996), to Dental Health and Development (UWCM 1997, 2001) and finally to the Department of Health and Biological Sciences (UWCM 2002).

Children's dentistry has historically been associated with preventive and public health dentistry (Welshman 1998; Zangwill 2001) and, at the WDS, it is through this department that the hospital-based dental training is linked to primary care dental practice and the community. On the other hand, oral medicine, oral surgery and oral pathology have traditionally been allied to medicine (Bertolami 2001; Scott 1990; Spielman, Fulmer, Eisenberg et al. 2005). This is exemplified not only in these

disciplines' reliance on conceptual tools of medicine in the diagnosis and treatment of oral conditions, but these disciplines also readily collaborate with medicine in research and in the provision of care. At the WDS, the discipline of oral medicine and the department of haematology instituted an integrated approach to the diagnosis and treatment of dental patients with blood disorders (WNSM 1983). It is also worth noting that under the restructured theme-based curriculum, leadership and the dental school membership of the Human Disease theme is predominantly from OSMP.

The disciplines constituting restorative dentistry form the central core of the curriculum in the odontological model followed by most Western countries including the WDS (Fiehn 2002; Scott 1990). There is a general trend in the odontological model to emphasise what has been described as the "drill-and-fill and related technical or mechanical aspects of dentistry" (Giddon and Assael 2004, p. 438) with the net result that graduates from these schools tends to have exceptionally 'higher expertise in restorative dentistry' (Scott 1990, p. 72). The segmentation of dental knowledge into three main departments has implications for the framing of dental knowledge.

National and International Contribution of the WDS to Dental Education

From its establishment, the WDS has grown to claim its place in dental education at the national and international levels. Nationally, the School's contribution to dental education and oral health care extends beyond Cardiff City into North Wales through its outreach teaching programme. Internationally, the School is actively engaged in the promotion of dental education through collaborations with other dental schools in Europe, South America and, more recently, in Africa. This is in accord with the Dental School and Hospital mission, "To remain a recognised leader of academic excellence in Wales, the UK and beyond" (University of Wales College of Medicine 2001, par. 4.1).

Commitment to Dental Education and the Delivery of Oral Care in Wales

The dental school at Cardiff was established in order to meet the national needs for comprehensive dental care. But from a Welsh perspective, the school has been significant for two reasons. It offered an opportunity to improve the quality and quantity of dental care to the people of Wales through the provision of essential dental manpower. This was a significant development because Wales had one of the highest dentist-patient ratio in the UK (Cooke 1997; South Glamorgan Health Authority 1987). The dental school also provides ready availability of specialist dental services.

Related to the provision of dental care is the education mission of the School. The educational mission and vision of the WDS extends beyond the borders of Cardiff were it is located. The school has outreach teaching posts within and around Cardiff, with the largest and most recent being the Primary Care Unit at St. Davids Hospital. It has also an outreach teaching post in North Wales at Wrexham (see Appendix I and Chapter 9). There are also plans to expand graduate education and to extend outreach teaching to other parts of Wales. The education mission and extended dental care programme through the school's outreach programme and provision of specialist dental care that extends beyond the borders of Cardiff City to the rest of Wales, makes the dental school at Cardiff University truly a *Welsh Dental School.*

International Contribution to Dental Education

One of the aspirations of the WDS is to become an international leader in dental education (UWCM Dental School 2001b). This aspiration has been translated into practice through the school's collaborative links with other universities, hosting of

international conferences and the active involvement of academic staff in regional and international dental education forums. From a humble beginning of one department at its inception, the school has grown to a world-class dental education and research centre. This achievement has not come by accident but is a product of several factors including a highly dedicated and committed staff (Cooke 1997).

The school established collaborative links with Scandinavian universities which date back to the early 1970s (WNSM 1971). Similar education links were developed with a dental school at Trujillo in Peru, South America (Jones 1994; UWCM 1995), the Baltic States and, more recently, with Makerere University in Uganda, East Africa.

Collaboration with EU and Non-EU Dental Schools

In 1995 the School entered into a formal twinning agreement with the University of Lund, Malmo in Sweden involving three areas: joint curriculum development, student electives and staff development (UWCM 1995). The close education links between the two institutions is partly reflected in similarities in approach to curriculum management. Although Malmo University follows a PBL curriculum model and the WDS follows a mixed pedagogic approach, both institutions have adopted an integrated theme-based dental curriculum (cf. Rohlin et al. 1998; UWCM Dental School 2001b, 2004). Besides Malmo University, the WDS has been actively engaged in the development of dental education programmes in the new EU members in the Baltic States. The school has helped to set up dental education programmes in these countries, in some cases, from scratch.

The school's dental education mission extends beyond the EU borders. The School helped to develop an undergraduate curriculum that closely matched the oral health

needs of the community at a new dental school at Trujillo in Peru (UWCM 1995). Besides the curriculum project in Peru, at the time of conducting interviews for this study, the School was in the process of entering into partnership with Makerere University in Uganda in the area of undergraduate and postgraduate education.

The impetus for international collaborations and partnerships were partly driven by the deep entrenched school's mission in dental education. But there were also social and material motives for these collaborations. Some of the social benefits for collaborating with other EU dental schools include the provision of an enhanced education and social experience for students during electives and opportunities for staff development in teaching and research. Collaborative work also provided opportunities for the WDS academic staff to come in contact with their peers from institutions with a different approach to education. This created opportunities for cross-pollination of ideas and for staff to seriously question and reflect upon the usually taken for granted assumptions about dental education. The execution of some education projects abroad involved assembling a team of academic staff from the WDS and this created opportunities for team building. There was also potential for these projects to evolve into long term collaboration and partnerships in postgraduate education and research between the WDS and the recipient institutions.

Participation on International Forums in Dental Education

Apart from the involvement in the promotion of dental education at overseas dental schools, the school and academic staff have been active participants on international dental education forums, especially in the work of the EU regional body, DentEd. A year before implementing the new curriculum, the school invited a team from DentEd in 2000, to accredit the new curriculum. The DentEd team offered some valuable

suggestions that helped to further enhance the new curriculum (UWCM Dental School 2000). But this visit also marked the beginning of the school's increased involvement in the work of DentEd. Since then academic staff from the WDS have participated in the DentEd visitations to other European dental schools.

The WDS staff also actively took part in the global congress on dental education (Shanley and Nattestad 2002) and were among panels that looked at different aspects of dental education (See, for example, Falk-Nilsson, Walmsley, Brennan et al. 2002; Ferrillo, Jonas, Gundersen et al. 2002; Oliver, Paganelli, Cerny et al. 2002; See, for example, Plasschaert et al. 2002). The benefits of active participation in international forums included team-building, developing a broader view of dental education and a greater appreciation of general trends in dental curriculum. It may be argued that these international forums also served the important function of 'consensus' building (Bland et al. 2000; WHO 1990) among members of the WDS curriculum management team.

Curriculum Re-organisation

One event that was central to the initiation of curriculum restructuring at the WDS was the dual appointed of Prof. Norman Whitehouse as Unit General Manager of the Dental Hospital and Dean of the Dental School (Jones 1994; UWCM 1993). This event marked the beginning of what was described as a 'seamless' approach to the management of dental education and oral care delivery (Jones 1994; UWCM 1995). As is usually case when there is change in leadership (Tosteson , Adelstein and Carver 1994), upon assuming these two offices, Prof. Whitehouse initiated a joint dental school and hospital strategic plan covering three areas: education, research and clinical service in 1993. Three committees were appointed to consult widely among members of staff and other interested parties (UWCM 1993, 1994a, 1994b).

Prof. Whitehouse devolved responsibility for planning the new curriculum to a young generation of academics instead of leaving it in the hands of senior staff who were about to retire. There were two advantages for placing responsibility in the hands of the young generation of academics. The first was that this facilitated the infusion of new and innovative ideas into how dental education, research and oral care should be run. The other advantage was that this allowed for continuity. Planning for the new curriculum was initiated in 1993 but it was not until 2001 that it was implemented.

The period between 1995 and 1999 was marked by relatively high attrition of very senior academics, including the dean, through retirements (see, for example, UWCM 1995, 1997, 1999). But during the same period there were a number of local appointments of a new generation of senior academics including the appointment of a new dean in 1999 (see also, UWCM 1995, 1996, 1999, 2001). It was this new crop academics who saw the new curriculum to its full implementation.

Although generally the WDS curriculum had remained relatively unchanged from the time the dental programme was introduced in 1961, some school-wide and departmentally-based 'minor modifications' to the curriculum were carried out from time to time (UWCM 1985, 1991; WNSM 1983, 1984). In 1984/85 and 1991, what may be described as school-wide curriculum reorganisations were carried out. Following the GDC visitation in April 1983, the school was advised to extend its undergraduate curriculum by one year in order to overcome congestion in the clinical course (WNSM 1983). Similar reorganisations of the curriculum took place in 1990/91 following the GDC directive that the dental curriculum be increased to five years in line with the European Union directive (General Dental Council 1985, 1990; UWCM 1991).

But it may be argued that both curricula changes were externally sanctioned and involved mainly spreading out the content over the extra year.

Apart from externally sanctioned curriculum reorganisations, some departments and subject heads occasionally carried out some curriculum innovations. But most of these were precipitated by establishment of new departments and later by department mergers (UWCM 1988; WNSM 1983). As already pointed out, in 1965 when the first cohort of students commenced clinical training, the school had only two departments—the departments of dental surgery; and oral medicine and oral pathology. But by 1983 they proliferated to eight. But this was soon followed by a period of departmental mergers from 1986 onwards. By 2001 when the newly restructured curriculum was implemented, there were only four departments. Each time departments merged, changes were carried out to the affected curriculum.

Although departmentally based curriculum restructurings did not have a significant impact on the overall dental programme, they had two positive spin-offs. The first is that they served as forerunners and helped to prepare academic staff for the school-wide 1999-2001 curriculum restructurings. The second is that these restructurings may have helped to rekindle some interest in the traditionally clinically- and research-oriented faculty members. For the first time, saw dental education in general and dental curriculum in particular as a worthwhile and rewarding academic activity. Most of those who played leading roles in their respective departments went on to serve on the curriculum management group and on the various ad hoc curriculum committees. It has been pointed out that staff who are used to discipline-based curriculum changes are less likely to resist institutional-wide restructurings (Bland et al. 2000).

One feature of the pre-2001 curriculum changes was the absence of central control. Each department was free to reorganise its component of the course independent of the other departments. The lack of coordination among departments pointed to strong boundaries between disciplines under a traditional curriculum. But strong boundary maintenance meant that these changes were less visible and, overall, had insignificant impact on the system as a whole. This is in agreement with the observation of Bernstein (1977, p. 100) who noted that, "Weak central control does permit a series of changes which have, initially limited consequences for the system as a whole."

It has long been recognised that one of the barriers to successful curriculum innovations is disciplinary loyalties in general and department heads in particular (Bloom 1989; Kabara 1972; Robins et al. 2000). To counter this, the management of the new curriculum was centrally controlled in the management. This was achieved by creating themes and assigning responsibility for the planning and implementation of the new curriculum to theme leaders instead of department heads.

Leadership and the Curriculum Management Group

Central to the success of the WDS 2001 curriculum restructuring was a focused and committed leadership (Bland et al. 2000; Tosteson et al. 1994). Following the recommendations by the committee assigned to consult on education in preparation for the 1994 strategic plan (UWCM 1994b), a multidisciplinary team was appointed to plan and implement the new curriculum. Among the qualities that were identified as desirable for members of the curriculum management group (CMG) were a keen interest in dental education, determination to forge ahead even in the face of difficulties and uncertainties, some expertise in education theories, good communication skills and the ability to command the support and respect of peers (Bernier, Adler, Kanter et al.

2000; Bland et al. 2000; WHO 1962). Apart from enhancing the chances of success, the appointment of CMG members from a cross section of disciplines and expertise was an important initial step towards reducing disciplinary loyalties.

Additional factors that were essential in the successful implementation of the new curriculum were foresight by the then dean, unwavering determination to forge on and unit of purpose. It took over 8 years from the time the idea of curriculum restructuring was first conceived to the time when it was finally implemented. During this same period, the dean, the architect of the new curriculum, and other senior academics retired. These retirements would have led to loss of continuity and zeal for restructuring. But because responsibility for the restructuring was devolved to the young academics, the threat of loss of continuity was minimised.

Taking Advantage of Available Opportunities

In addition to having in place a committed curriculum team, the WDS leadership was adept at identifying and seizing opportunities that arose. These opportunities enhanced the success of the new curriculum. The school took advantage of its membership of the GDC and DentEd and invited the two organisations to validate its new curriculum. The approval of the GDC was particularly cardinal because at about this same time the GDC was also engaged in the revision of its curriculum framework.

Related to the new curriculum was the establishment of a multi-chair Primary Care dental Unit (PCDU) at St. Davids. This was a significant development in outreach teaching (see chapter 9 for a detailed discussed of outreach teaching). The PCU at St. Davids illustrates the growing trend in contemporary dental towards outreach teaching (Eaton, de Vries, Widstro¨m et al. 2006; Elkind 2002; Hunter , Oliver and Lewis 2007).

It points to weakening of boundaries between the traditional hospital-based secondary care and community-based primary care models of dental education. But what Mathews referred to as 'an opportunity' points to the established partnership between the dental school and the government. When Matthews talks of "...and money was found", this points to the willingness on the part of the government to fund HE in general and dental education in particular. The importance of a well resourced HE in Wales has been underscored by the Rees Report (2005a; 2005b).

Following the passage of the Higher Education Act, 2004, responsibility for elements of HE funding and student support were transferred from the Westminster Government in London to the Welsh Assembly Government (WAG). The Minister of Education and Lifelong Learning in Wales commissioned an independent study to advice Government and the Higher Education Funding Council for Wales (HEFCW) on the future policy on student support system and tuition fee regime. The Rees Report (2005a, p. 7) has pointed to the link between a well resourced HE and a vibrant and prosperous knowledge-based economy;

> "We are all firmly of the view that Wales needs an HE sector that conducts world-class research and provides excellence in teaching in order to contribute to a vibrant, prosperous knowledge-based economy. A strong, well-resourced HE sector makes a major contribution to the health and vitality of civic and cultural life."

The Rees Report cautions that a poorly resourced HE would have far reaching negative consequences for everyone in Wales not only those in HE: "Our economy, our levels of skills and earnings and our wider culture would be impoverished" (Rees 2005a, p. 7). It may be argued that the appointment of the Rees Committee by the Minister of

Education is an indication of the existence of political will on the part of the WAG towards HE.

Summary

Several factors played some significant role in initiating and subsequent implementation of the new curriculum at WDS. These factors may be summarised as follows:

1. The proposed curriculum restructuring did not occur in a vacuum, but was part of a wider seamless restructuring effort involving the dental school and hospital.
2. The CMG comprised committed members who had the full support of the School.
3. The devolution of responsibility for the planning and implementation of the new curriculum to the young generation of academics helped to ensure continuity even after the initiator of the curriculum restructuring had retired.
4. A number of planned activities, including away days, involvement in international dental education collaborative projects, helped to cultivate team spirit and to build consensus among staff. Both team-spirit and consensus building are important ingredient in ensuring success of any planned change.
5. The school leadership was adept at identifying and taking advantage of opportunities that arose. This is best illustrated by the St. Davids Primary Care Unit.

Evolving culture of integration

An equally important factor was the fact that two of the key features of the new curriculum—integrated and thematic approaches—had become entrenched in the culture of the school over the course of the school's evolution. The 'seamless structure' approach in the management of the dental school and hospital involved blurring of boundaries between the dental school and the dental hospital. Similar weakening of

boundaries occurred at departmental level. The amalgamation of departments, for example, children's dentistry and orthodontic (UWCM 1986) and the physical merging of orthodontics and paedodontics clinics (UWCM 1987) all point to burring of boundaries between two previously autonomous departments. Another example of blurring of boundaries between disciplines is illustrated by the joint teaching of oral medicine, oral microbiology and oral pathology under the department of oral medicine and oral pathology. But weak boundary maintenance is the core principle of integration (Bernstein 1977). It can therefore be argued that the concept of integration had become part of the culture of the school long before the new curriculum was implemented. What the new curriculum achieved was to formally institutionalise it.

The thematic approach, which requires the heads of departments to cede their authority and control over the management of the curriculum to theme leaders, was not totally alien to the school. Departmental mergers and inter-disciplinary collaboration in research all required the willingness of heads of departments to relinquish or share some of their authority. This new requirement was further facilitated by the dual appointment of academic heads of department as heads of clinical directorates of the NHS Trust. The expanded duties of heads of departments may have made them more willing to surrender control of the curriculum to theme leaders.

In this chapter I have set the institutional context of curriculum restructuring at the WDS. The concepts of integration, the principle underpinning curriculum restructuring at the WDS, is discussed in detail in chapter 6. The concept of community outreach dental education (CODE), the factors driving dental schools towards the CODE, the advantages, limitations and future prospects of CODE are discussed in more detail in chapter 9.

Chapter 4

Strategies Employed to Conduct the Research: access negotiation, participant recruitment, data collection and analysis strategies

Introduction

The research process involves continuously making and revising decisions. This chapter outlines some of the methodological decisions and strategies employed to conduct a successful research project. The first decision involved choosing the most appropriate research method for this study—quantitative or qualitative or a mix of the two approaches. Other equally important decisions included selecting the most suitable research setting; negotiating access and recruiting participants; and choosing appropriate data collecting and analysis strategies. Some of these decisions had to be made before commencing the research, while others were made and revised during and after the data collection stage.

The primary aim of the study was to investigate drivers of contemporary dental curriculum. To unpack the underlying factors, it was essential to employ a methodological approach that would allow sufficient depth of coverage. Thus depth rather than breadth of understanding was the main guiding principle in the choice of the research method. Having decided on the most appropriate research method, the most appropriate data collection instruments had to be chosen. That is, whether I was going to rely on firsthand accounts of actors (Loon 2001), documentary data or participant observations. These decisions were made during the planning stage of my research and they, in turn, informed my selection of the research settings, sampling strategies, access negotiations and strategies of recruiting participants.

The first part of this chapter begins with a brief discussion of the appropriateness of the qualitative method of inquiry to this study. Although any debate to justify or privilege one methodological approach over another need no longer be the pre-occupation of contemporary researchers, a brief discussion is nevertheless given for the sake of my audience many of whom will, undoubtedly, be from a positivistic background. A brief discussion of the case study approach as a strategy within the qualitative enquiry is followed by a justification for the choice of the General Dental Council (GDC) and the Welsh Dental School (WDS) as case studies. A discussion of the selection of research setting is followed by a detailed account of the process of negotiating access at the GDC and the WDS. The difficulties I encountered in establishing contact with and recruiting participants are highlighted. The chapter closes with a discussion of data collection and analysis strategies.

The Qualitative Research Paradigm

There are two broad strands of research approaches: quantitative and qualitative. The quantitative approach is premised on the positivist view that the world operates on objective truth and universal natural laws. This approach relies heavily on data that are amenable to quantification. That is, social phenomena are reduced to and expressed as variables that can be measured, described and expressed statistically. The qualitative approach, on the other hand, sees social phenomena as socially constructed. That is, the qualitative researcher attempts to interpret phenomena in terms of the meanings people assign to them (Denzin and Lincoln 2000). It is not my intention to engage in a detailed discussion of the differences between the two methodological approaches. A detailed coverage of the distinction between the two strands is well articulated in standard textbooks (Denzin and Lincoln 2000; Silverman 2000; Silverman 2001). Suffice to say that while quantitative methods are reductionist and focus more on the macro or

aggregate level, qualitative approaches focus on the micro or individual level, are holistic and provide contextual understanding and insights (Obermeyer 1997). They are, therefore, most suitable for research in which depth rather than breadth of understanding into a phenomenon is being sought.

As a field of inquiry, qualitative research crosscuts many research settings. It has traditionally been associated mainly with sociologists and anthropologists conducting research in exotic settings, but has now found application in wide social settings including education, health care and others. Atkinson's (1997) *The Clinical Experience,* Ball's (1981) *Beach Side Comprehensive* and Coffey's (1993) *Double Entry* are but just a few examples of qualitative research in medical, educational and professional organisation settings respectively. It employs a wide range of methods and approaches (Coffey and Atkinson 1996; Denzin and Lincoln 2000) making it possible for the researcher to weave his/her account using a wide range of strategies.

The use of qualitative methods in health care settings is widely accepted and continues to grow in popularity. Among the prominent the work in this setting is that of Merton et al. (1957). The work of Becker et al. (1961); Haas and Shaffir (1987), Atkinson (1995; 1997) and Sinclair (1997) are other examples. Since the 1950s, its use has since grown with more and more researchers in health care settings employing qualitative research methods (Barbour 2001; Harding and Gantley 1998; Jaye 2002; Lambert and McKevitt 2002; Mays and Pope 2000). The question is no longer whether qualitative research is an appropriate and valuable research method but, as Harding and Gantley (1998, p. 77) advise, it is now a question of how committed researchers are to methodological and theoretical demands of qualitative research in order to avoid "too simplistic an approach to qualitative methods". Barbour (2001, p. 115) also cautions against the temptation of

uncritically adopting a range of "technical fixes" when conducting qualitative research and calls for a "systematic and thorough application of principles of qualitative research".

One of the advantages of the qualitative inquiry lies in the flexibility and range of data collecting strategies at the disposal of the researcher (Coffey and Atkinson, 1996). These strategies include, but are not limited to, observations, interviews, documentary material, photography, and video. This means that the researcher can use one or more strategies to meet the substantive requirements of the research question. It is not uncommon for researchers to utilise more than one method to collect data. The advantage of employing multiple-data collecting strategies is that this "makes the world visible in a different way" (Denzin and Lincoln 2000, p.4). That is, when multiple methods are used each contributes in a distinctive way leading to a deeper and richer understanding of the phenomena (Cohen , Manion and Morrison 2000). In policy related research, the most dominant data collecting strategies are interviews and documents.

As a methodological paradigm, the qualitative approach not only offers a deeper understanding of social factors informing dental curriculum, it also has the added advantage of an array of methods for data collection (Delamont 2002; Denzin and Lincoln 2000). I therefore came to the conclusion that a case study, employing interviews and documents as my main sources of data, offered the best option. These two data collection strategies offered me an opportunity to approach the study from different angles thus capturing a much wider picture (Jaye 2002; Yin 2003). I was aware of other possible ways of approaching my study. But considerations of time and resources made the qualitative case study the most suitable for my research.

The Case Study Approach

The use of case study as a method of qualitative inquiry is widespread and crosscuts disciplinary boundaries (Stake 2000). In case studies, a single or a few cases are chosen from a population of cases. Attention is then focused on the particular case or cases (Stake 2000; Yin 2003). Each case can be considered as a specific, unique, bounded system offering an opportunity to learn (Stake 2000). Merrian (1988) pointed out the particularistic nature of case studies, noting that in case studies attention is usually paid to a specific phenomenon. This focusing of attention on a specific phenomenon has implications on the selection of a case from the population. Decisions on the selection of a case do not necessarily depend on the representativeness of the case in the population, a common requirement in quantitative approach, but on the opportunities that a particular case offers for investigating a phenomenon. To this broad requirement can be added practical considerations of accessibility and cost to the researcher.

The aim of this study was to identify factors informing contemporary dental curriculum and to develop a comprehensive curriculum model that takes into account education principles and the wider socio-cultural factors. This required selecting a case or cases that offered sufficient depth of understanding of the interplay of social factors and education principle in shaping the dental curriculum.

Types of Case Studies

Stake (2000) has distinguished three types of case studies depending on the focus or interest of the researcher: intrinsic, collective and instrumental case studies. In intrinsic case studies the researcher's interest is in the case itself. The focus here is the development of a better and deeper understanding of the particular case. In collective

case studies, several cases are investigated in order to develop insight into a particular issue or phenomenon, while in instrumental case studies a single case is investigated with the view of developing insight into an issue or phenomenon. That is, in collective and instrumental case studies the focus is on the development of a better understanding of the researcher's particular subject of interest.

In order to develop insight into a phenomenon, in both collective and instrumental case studies, it is necessary to carry out a detailed examination of the context and activities of the particular case even though the interest of the researcher is not in the case itself. Stakes (2000, p. 437) notes that, "The case is still looked at in depth, its context scrutinized, its ordinary activities detailed, but all because this helps the researcher to pursue the external interest". Chapters 2 and 3 give some detailed background to the General Dental Council and the Wales Dental School as cases respectively.

In the selection of the most suitable instrumental case, considerations of the opportunities offered by a particular case to increase our depth of understanding of a phenomenon are of primary importance. Patton (2002) argues that when embarking on case studies, it is important to select a case which offers maximum opportunities to learn something about a phenomenon under investigation.

Selection of the Research Settings

In deciding on the most suitable research setting, I took two factors into account: the research question and accessibility of the research setting. Hammersley and Atkinson (1995 p. 40) point out that the research question play some significant role in the selection of a research setting, and vice versa. They note that, "Whatever their stage of development before data collection begins, the foreshadowed problems will specify a

range of types of settings in which research might usefully be carried out." Fetterman (1998, p. 67) agrees with Hammersley and Atkinson but cautions that in research the ideal setting may not always be accessible. He therefore advises that when limitations arise, the researcher must "accept and note the limitations of the study from the onset". In his ethnographic account, Atkinson (1995) talks of how he set out to conduct an ethnographic study of the work of pathologists and haematologists. But because he could not gain access to the research setting of pathologists, he was content to conduct his research only among haematologists.

This study focused at two settings: the macro- and meso-levels. At the macro-level, the statutory body with responsibility for policy formulation in dental education was investigated. At the meso-level, the focus on curriculum change at a UK dental school. There were two possibilities. To either conduct an ethnographic case study of a dental school undergoing curriculum restructuring or retrospective case study of a dental that had recently restructured its undergraduate curriculum, at least within the last five years to minimise the degree forgetting and filtering of past events by participants (Fetterman, 1998). I had at least two choices at the macro-level and more than five dental schools within relatively easy reach from Cardiff.

There are two statutory bodies with some responsibility over dental curriculum in the UK: the General Dental Council (GDC) and the Quality Assurance Agency (QAA). Both bodies have produced policy guidelines on undergraduate dental curriculum. In addition to these two bodies, at the regional level, the Association for Dental Education in Europe (ADEE)/DentEd has also played some significant role in formulating policies on dental curriculum among the European Union member countries.

The GDC is a statutory body with responsibility for formulating guidelines for undergraduate dental education in the UK. It sets the minimum standards that all dental schools must meet in the education and training of dentists. Failure to meet these standards may attract severest sanctions of refusal to register graduates from the dental school found wanting. These policies are meant to ensure that all graduates from dental schools are fit to carry out independent general dental practice on graduation (see chapter 2: p. 56, the educational functions of the GDC).

The QAA is a statutory body with responsibility for maintaining high standards of teaching and learning in all higher education institutions in the UK. It has developed subject benchmark statements which, for dentistry, stipulate competences expected of newly qualified dentists. In addition to benchmark statements, the QAA also conducts inspections of all higher education institutions, including dental schools, to ensure that teaching carried out at these institutions is of high standard. The subject benchmark group for dentistry was composed entirely of dental academics from the different specialties of dentistry.

ADEE, in association with Erasmus and DentEd, has been active in promoting high standards of dental education in all participating European Union dental schools. ADEE, through its DentEd III Thematic Network Project, has produced a paper called "Profile and Competences for the European Dentist" (Plasschaert et al. 2004). In this paper, 17 major competences have been specified which all EU dental schools are expected to adopt as the minimum standard in the training of dentists. Like the QAA, ADEE also conducts inspections at participating dental school. These inspections are, however, not mandatory and are carried out at the invitation of individual dental schools.

In addition, there are several interest groups that play some role in shaping the undergraduate dental curriculum policies and reforms in the UK. These interest groups exert their influence at the institutional, national and regional levels. They include the National Health Service (NHS), which is the main employer of graduates of dental schools; subject specialists associations, representing various specialist disciplines of dentistry; General Dental Practitioners (GDPs) and alumni; academic staff; and dental students. These various groups act as pressure groups and lobby for specific changes in the curriculum. Although the interest groups play some role in influencing change in undergraduate dental curriculum, the most significant players at the macro- and meso-levels are the GDC and the dental schools respectively. It is these two which are the focus of my case study.

There were 16 dental schools in the UK when I commenced my study. Another two—the University of Central Lancashire, School of Dentistry and Peninsula Dental School, have since been established. Most of the dental schools had restructured their curricula in the last 10 years. For example, Manchester University (Hoad-Reddick and Theaker 2003), the Royal London School of Medicine and Dentistry (Fry et al. 1998), the Wales College of Medicine and Glasgow University, had all carried out some curriculum restructuring of one form or the other. In theory, I had a wide choice of dental schools to consider for my study. Similarly, at the macro-level, I had at least a choice of two statutory bodies to consider for my study: the GDC and QAA. This offered me two possible ways of conducting my qualitative case study. I could carry out a collective case study involving the two statutory bodies at the macro-level; and three or more dental schools at the meso-level. The second option was to conduct an instrumental case study involving one statutory body and one dental school. However, after taking into

account practical considerations of cost and accessibility (Fetterman1998, Atkinson 1995), I decided on an instrumental case study of the GDC and the WDS.

My choice of the GDC and the WDS as an instrumental case study was partly dictated by practical considerations of cost and access (Delamont 2002; Hammersley and Atkinson 1995) and by what Atkinson (1995, p. 2) describes as "a series of happy accidents". Two years prior to commencing my studies at the University of Wales College of Medicine, the WDS had implemented a restructured undergraduate dental curriculum. The first cohort of students under the new curriculum commenced their studies in October 2001 and was expected to graduate in 2006. In 2003, when commenced my studies, the restructured curriculum was in its third year of implementation. The events leading to the restructuring and the anxieties associated with implementing change were still fresh on the minds of actors. As one participant commented, the WDS was 'an institution in transition' and therefore a good candidate for an instrumental case study. Additional factor in favour of WDS as a research setting was that in 2004 the School hosted the ADEE conference. This presented an opportunity to meet some of the gurus in dental education in Europe and far a field. Another related event worth noting was the scheduled GDC inspections of the WDS in February 2005. Although I could not think of a way in which I could use this important event to my advantage, I nevertheless, noted it down.

The GDC, on the other hand, had carried out a major review of its undergraduate curriculum policy guidelines in 1997 leading to the production of a more comprehensive policy document called *The First Five Years* (General Dental Council 1997). Five years later, in 2002, this document was revised (General Dental Council

2002). The events at the two institutions, therefore, offered a unique opportunity to unravel underlying issues and assumptions in contemporary dental curriculum.

Sampling Strategy

I had a choice of two sampling strategies that I could employ in my study—the theoretical and purposeful sampling. In theoretical sampling the sample is not determined beforehand but evolves as the research progresses (Strauss and Corbin 1998). The main guiding principle in theoretical sampling is the representativeness of the sample, that is, the sample should be large enough to cover the scope of opinions on the issues the researcher is studying. In purposeful sampling the focus is on the opportunity the sample offers for "intensive study" (Stake 2000, p. 446). Some of the factors taken into account in the selection of a purposeful sample include accessibility and opportunity to learn. Stake (2000, p. 447) notes,

> "The choices are made, assuring variety but not necessarily representativeness, without strong argument for typicality, again weighted by considerations of access and even by hospitality... Here, too, the primary criterion is opportunity to learn."

Based on Stake's advice, purposeful sampling was found to be the most suitable strategy for this study. This decision was not determined by the sample size alone, but also on account of the challenges faced in recruiting participants, particularly former members of the GDC Working Party.

Recruiting Respondents

The challenges confronted when researching the elites and ultra elites include locating individual participants, negotiating access, background preparations and this includes studying participants' "histories and works" (Stephens 2007, p. 206). These challenges

have been highlighted by Harris et al. (2008), McDowell (1998), McEvoy (2006), Ostrander (1995), Richards (1996) and Welch et al. (2002) and many others. Many researchers have commented on the difficulties experienced in gaining access (Ball 1981; Burgess 1985; Delamont 2002) and advise on the need to be innovative. I did not experience serious problem in gaining access in comparison to many researchers (see, for example, Atkinson 1997; see, for example, Coffey 1993). However the task of locating and recruiting former members of GDC Education Committee presented with some challenges.

My first task in access negotiation was to identify and approach gatekeepers at the GDC and at the WDS. These were the Director of Education and the Dean respectively. The role of gatekeepers in granting access to research settings is acknowledged by researchers (Atkinson 1995, 1997; Coffey 1993; Delamont 2002; Odendahl and Shaw 2001). Establishing contact and negotiating access with the GDC presented with minimum problems but called for patience and perseverance (Cookson 1994). A visit to the GDC website at www.gdc-uk.org gave me the initial information I needed to get started. The website has information on the range of activities carried out by the Council. Of particular interest to me was the educational function. Members of the general public with questions related to the educational functions of the GDC are advised to direct their queries to the Director of Education. Both the physical and email addresses are given. Since my area of interest—undergraduate curriculum policy—fell under the directorate of education, I emailed the Director of Education seeking his help.

In my first email I introduced myself, briefly disclosed the nature and purpose of my study (Cookson 1994; Odendahl and Shaw 2001) before asking the Director to recommend some names of members of the Working Group who I could talk to. This

marked the beginning of a long chain of email exchanges I had with him before finally securing an interview with the Chairman of the 2002 Curriculum Working Party at the GDC offices in London on 24th May 2004.

At the Dental School the approach was slightly different. My two supervisors, Dr Lesley Pugsley and Dr Sara Delamont assisted me in negotiating access by acting as my contact persons. Lesley negotiated for a meeting with the Dean of the WDS, while Sara facilitated an interview with the director of teaching at the School of Biosciences at Cardiff University. The significance of having a contact person when negotiating access is acknowledged by qualitative researchers (e.g. Cassel 1988; Fetterman 1998). Both Atkinson (1995; 1997) and Coffey (1993) acknowledge the role played by contacts in facilitating access.

New entrants to the undergraduate dental programme spend their first year—the pre-clinical year—studying basic sciences before commencing the dental programme proper. At Cardiff University, the teaching of basic sciences takes place at the School of Biosciences. The School of Biosciences is located at Park Place near the city centre while the Dental School is located at the Heath Park campus, approximately two miles from the city centre. The restructured dental curriculum covered both the pre-clinical and clinical phases of the programme. In theory this meant that I had to negotiate access at two physically separate schools: the Dental School at the Heath Park campus and the School of Biosciences at Park Place. In practice however, most of my participants came from the Dental School. At the School of Biosciences, the main player was the director of teaching, being a one of the members of Curriculum Management Group (CMG). Long before arrangements were made to meet the dean at the WDS, I already had an

interview with the director of education at the School of Biomedical Sciences with the help of Sara acting as the contact person.

The process of negotiating access at the Dental School was facilitated by Lesley who, being based at the Heath Park Campus, had links with the Dental School. She secured an appointment with the Dean. During the meeting, which was held in the dean's office, Lesley introduced me and briefly explained the purpose of my study. At the conclusion of the meeting, the Dean granted permission to talk to members of staff, facilitated acquisition of the necessary documents that I requested, and gave me an initial list of seven members of the CMT, including the head of biomedical sciences at Park Place whom I had already met. He recommended that I contact and talk to each of these first. Following this authorisation, recruiting participants at the WDS became a relatively straightforward matter.

Once access was granted, my next task was to persuade potential participants to take part in my study. This was a crucial stage in my study, as Odendahl and Shaw (2001, p. 308) have noted, "Identifying a subject pool is more than a matter of generating lists of potential respondents. Contacting potential respondents and convincing them to participate is, needless to say, the key to moving ahead." Those I targeted at the dental school were mainly senior academic staff. Similarly, nearly all of the former members of the working group at the GDC were senior academics and many of them were deans of their respective dental schools. That is, the pool of participants I was interested in comprised of busy people with very tight schedules (Walford 1994). They had clinical, teaching, research and other administrative duties to attend to and they had no obligation, whatsoever, to take part in my study. I therefore needed to carry out extensive preparations (Odendahl and Shaw 2001), persevere in the face of difficulties,

and learn some negotiating skills in order to increase my chances of succeeding in recruiting as many participants as possible.

Participants at Dental School

Recruitment of participants at the dental school involved a mixture of purposeful sampling and snow-balling. The number of potential participants here was much larger in comparison to the GDC. There were well over 40 participants representing various groups, who had directly taken part in restructuring of the new curriculum. The main actors, however, were members of the CMT, comprising of administrative support staff, theme leaders, the Dean and the Chair. Others important actors in the reform process included heads of subject areas and student representatives. Although in theory it was possible to recruit all these actors, in practice considerations of time made this impossible.

Having been given names of some members of the CMT by the dean, my next task was to secure an interview with each of them. Three options were open to me on how I could establish initial contact. These were by telephone, email or letters. Being a research student of Cardiff University, it was very easy to secure both telephone and email addresses of members of staff at the dental school. However, I took the advice of Odendahl and Shaw (2001, p. 308) who recommend extending invitations for interviews through 'formal written communication printed on institutional letterhead'.

Immediately after the meeting with the Dean, I drafted letters to each member of the CMT, printed the letters on the School of Postgraduate Medical and Dental Education letterhead and dispatched them through the college's internal-mail system. In drafting the letters, I took the advice of Delamont (2002) and Cookson (1994) who have

counselled that letters sent to potential interviewees should be informative, literate, persuasive and interesting in order to gain you access. I introduced myself, explained the purpose of my research and the intended use of the findings (Odendahl and Shaw 2001). I concluded the letter with a request for an appointment for interview at respondent's most convenient time. I also added that the Dean had recommended their names to me.

The general practice by most researchers when negotiating access or recruiting participants is to follow up official letters with a phone call (Coffey 1993; Cookson 1994). In my experience I found the use of email equally effective with academics. One week after dispatching off the first batch of letters, I received an email from one respondent advising me to contact him by phone to make arrangements for an interview. After several attempts to reach him, I decided to email him explaining my failure to contact him by phone. From that point on we communicated by email. With the academic elite, there were better chances of receiving a response from an email enquiry than from telephone message left on the answer-phone. I received positive responses from all but one member of the CMT. I learnt later that he had left the dental school by the time I was sending out the letters. After interviewing the six people recommended by the Dean, I approached three theme leaders to recommend further names of academic staff under their themes that I could approach to pursue the subject further. I was given a further thirteen names of heads of subject areas. This brought the total of participants at the WDS to 20.

Members of the Working Party

The majority of members of the Education Committee at the GDC came from Dental Schools. These were, in almost all cases, deans of their respective dental school. Other

members included a representative from general dental practitioners, a representative from professions complimentary to dentistry (PCD); lay members representing the community, and a nominee from the General Medical Council. It was from among members of the Education committee that members of the 1997 and 2002 curriculum review groups were appointed. In order to recruit participants from the GDC, my first task was to locate the former members of the review groups. The second task was to secure an appointment from those who were willingness to participate. On first sight this appeared to be a relatively straightforward matter. However, the ad hoc nature of the two groups meant that nearly all of them were no longer serving members of the GDC. Being very senior academics also introduced another dimension. Most of them had retired from active employment by the time I commenced my study making it even more difficulty to locate them.

The composition and ad hoc nature of the two curriculum review groups at the GDC presented with problems of how to locate and recruit participants. The first problem was that, because membership on the GDC Education Committee from which members of the two working groups were appointed, was only for a prescribed period of time as stipulated in the Dentist Act 1984, this meant that at the time of commencing my study all members who had served on the two working groups were no longer with the GDC, except for the chair of the 2002 Working Group who remained under special arrangements to co-chair the Education Committee for a further period of three years. The second problem was that a majority of these members were senior academics nominated by universities to represent the universities sit on the Education Committee. Almost all of them were deans of their respective dental schools. Many of these had been in the dental profession for a long time and were coming to the end of their academic careers by the time they were appointed to serve on the Education Committee.

A majority of them had qualified as dentists in the 1960s and early 1970s. It did not, therefore, come as a surprise to discover that all those dental academics that had served on the 1997 review group and a good number on the 2002 working party, had retired or were in the process of retiring from active academic life by 2004. The GDC could do little to assist me in recruiting these former members of the two working parties. Apart from facilitating an interview with the former chair of the 2002 working group, the only other help I received was information on institutional affiliation of academics serving on the two Working Parties. The Director of Education was not able to give information on institutional affiliation of the few non-academic members the Working Parties. But knowing institutional affiliation of members proved to be of limited help because, as already mentioned, nearly all members affiliated to universities who had served on the 1997 and some on the 2002 groups had retired from active academic life. The big challenge became that of locating these members.

Armed with the list and institutional affiliation of some of the members, my next task was to locate and establish contact with each of them. This turned out to be a challenging task (Odendahl and Shaw 2001) and called for extensive preparations, perseverance and a systematic search strategy as Odendahl and Shaw (2001, p. 307) have warned,

> "Although we often, in writing up our results talk blandly of our samples or our case studies, letting the reader assume that the particular industry, location, site, and respondents were the optimal or ideal for investigating the particular issue in which we were interested, we all know that the "reality"... is a lot messier."

In order to locate respondents, I adopted three strategies: visiting website of dental schools, Google computer searches and a search through the dental and medical registers. However, current registers were only useful in tracing members who, although

they had retired from academic life, were still in practice. Computer searches were not also very helpful for the same reason.

After securing the physical and/or email addresses of 12 members, I had the task of contacting them requesting a 'chat' about their work with the GDC. Out of 12, four never bothered to reply in spite of follow-up reminders. Among those who replied, two agreed to participate without any hesitation, three needed further persuasion before they finally agreed to participate and two refused to take part giving various reasons including feeling inadequate over the subject matter and personal circumstances.

Ethical Concerns

All qualitative research presents with ethical challenges (Christian 2000; Delamont 2002; Walford 1994). Methodological and ethical dilemmas are particularly present in research involving the elite (Philips 1998; Walford 1994). Dilemmas may arise on many occasions and at unexpected times as has been acknowledged by Atkinson in his research projects involving medical students and haematologists (Atkinson 1995, 1997). These dilemmas centre on privacy and confidentiality, and informed consent.

Confidentiality

The ethical demand to safeguard and protect the identity of participants and the research location, presented a dilemma in my study. The first dilemma was how to safeguard the identity of the research sites—the GDC and the dental school. There is only one statutory body charged with responsibility of formulating undergraduate dental education guidelines in the UK. Similarly, there is only one dental school in Wales. Therefore, any attempts to conceal the identity of these two institutions would not only have proved impossible but also unnecessary and misplaced. Besides both the GDC and

the dental school were large public institutions capable of defending themselves in the unlikely event of uncovering information that might be deemed embarrassing to the institution. However, there was need, nevertheless, to safeguard against unwarranted exposure of participants. This required securing and concealing of all personal data 'behind a shield of anonymity' (Christian 2000).

Concealing the identity of participants, especially from insiders, was a difficulty task because both the GDC and the dental school were relatively small institutions where everyone knew everyone else. The fact that only a small proportion of members were entrusted with the responsibility of reviewing curriculum guidelines at the GDC; and with the restructuring of the curriculum at the dental school, made the task of concealing the identity of individuals even more challenging. I, however, attempted to maintain anonymity of participants by taking the following measures: assigning pseudonyms to all participants (Delamont 2002).

Additional safeguards included randomly assigning male and female names to participants from the dental school. This measure was taken because the number of male academics at the dental school far exceeded that of females in all departments. For example, at the time I was conducting the interviews there was only one female professor, and among my interviewees only four were females. This would have made it easy to identify female participants if this step had not been taken. The added advantage is that at the time of writing all the participants at the WDS had either been promoted or moved on to other dental schools. For participants from the GDC, in addition to anonymising them, I have also avoided any reference to their institutional affiliation as this can easily reveal their identity. Although these measures cannot guarantee total

anonymity of participants from insiders, I believe they are sufficient to safeguard their identity at least from outsiders.

Informed Consent

The other ethical requirement involves getting the consent of participants before taking part in research. This requirement dictates that researchers explain as best as possible what it is that participants are taking part in. Obtaining informed consent is mandatory for all research and it is an obligation for every researcher to obtain consent. In my research, during the initial stages of recruiting participants, I explained to them what my study was about. Once I had secured their participation, before commencing each interview session, whether face-to-face or by telephone, I obtained their permission to tape-record the discussion. In all cases permission was granted without hesitation. Only in one instance was the participant a bit apprehensive about being misquoted. He indicated to me when I was negotiating for an appointment to interview him that he would want a copy of the tape-recording. "I don't want to be quoted wrongly," he said. I assured him that I would not misquote him in anyway and that the data I was collecting were purely for research and would not be accessible to a third party in its raw form. I also honoured his request for a copy of the recording of the interview by going to the interview with two cassette recorders. At the conclusion of our talk I was able to deliver what he had requested.

In another related incidence, at the conclusion of a long interview the interviewee said just when I was about to leave, "Quite a lot of interesting stuff there. I want to listen to it myself." Again I obliged and sent her a copy of the recording and transcript of the interview as soon as they were ready. However, it took me some time to duplicate the tape-recording because I did not initially have the machine for duplicating tapes. In both

cases I strived to be as honest as possible in my dealings with respondents (Cookson 1994; Delamont 2002). This further helped in building rapport with participants.

Data Collection Strategies

Having secured access, I now needed to adopt some appropriate data collection strategies, bearing in mind that there is no data collecting technique that is peculiar to cases studies (Merriam 1988). In fact Yin (2003) argues that in carrying out research in general, and case studies in particular, it is advisable to use a variety of data collecting strategies in order to capture the wider picture. Due to its emphasis on generating contextual information, qualitative research utilises information generating strategies that are not only flexible, but also sensitive to social milieu in which the data are produced (Mason, 1996). Data for this study, as earlier mentioned, were generated through in-depth interviews and the analysis of documentary material.

Interviews

Interviews—also often referred to as in-depth, intensive, or ethnographic interviews—are a very popular method of data collection in qualitative research (Atkinson , Zeller and Shah 2002; Baker 2004; Holstein and Gubrium 2004; Warren 2001). Interviews are used to generate data by asking people to talk about their lived experiences (Holstein and Gubrium 2004). Qualitative interviewing is particularly suitable where the aim is to gain greater depth of understanding on issues which are often taken for granted (Johnson 2001). In an interview the researcher asks questions and listens carefully to the interviewee's answers in order to capture the meaning of what is being conveyed (Cohen et al. 2000; Warren 2001). One of the tasks of the qualitative researcher is to identify common themes from respondents' accounts. Qualitative interviews are therefore of special appeal to researchers whose topics of interest aim at establishing

common patterns or themes from responses of interviewees. This characteristic of qualitative interviews was particularly relevant to my research topic, as I sought to establish common areas of concern in dental curriculum policy and reform.

One of the purposes of interviews is to derive interpretations from the respondent's talk (Warren 2001). They 'generate accounts and narratives that are forms of social action in their own right' (Atkinson et al. 2002, p. 850). Besides the generation of information, qualitative interviews can be instrumental in establishing relationships between the interviewer and the interviewee which may extend beyond the duration of the interview. As Warren (2001, p.98) has observed, "in the social interaction of the qualitative interview, the perspectives of the interviewer and the respondent dance together for a moment but also extend outwards in social space and backwards and forwards in time." While this may not be an important factor for one-off research projects, it had some significance for my research. Maintaining future contact with some of the people I met would be beneficial not only to me but to Zambia in her efforts to establish dental faculty.

There were two ways in which I could conduct the interviews—face-to-face of or by telephone. With participants at the dental school I was able to conduct face-to-face interviews throughout. It was not, however, possible to conduct face-to-face interviews with members of the GDC working groups, apart from the chairman, because they were scattered all over the UK. The only way I could talk to them was by telephone.

Telephone Interviews

The use of a telephone to conduct interviews has been a common feature in survey research (Garbett and McCormack 2001; Shuy 2001; Wilson and Roe 1998). But it has

also been found to be a suitable method in qualitative interviews (Shuy 2001; Waterman, Leatherbarrow, Slater et al. 1999). Telephone interviews offer a number of benefits. These include cost effectiveness, ease of use and is more conducive to free exchange of information, especially on sensitive issues (Garbett and McCormack 2001; Waterman et al. 1999; Wilson and Roe 1998). My use of telephone interviews was, however, limited only to members of the GDC Working Party. Since these were located in different parts of the UK, this helped to cut down on the cost and time that I would have incurred travelling long distances in order to get to participants (Stephens 2007).

Face-to-face Interviews

Most of the interviews that I carried out were face-to-face interviews. This involved arranging with the respondent in advance when and where we would meet. For respondents at the dental school, interviews were conducted in the respondents' offices. To carry out systematic interviews, I prepared a loose interview schedule, which is given in Appendix D. During the initial stages of the study, I adopted a strategy of asking general exploratory questions. Once themes began to emerge, I started asking specific questions in order to probe emerging issues further. That is, I moved from a general exploratory to a more focused enquiry. Such an approach required that I begin with open questions and then move on to more focused ones until when all emerging themes were saturated. At the end of each interview session I asked participants if they would be willing to be interviewed again in case there were issues that arose during the course of my enquiry that needed further clarification. All respondents expressed willingness to participate if I needed to find out anything else at a later stage in my research.

Each interview encounter was unique and involved extensive prior preparations. For respondents at the dental school, preparations included visiting the dental hospital a day before the appointment in order to locate the office where the interview would take place. On the day of the interview, I arrived at least 10 minutes early. On two occasions the participants were engaged in clinical duties and had to be reminded of my presence by the reception staff. Although each interview session required prior preparations, the interviews with the two respondents at the GDC required extra preparations because this involved travelling to London.

Documentary Data

Documents are an important component of contemporary society. Yet, it has been observed that they are among the most under-utilised resource in social science research (Atkinson and Coffey 2004; Prior 2003; Scott 1990). When investigating documentary data, Prior (2003) advises on the need not only to focus on the content, but also on the circumstances surrounding the production and function to which documents are put. He argues that the study of the use of documents can be as revealing as the study of content. This last point draws attention to the need to go beyond simple content analysis when analysing documentary data.

The need to exercise discretion when selecting appropriate documentary sources is recommended. Hammersley and Atkinson (1995) observe that the selection and lessons drawn from documents should depend on the analytic themes being pursued. The focus of my study was an explorations of factors informing contemporary dental curriculum, therefore the main documents that informed my study were the WDS (2001, 2004) restructured curriculum, and the GDC (2002) curriculum framework documents.

However these could not be examined in isolation of other equally important earlier or related documents. The full list of the documents examined is given in appendix E.

The analysis of documentary data was not done in isolation of interview generated data. The fact that participants constantly made reference to the GDC curriculum guidelines, the QAA benchmarking, the WDS competence statements and other documents such as the GMC's *Tomorrow's Doctors* begged that these documents be examined at the same time as the interview analysis. The GDC curriculum guideline documents were comparatively analysed for changes in emphasis over time (See, example, the prosthodontology, orthodontics and gerodontology in chapter 7). I also carried out inter-documentary content analysis in which, for example, I compared the competence statements between the QAA, DGC and WDS documents and offered some plausible reasons for similarities between the three documents (See again chapter 7). This analytical approach brought out some interesting findings related to the production and ownership of these documents.

Establishing Social Relationships with the Dental Elites

One of the most cited challenges in elite interviews is the asymmetric distribution of power between the researcher and the elite participants (Gillham 2000; Harris et al. 2008; Pierce 1995; Welch et al. 2002). The literature is full of examples of heroic accounts of how a researcher survived the patronising (Kezar 2003; McDowell 1998; McEvoy 2006) and intimidation (Pierce 1995) of the elite participants. Although, admittedly, there was power asymmetry between myself as a researcher and the elite participants, my experience with both the GDC and the WDS participants was anything but patronising or intimidating. There are two plausible reasons for the exceptional positive experience I had with the dental elites at the GDC and the WDS. The first is

related to the asymmetry in social position between me, as a researcher, and the elite participants. The second is the type of elite group I was dealing with—the academics. Unlike political and corporate elites who tend to be patronising and/or intimidating (Lilleker 2003; McDowell 1998), the academics are sympathetic to and take seriously PhD research (Stephens 2007). Other factors such as gender, age and a shared professional background (McDowell 1998; McEvoy 2006; Welch et al. 2002), and the research aims may have all played some role in facilitating good rapport.

When recruiting participants I made it clear to them that the findings from the study would be used to guide the development of a curriculum model that best suited the oral health needs of Zambia. As I have stated in chapters 2 and 3 that both the GDC and the WDS are committed to the advancement of dental education locally and internationally. It may be argued therefore, that because the overall aim of the study and what the GDC and the WDS stood for were in agreement, this further enhanced the social relationship developed between me and the participants. Knowing that they were contributing towards the advancement of dental education in a developing country may also have made the participants to look at the study more sympathetically. It also meant that the participants saw themselves not as research respondents but more as experts and leaders in dental education. It was not uncommon for most of them to pause and make contrasts between Zambia and the UK and to point out what would and would not be appropriate for Zambia. The interview excerpts below help to illustrate this point.

Towards the end of a long account about how the GDC dealt with dental schools found wanting, Prof. Coleman pointed out that the GDC framework document had been adopted as a model for the EU. He went on to offer some suggestions how the GDC document could be adapted to Zambia:

AK: [...] just putting it in a general way, has there been any school that has been found wanting in their performance?

BC: Oh, yes!

AK: And what has been the reaction from the GDC?

BC: The General Dental Council makes recommendations. On four occasions we said we need to revisit again in one year. [...]The European dentists met here [the GDC London offices] last year and they have agreed to take that [the 2002 FFYs curriculum framework document] as their model. [...]. These are the sort of things, if you looked at them that would be relevant to Zambia. You may not place as much importance on some of them in Zambia as we might do here in Britain. There might be differences of interpretation. For example here, "Be competent at carrying out an orthodontic assessment including an indication of treatment need." By using those words 'treatment needs' means that the student should have an understanding of the orthodontic index of treatment needs—grade 1, grade 2, grade 3, grade 4, grade 5. But in Zambia you might say, "Well that is not appropriate to Zambia. We don't want five grades for orthodontics." But you still expect them to carry out orthodontic assessment whether you would expect them to do fixed appliance therapy or removable appliance therapy or no treatment because you may not have a big need. Your jaws may be better formed in Zambia. [...].

After giving a chronological account of the evolution of the GDC dental curriculum policy, Prof. Coleman points out that the EU dentists had looked at the GDC curriculum framework document and adopted it as a model for the EU dental schools (See also, GDC-DentEd 2003). He then goes on to show how some of the principles in the document can be adapted to Zambia. Taking orthodontics as an example, Coleman takes up the role of expert adviser and points out what could be adaptable to Zambia and why. He conveys this when he talks of the "sort of things" that would be relevant to Zambia.

He then goes on to talk about possible "differences of interpretation" between the UK and Zambia in what the students may need to learn in orthodontics.

In related account, Henry Patton talked very highly of the GDC curriculum policy and how it has been adopted by other dental schools in the EU:

> AK: What do you see as the role of the GDC, where do you place the GDC?
>
> HP: The GDC is quite unique, more or less. Self-regulation I think is a unique principle in that it has credibility. It has knowledge and expertise; it has insight into the regulation of the profession. It is quite obvious at the moment, if you read the newspapers in relation to the GMC that journalists—people outside and the politicians—while they are absolutely entitled to have their views, they lack depth of understanding of the realities of the situation. [...]I think, by and large, the GDC does a good job. It is interesting in the European context that the Irish, for example, have got an Irish Dental Council which is modelled on the GDC. And most of my colleagues in Europe would like to have something like the GDC ...in those countries that don't have such a body. So it is an admired institution and, as I said earlier, the system of promoting and improving dental education in Europe has taken on board some of the mechanisms of visitation and reporting carried out by the GDC (Telephone Interview excerpt with Prof. Henry Patton, Member of the 1997 GDC Curriculum Review Group on 10/03/2005).

By talking about the EU meeting at the GDC and the adoption of the FFYs as a model for dental education in the EU, both Coleman and Patton not only reassert the international acclaim of the UK dental curriculum policy. But they also implicitly assert themselves as world leaders in dental education.

As leaders in dental education, the participants saw part of their mission as that of advancing dental education around the world. Prof. Kenneth Matthews, the dean of the WDS outlined some of the dental education activities the school was engaged in the

emerging countries of Eastern Europe, in South America and more recently, in East Africa:

> *AK:* I am aware that you have some links with an African University. Based on your experience what would be your advice on how best to proceed to us who are planning to come up with a dental program?
>
> *KM:* We are working currently with Kampala. We were asked by Makerere University whether we would become involved because there were some particular issues in Uganda which may be quite similar to Zambia. We were finishing some work in Peru. I have always taken the view that we should get involved in curriculum development overseas and research collaboration as well. But we focus it and we have a limited amount. So since we are finishing in Peru I was quite prepared to look and work with Uganda. [...]We have been involved now with curricular work with Peru, a new school where we went and looked very closely at the needs in the country as to what should be taught. There was great enthusiasm to teach things like dental implants. We said that was totally ridiculous. They needed other areas taught much better and to put their resources into it; areas around education, dental health education promotion and fluoridation. A whole package was put together. We have worked with Baltic States and still work with Baltic States, particularly Latvia. (Interview excerpt with Kenneth Matthews, Dean, WDS. 20/09/2004)

The power differential between the participants and the researcher had some positive implications in the establishment of good rapport. The participants positioned themselves as experts and world leaders in dental education, while, as a researcher from a developing country I was cast in a non threatening subordinate position of a recipient of the stock of wisdom that they had control over. Because I was considered as an outsider in search of help, it was not uncommon for participants to go to great length explaining what would and what would not be appropriate for Zambia. It is possible to speculate that had I been a British sociologist, probably I would not have given the type reception that I received.

Another significant factor in the establishment of positive rapport is my social status as a researcher. I was a PhD student from a developing country on a Commonwealth scholarship, researching on a dental topic at two elite UK institutions. This had some positive implications on establishing rapport. Stephens (2007, p. 207) has pointed to a shared similarity in "prevailing academic attitude" and "expectations of research competency and intellectual curiosity," between a PhD researcher and the academic elites as one reason for the positive attitude manifested by academics.

In addition to being a PhD student, I was from a dental background. Before commencing my studies at Cardiff, I had served as principal of the only dental training institution in Zambia and a part-time lecturer at the University of Zambia. Stephens notes that the elite status is not a fixed social position but a product of local social negotiations. Drawing on Aldridge (1995), he stresses the importance of taking into account both similarities and differences between the researcher and the participants, pointing out that a balanced awareness of the social characteristics such as differences in age, gender and professional background are essential for negotiating good rapport. In their study, Harris et al. (2008) have pointed to the significance of similarities between researchers and elite participants in the negotiation of rapport.

The overwhelming positive relationship that I developed with participants had, however, the potential to colour my objectivity, in the analysis and interpretation of data, which needed to be checked. Guba and Lincoln (2005, p. 205) note that one of the powerful threats to "conventional objectivity" were feelings and emotions. A combination of warm reception from participants and their assumed role of experts had the potential to impact my approach data analysis and interpretation. The greatest threat

was to take the respondents accounts uncritically as the factual truth. This threat was dealt with by adopting a rigorous approach to data analysis.

Data Management and Analysis

In this section the strategies employed to manage and interpret data are discussed. It describes how the interview accounts were recorded and transcribed and the process of data analysis and interpretation.

Recording and Transcribing of Interviews

At the beginning of every interview session respondents were asked for permission to audiotape the interview. The nature of the topic and the warm pre-interview reception that I received all made this a mere formality. No participant objected and none was apprehensive because of the presence of an audiotape recorder. As part of the general preparations for interviews, I always carried with me two audio-recorders, each loaded with new batteries and a new tape. I also carried along extra audio-tapes and batteries (Poland 2001). Both tape-recorders were tested before going for an interview appointment and just before commencing the interview to ensure that they were operating well. Having two tape-recorders helped to ensure that in the unlikely event of some last minute malfunction, I would have something to fall on.

Having a standby audio-recorder during telephone interviews served another function. In the event of the audio-tape running out during the interview, I would simply turn on the standby audio-recorder. This minimised the risk of failing to capture some of the interview on tape. In face-to-face interviews, participants would know when the tape had ran out and they always stopped to allow me to change the tape. The lack of visual

contact during telephone interviews necessitated taking this extra precaution. However, a situation never arose where I needed to use the second recorder because I took the extra precaution of setting the audio-recorder on the slow recording speed. This doubled the recording time from 80 to 160 minutes. The longest telephone interview lasted for 1 hour 40 minutes.

Over 30 hours of interview recordings were generated. All audio data were transformed into textual form before coding and analysis (Coffey and Atkinson 1996). The process of transforming audio-tape conversation into textual form is called transcribing. Poland (2001) calls for rigor during transcribing. Immediately after each interview session, each tape was listened to in order to get a feel of the whole encounter. This was then followed by transcription. I transcribed all the tape-recordings myself, although this proved to be a time consuming and tedious task (Atkinson 1995). The task of transcribing was made difficulty by the wide range of English accents among my interviewees. The factor that English is my second language compounded the problem further. The problem was compounded further in one telephone interview where the line was not very clear and the interviewee's voice used to trail away from time to time making listening difficulty and the quality of recording poor. However, overall, transcribing was a worthwhile exercise as it helped me to familiarise with the data (Burgess 1984). The process of transcribing served another purpose. During transcribing, some themes and concepts were identified. Transcribed data was subjected to further closer scrutiny, by reading and re-reading and listening to audio-tapes, in order to identify emergent themes and concepts. Emerging themes were probed further in subsequent interviews.

All tape-recordings were transcribed verbatim but no attempt was made to preserve linguistic features such as pauses, partial sentences and emotions. Although details of these features of speech are an essential component in research involving discourse analysis, they were not deemed necessary for my purposes. Some light editing was also carried out to remove individuals' mannerisms in speech. During transcribing, I wrote some notes giving details of the interview context and other observations such as where the interview took place, whether there were any interruptions during the interview and the general mood of the interview. Sketchy notes were written down immediately after each session of face-to-face and during telephone interviews. These were then expanded on later during transcribing. All this textual data, including material from documents, formed the bulk of textual material for analysis.

Strategy for Data Management

The decision to manually code and manage data, a laborious and somewhat outmoded process given the extensive range of computer assisted qualitative data analysis software packages (CAQDAS), was taken after careful consideration of the benefits offered by each of these two approaches. Literature abounds on CAQDAS (Pfaffenberger, 1988; Tech, 1991; Richards and Richards, 1994; Weaver and Atkinson, 1994). Holbrook and Butcher (1996) note that the use of CAQDAS is open to debate and may be right for some and not for others.

Before deciding on whether I was going to manage data using manual techniques or whether I would need to use 'micro-computing strategies of qualitative data handling' (Coffey et al., 1996, par. 1.4), I informed myself of the main reasons why the use of computer software packages had become widespread in qualitative research (Coffey , Holbrook and Atkinson 1996; Kelle 1997; Richards and Richards 1994). There seem to

be two main reasons for the increased popularity of CAQDAS. The first is the increase in flexibility and comprehensiveness of data handling that CAQDAS offer (Coffey and Atkinson 1996). Coffey and Atkinson (1996, p. 171) have noted that, "Computers can help implement more comprehensive and more complex searching tasks than can be performed by manual techniques." The second is the increased control that computer software packages offer when handling large volumes of data (Richards and Richards 1994). The use of computers is undoubtedly, of big benefit in large scale research projects where huge and complex volumes of data are generated. Examples include Richards (1990) Green Views Project in which vast amounts of data were amassed. Richards and Richards (1994) confess the increasing difficulties encountered in handling huge volumes of data in the Green Views Project,

> "Simply co-ordinating these records were a formidable task, and understanding them a major challenge. Bulk records defied sensitive interpretation and multiple data sources defied co-ordinated analysis" (Sturman 1994, p. 147).

That CAQDAS offer many tangible benefits in the manipulation large volumes of data is unquestionable. However, it is also recognised that computers are only 'tools to mechanize clerical tasks of ordering and archiving texts' (Kelle 1997, par. 6.3) and that no computer software package is capable of carrying out 'automatic data analysis' (Coffey and Atkinson 1996, p. 187). The underlying logic of coding and searching for coded segments in CAQDAS also differs little, if at all, from that of manual technique. Coffey, Holbrook & Atkinson (1996, par. 7.2) also note that, "There is no great conceptual advance over indexing of typed or even manuscript notes and transcripts, or of marking them physically with code-words, coloured inks and the likes."

In arriving at the decision to use manual techniques of data management, I took all the above arguments into account and also the advice offered by Coffey and Atkinson (1996, p. 169) who have argued that, researchers "should use to their full extent whatever resources are available before seeking out more specialised, esoteric research tools." The lure for sophistication was great and the use of a computer software packages to manage my data would have definitely added some element of sophistication to my research. But I was more conscious of the need to remain close to my data, and since my research project was relatively small, the risk of my data documents becoming what Richards and Richards (1994, p.151) describe as "increasing distant and dead", was minimal.

Data Analysis and Interpretation

In qualitative research the processes of data collection and analysis are not distinct phases but are cyclically interlinked (Coffey and Atkinson 1996; Miles and Huberman 1994). However, in order to systematically present the different activities constituting data analysis and interpretation, I have followed the approach of Miles and Huberman (1994) who have divided analysis into three activities—data reduction, data display and conclusion drawing and verification.

The analyses of the interview and documentary data were organised at three levels of generality according to Miles and Huberman (1984). Themes were identified by readings the transcripts several times over and by listening to the audio-tapes during and after transcribing them. Recurrent themes and concepts were then categorized and studied for patterns of connection. The process of analysis was carried out throughout the study, and new themes were identified and explored as more interview data were collected. In qualitative research, data collection and analysis are not distinct stages,

with data collection being followed by data analysis in a linear sequence. Rather, they occur simultaneously with analysis informing further data collection (Burgess 1984; Coffey and Atkinson 1996; Hammersley and Atkinson 1995; Miles and Huberman 1994; Strauss 1987). Miles and Huberman (1994) stress the need for early analysis of data. This leads to the evolution of a cycle of data collection and analysis. Coffey and Atkinson note that,

> "The process of analysis should not be seen as a distinct stage of research; rather, it is a reflective activity that should inform data collection, writing, further data collection, and so forth. Analysis is not, then, the last phase of the research process. It should be seen as part of the research design and of the data collection. The research process, of which analysis is one aspect, is a cyclical one" (Coffey and Atkinson 1996, p. 6).

Emerging themes were put into categories, indexed and filed. Miles and Huberman (1994) recommend that co ding should take place throughout the research process and a strategy allowed for progressive focusing on the data which allowed existing themes to be refined and new themes were generated. This 'grounded theory' approach (Glaser and Strauss, 1967) is well suited to the study of local interactions and meanings which are related to the social context within which they occur.

Data Reduction

Miles and Huberman (1994) described data reduction as the process of selecting, focusing, simplifying, abstracting and transforming the textual data generated during interviews and from the field. Data reduction is not divorced from data collection and takes place before, during and after data collection. Its main function is to aid conclusion drawing. Miles and Huberman have pointed out that,

> "Data reduction is not something separate from analysis. It is part of analysis. The researcher's decisions—which data chunks to code and which to pull out, which patterns best summarize a number of chunks, which evolving story to tell—*are all analytic choices*. Data reduction is a form of analysis that sharpens, sorts, focuses, discards, and organizes data in such a way that "final" conclusions can be drawn and verified" (p. 11. Emphasis in the original).

One of the main and initial activities in data reduction is coding.

Coding

To code the data, I read and re-read to get a clear picture of the general content and to look for concepts and ideas in the data. This process enabled me to generate coding categories. Following the generation of codes, each time these concepts, ideas and themes occurred in the data, they were marked off and given a tag. That is, coding involves organizing, managing, and retrieving meaningful bits of data by assigning tags or labels to the data (Coffey and Atkinson 1996). In this process, bulk data sets are condensed into analyzable units by "creating categories with and from" the data (Coffey and Atkinson 1996, p. 26).

The coded data was then grouped into themes and sub-themes. This allowed me to compare within and between interview data (Rubin and Rubin 1995). Appendix F gives an illustration of the process of coding. The first table is an example of initial coding in which tags were assigned to segments of interview data. The second table is an illustration of the grouping of these codes into themes and sub-themes later in the analysis. In the final stage of the analysis, the themes and sub-themes were grouped into two main categories—the education and social environments of dental curriculum. The excerpt in appendix F was chosen to illustrate coding because of the occurrence of many of the themes and sub-themes that emerged from the interview accounts.

Data Display

The coded data was organised into themes and categories and is presented in the form of a dental curriculum tree in Appendix F. The main reason for using the dental curriculum tree to display the data was to facilitate easy reading of the data. Miles and Huberman describe data display as,

> "...an organized, compressed assembly of information that permits conclusion drawing and action. ...Looking at displays helps us to understand what is happening and to do something –either analyze further or take action—based on that understanding" (Miles and Huberman 1994, p. 11).

Data that relate to particular code or category need to be presented together in order for the researcher to explore the composition of each code set (Coffey and Atkinson 1996). The most common form of data displayed is the extended written text. However, Miles and Huberman are critical of the extended text as the only form of data display because, they argue, "It is dispersed, sequential rather than simultaneous, poorly structured, and extremely bulky" (p. 11) and if only the extended text is used, a researcher may jump to hasty and wrong conclusions. They further note that humans are not very good at processing large amounts of information: "our cognitive tendency is to reduce complex information into selective and simplified gestalts or easily understood configurations" (p.11).

I have extensively made use of graphic data display throughout the theses to aid analysis and to help clarify my thoughts. Miles and Huberman (1994, p. 11) further observe that good displays help to organize information into accessible and compact form that allows the analyst to arrive at valid conclusions.

Data Interpretation

In carrying out data analysis and interpretation, I have taken the advise of Coffey and Atkinson (1996, p. 15), who have advised against being tied down to one analytical strategy. They, instead, emphasise the importance employing multiple analytic strategies. They argue that when analysing interview accounts, it is important not to focus only on the thematic content but to also pay attention to the narrative forms, metaphorical content and interpretative repertoires drawn on by participants "in order to produce rich and variegated analyses." Reissman (1993) also advocates the use of multiple methods when analysing qualitative data. She argues that,

> "Combining methods forces investigators to confront troublesome philosophical issues and to educate readers about them. Science cannot be spoken in a singular universal voice. Any methodological standpoint is, by definition, partial, incomplete, and historically contingent. Diversity of representation is needed" (p. 70).

In conducting the analysis in this study, attention was paid to the occurrence of narratives, rhetorical devices and interpretive repertoires in participants' accounts. Each of these is discussed briefly below.

Narratives and Stories

Some segments of the interview data could not easily be broken down into codable segments without threatening to lose their meaning. Where this was noticed the whole segment was preserved and quoted as a whole. Two illustrations of narratives are given below:

AK: There is generally a feeling that medical and dental students do not take behavioural sciences that seriously. How have you managed to stimulate the interest of the students in your subject?

IC: I think the key has been not so much working on getting the students themselves interested but other teaching staff. When I first came here one of the problems that I encountered was that I was dealing with other members of academic staff who didn't themselves see what the point was for doing behavioural sciences. [...].

This was followed by a long story of how Ian Carr's appointment as the first and only behavioural sciences lecturer at the WDS was followed by the symbolic isolation and occasional disparaging remarks from clinical lecturers who did not see the relevance of behavioural sciences to dentistry. Ian Carr signalled exist from his personal narrative by summarising what he considered to be the most significant development in the restructured integrated curriculum:

[...] The best thing, I think has been the added integration for my subject. The isolation that was in the old curriculum has gone. [...]. I think that has been the greatest thing about it for my subject.

A second example of a narrative account is that given by Professor Brushwell Coleman, the former Chairman of the 2002 GDC curriculum Working Party. Unlike the other GDC participants, Prof. Coleman had asked for the questions which were going to be covered in the interview. In response to how the GDC informed dental curriculum policy in the UK, Coleman began by giving a long chronological account of the GDC curriculum policy;

BC: What I have prepared is some information on how the General Dental Council has approached the curriculum. [...] I want you to pay most attention to the latest bit. But I feel I ought to tell you what has happened in the last 15

> years to give you an idea. I don't want you to have to repeat those 15 years. But it gives you an idea where we have come from. [...]

After a long and detailed account of the evolution of the GDC dental curriculum policy, the process of policy formulation and developments in medical and dental education, Prof. Coleman signal the end of the narrative with the phrase:

> [...] So that is the story! Now does that help you?

The beginning and ending of a narrative account may or may not be signalled by "entrance and exit talk" (Riessman 2001, p. 698). Both Carr's and Coleman's narratives were, however, marked by entrance and exit talk.

Narratives serve two main functions (Riessman 1990). They are used to convince the listener that the action taken by the teller was justifiable or reasonable. Ian Carr's account is an example of the use of a narrative to justify or to give credibility to the paradigm shift from the traditional to the integrated curriculum. Carr justifies this move by drawing attention to the fact that his presence has now been rendered more visible (See chapter 6, pages 204 and 205, for a fuller account). The other function is to help the listener understand what is described. This is particularly important if the teller and the listener belong to two different social worlds as was the case between me and the elite academic dentists. Riessman (1990, p. 78) has pointed out that, "Tellers must find a way to make themselves and the times they are describing understandable." Coleman's narrative ably illustrates this latter function.

Contrastive Rhetoric

In his classic study of teachers' interaction over 25 years ago, Hargreaves (1981) described the contrastive rhetoric as follows,

> "Contrastive rhetoric refers to that interactional strategy whereby the boundaries of normal and acceptable practice are defined by institutionally and/or interactionally dominant individuals or groups through the introduction into discussion of alternative practices and social forms in stylized, trivialized and generally pejorative terms which connote their unacceptability" (Hargreaves 1981, p. 309).

The use of contrastive rhetoric was particularly prevalent in participants' accounts in response to the questions, "Why did you restructure your curriculum?" Or "What are the advantages of early clinical contact over the traditional approach?" These questions demand some justification for the action taken and depended on the individual's ability to "build descriptions by implicit or explicit reference to a comparative case" (Hargreaves 1981, p. 309). With participants at the WDS, the old and the restructured curricula formed a set of comparable cases. The use of contrastive rhetoric is particularly prevalent in interview extracts used in chapter 6 where the rationale for curriculum restructuring is explored.

The use of contrastive rhetoric served one important function. It set the boundary between what participants defined as traditional and innovative approaches to dental curriculum. Hargreaves (1981, p. 313) observed that,

> "The users of contrastive rhetoric demarcate the boundaries of existing practice at both ends of the educational practice. By excluding extreme and unacceptable alternatives of both progressive and traditional kinds, contrastive rhetoric specifies the range of acceptable practice."

The use of contrastive rhetoric was not limited to comparisons of traditional and innovative curriculum approaches, but was prevalent in other forms of accounts. As Hargreaves (1981, p. 312) pointed out that the use of contrastive rhetoric is a widespread "feature of social, interactional and conversational practice."

Context Specificity of Participants' Accounts

In their classic study of scientists' discourse some 25 years ago, Gilbert and Mulkay (1984) critiqued the general practice of sociologists of treating participants' accounts as objective truth without taking into account the social context in which these accounts were produced. They were particularly concerned with the common tendency among researchers of presenting 'definitive versions' of participants' accounts. They argued that the practice was flawed because it implied "unjustifiably that the analyst can reconcile his versions of events with all the multiple and divergent versions generated by the actors themselves" (Gilbert and Mulkay 1984, p. 2). They further argued that, "Instead of assuming that there is only one truly accurate version of participants' action and belief which can, sooner or later, be pieced together, analysts need to become more sensitive to interpretative variability among participants and to seek to understand why so many different versions of events can be produced." They argued that there was much to be gained analytically by "setting free the multitude of divergent and conflicting voices with which scientists speak" (p. 2).

Gilbert and Mulkay are not alone in acknowledging the context specificity of participant accounts. In his study, Hargreaves' (1984) showed that in formal staffroom curriculum meetings, teachers relied only on their personal classroom experience, while in informal settings, including interviews, they also drew on their personal non-classroom experiences as parents and former students. More recently, in their analysis of divorce

talk, Walzer and Oles (2003) have noted gender-related differences in accounts given by male and female participants on the causes of divorce. Similarly, in her classic study of divorce, Riessman (1990) reports that although both men and women draw on a common interpretative repertoire—the companionate marriage—in their accounts of divorce, they had very different meanings of "marital realities" (Riessman 1990, p. 72). She argues that participants' accounts "...do not spring into existence but are constructed within particular contexts (p. 64). Rapley (2001) also acknowledges the context specificity of interview accounts and argues that in interviews the participant and the researcher construct themselves as certain types-of-people in relation to the topic of the interview and reflexively the interview itself. An awareness of the local context of data production is central to analysing interview data regardless of whatever analytic stance the researcher may decide to take.

Interpretative Repertoires and Rhetorical Devices in Interview Accounts

Because participants' accounts are socially mediated, the importance of paying attention to the social contexts in which these accounts are produced is emphasised (Gilbert and Mulkay 1984, Rapley 2001). This requires adopting a systematic and rigorous approach to analysing and interpreting participants' accounts. The approach adopted by Gilbert and Mulkay (1984, p. 55) involved discourse analysis in which they identified two social accounting devices selectively employed by scientists in formal and informal accounts. They called these the 'empiricist' and 'contingent' repertoires. They pointed out that whereas the empiricist repertoire was dominant in formal scientific research literature, the contingent repertoire was commonly deployed in informal interviews or ordinary conversations. They suggested that the identification of repertoires in participant accounts should be the first step in making sense of the variability in participants' accounts. They argued that this led to a better appreciation of "how

scientists make sense of and reconcile discrepant versions of actions and beliefs in different social contexts within the social world of science" (1984, p. 57).

Pragmatistic and Abstractionist Repertoires

Similar to Gilbert and Mulkay's 'empiricist' and 'contingent' repertoires, two interpretative devices were identified in the participants' accounts of dental curriculum: the pragmatistic and abstractionist repertoires. In the interview accounts, participants paid greater attention to the pragmatistic repertoire. On the few occasions when the abstractionist repertoire was deployed in participants' accounts, it was usually done in such a way that rendered further support to the pragmatistic repertoire. The interview excerpt with Prof. Brushwell Coleman (BC) helps to illustrate this point. Following a long chronological narrative of the GDC curriculum guidelines, Prof. Coleman drew attention to the importance of not being carried away by the jargon of education theory;

> *BC:* [...] What I have tried to show you is the developments over 12 to 14 years. This statutory obligation laid by Parliament that we have to promote high standards and how we have done it with the general reports and also how we tried to take account of the latest quality assurance ideas and also in education. [...]There are some people who don't agree with some of the ways in which medical education, in particular, is developing in this country. [...]But I think it might be a useful thing for you to realise that quite bit of medical and dental education theory is just theory and what I hope I have tried to do within this is not to get carried away with the jargon. I have tried to keep it as practical as possible.

One of the properties of the pragmatistic repertoire identified from Coleman's account is the placing of emphasis on the practical realities of dental curriculum rather than on theory. This importance of paying attention to the socio-cultural environment in which the dental curriculum was embedded was a common theme in participants' accounts.

'Cut Your Coat According to Your Cloth' (CYCATYC) Device

Underlying the importance given to the pragmatistic over the abstractionist repertoire was the principle that a curriculum must be sustainable within the local available resources. This principle was best articulated by Prof. Patty Carter. When asked for advice on the best approach for us who were just starting a new dental programme, Patty Carter used a specific rhetorical device—the "cut your coat according to your cloth" (CYCATYC)—to emphasise the importance of paying attention to the local socio-cultural environment of dental education when planning the curriculum:

> *AK:* Suppose you had to give advice to people who are just starting a dental program, what would be your advice?
>
> *PC:* You have got to be focused. I think the most important thing is to focus on your resource at the start. There is an expression which says, 'You should cut your coat according to the cloth'. So you must look at the resource you have in terms of manpower to deliver the course and deliver the course with a suitable number of students based on that resource and then scale up.

Carter went on to describe at great length what she saw as some of the shortcoming in the restructured WDS curriculum. In their use of the pragmatistic and abstractionist repertoires, participants constantly drew attention to the pragmatic factors and almost always excluded any education theories as the basis for curriculum planning. This was particularly a common feature in participants' accounts when they advised on the best approach to dental curriculum planning. This is discussed further in chapter 11.

When the pragmatistic repertoire occurs in the literature, it is often deployed to counter what is seen as the unchecked use of theory in curriculum. For example, in debates on

the problem-based learning, opponents of the PBL deploy the pragmatistic repertoire to support their position (cf. Colliver 2000; Morris 2003). The pragmatistic repertoire has also been used in reflection accounts by those who have experienced the PBL. See for example, Schwartz et al. (1999), Miller et al. (2000), Carrera et al. (2003) and McLean (2004). In all these instances a specific rhetorical device—the CYCATYC is used to render support to the pragmatistic repertoire.

In the interview accounts, the abstractionist repertoire appeared to serve two functions. It was used to render further support to the pragmatistic repertoire by showing the inadequacy of theory under certain social conditions. It was also used simply to show that the interviewee was familiar with prevailing education theories. In either case, it served to render credence to the pragmatistic repertoire. Like the contrastive rhetoric, the pragmatistic repertoire was used to demarcate boundaries between what is feasible and what is not under given set of social conditions.

Summary

In this chapter, I have briefly discussed the advantages of adopting a qualitative case study approach in my study. I have argued that qualitative methods besides becoming popular even among researchers from a medical background, offer the advantage of exploring to greater depth the underlying assumptions in contemporary dental curriculum change. I have noted, however, that if the qualitative approach is to be utilised to maximum benefit, then a deliberate attempt must be made to be committed to methodological and theoretical demands of qualitative research. This commitment has, in part, been shown by a detailed discussion of how decisions were arrived at in the choice of research settings, and the challenges encountered in access negotiation and recruiting of participants. I have noted that the location of participants had implications

on the mode of interviewing that could be carried out. That is, for participants who could easily be reached, face-to-face interviews were conducted, while those who could not, the telephone interviews were the logical and practical option.

One important issue in qualitative research, that is, managing and analysis of qualitative data, has also been discussed. I have pointed out the increasing tendency among qualitative researchers to use computer software packages. I have acknowledged the advantages offered by these packages in data coding and retrieval, especially in large research projects. I, however, resisted their use an account that the volume of data generated was manageable using the traditional manual techniques of data manipulation, and the use of CAQDAS would have denied me the benefit of being close to my data.

I have also drawn attention to the use of specific interpretive accounting devices in participants' talk. Two interpretative repertoires—the pragmatistic and abstractionist repertoires—commonly occurring in participants accounts have been described. I have pointed out that the pragmatistic repertoire occurs frequently in informal talk, while the abstractionist repertoire is prevalent in the literature. I have further observed that in the participants' accounts credence was given to the pragmatistic repertoire by using a specific rhetorical device, the CYCATYC device.

In the next chapter, I focus my attention on developing a theoretical framework for guiding my data analysis and subsequent development of a comprehensive curriculum model. To achieve this, I have turned to Bernstein's (1971) concepts of collection and integrated curriculum and to Dreyfus and Dreyfus (1980) novice-expert continuum to develop a hybrid analytical model.

Chapter 5

A Conceptual Framework for Analysing the Dental Curriculum

Introduction

In this chapter a theoretical framework that informs this study is presented. The framework draws on Bernstein's (1977) conception of collection and integrated curriculum and the novice-expert continuum (NEC) model of skills acquisition (Benner 1984, 2004; Chambers 1994; Dreyfus 2001; Dreyfus and Dreyfus 1986; Dreyfus 2004; Dreyfus and Dreyfus 1980). The use of more than one theory to guide data analysis and interpretation is not uncommon in qualitative research. In their comparative study of the French schools' success in mathematics, Fowler and Poetter (2004) have drawn on three theoretical frameworks, while Calgren and Kallos (1997), Cooper (1998) and Cooper and Dunne (1998) have employed two theoretical frameworks.

The chapter is divided into two sections. In the first section, Bernstein's (1977) collection-integrated framework (CIF) and the five-stage NEC skills acquisition model (Benner 1984; Dreyfus and Dreyfus 1986) are discussed. The final section draws together the CIF and the NEC into a single analytical framework, which has informed this study.

The Need for a Broad-based Theoretical Framework for Analysing the Curriculum

Although a number of theoretical frameworks exist that can be used to "clarify a range of educational problems" (Walford 2002, p. 414) including dental curriculum planning, most literature on dental curriculum does not make explicit the theory underpinning it. Where education principles underpinning curriculum innovations have been explicated, two trends can be noted. The first is what has been noted about my informants at the WDS chapters 4 and 6. In their discussion of the rationale for curriculum restructuring, my informants drew on both abstractionist and pragmatistic repertoires. However, the importance of theory in guiding curriculum planning generally received low attention compared to the everyday practical realities of dental curriculum.

The second trend is what Morais (2002) has noted in education: the preponderance among science teachers to turn to education theories from the fields of psychology and cognitive sciences rather than from social sciences. She talks of a "general rejection of sociological approaches" among science teachers. She suggests science teachers are attracted to education theories from the fields of psychology and cognitive sciences because the strong grammar of psychology makes it more readily acceptable knowledge for grounding "the how to teach" science (Morais 2002, p. 565).

The observed rejection of education theories from the fields of social sciences by science teachers' noted by Morais, can also be said about dental educators. A casual look at the literature on curriculum innovations in medical and dental education shows that, although it is recognised that the success of curriculum innovations such as PBL, centre around power and control between teachers and students (see, for example,

Dalrymple, Wuenschell, Rosenblum et al. 2007; Fincham and Shuler 2001; McLean and Van Wyk 2006), and power and control issues are well articulated by Bernstein, yet it is rare, if ever, that reference is made to Bernstein's work in the literature on medical and dental curriculum. Instead extensive reference is made to the competency-based education (Chambers 1993, 1994; Hendricson and Kleffner 1998; Hendricson and Kleffner 2002), the PBL (Fincham and Shuler 2001) and the NEC model (UWCM Dental School 2001c) as guiding principles in curriculum restructuring in medical and dental education. The NEC, as noted by English (1993), has its roots in cognitive psychology.

Ignoring contributions from the field of education sociology simply means that an important resource has gone unnoticed and untapped. In the analytical framework I am presenting in this chapter, I have not only drawn on theories from the fields of sociology and cognitive psychology. But I have gone a step further and, drawing on the concept of abductive inference (Atkinson and Coffey 2004; Kelle 1995), I have reconceptualised the CIF and the NEC in a new and innovative way to produce an analytical model that also foreshadows the curriculum model developed in chapter 11.

Bernstein's Contribution to Education: Classification and Framing and the Collection and Integrated Curriculum

The contribution of Basil Bernstein to the field of education is widely acknowledged and has been described as immense and inspiring (Aggleton, Brannen, Brown et al. 2001; Atkinson 1985; Atkinson , Davies and Delamont 1995; Sadovnik 1995). His work spans over a period of four decades and covers areas such as language (Bernstein 1977), curriculum and educational transmission (Bernstein 1975; Bernstein 1977). As

proof of the high esteem to which Bernstein was held, he has two festschrifts in his honour by Atkinson et al (1995) and Sadovnik (1995). When he died in September 2000, Aggleton et al. (2001) published a collection of eulogies to which several scholars from around the world contributed to celebrate his life. In addition, the editorial board of the *British Journal of Sociology of Education* published a special issue of the journal as "a mark of respect" (Arnot, Apple, Beck et al. 2002, p. 525) in recognition of his immense contribution to the field of education and to render his work more accessible to readers unfamiliar with his writing.

I do not intend to engage in an extensive discussion of Bernstein's work. Readers interested in exploring further this issue are referred to Atkinson (1985). The anthologies by Atkinson et al. (1995), Sadovnik (1995) and Morais et al. (2001) and the special edition of the *British Journal of Sociology of Education,* volume 23 number 4, are all highly informative and give a comprehensive picture of Bernstein's contribution to education. What I have focused on is his work on curriculum. I have particularly paid attention on the concepts of classification and frame that he introduced to define collection and integrated curricula.

Classification and Framing

Bernstein's conceptualisation of the curriculum is based on two principles. The first is concerned with the structural relationship between the contents of a curriculum. That is, whether the contents of a curriculum stand in an open or closed relationship to each other and to the outside. The other principle addresses the nature of power and control social relationships between categories (Neves and Morais 2001a). To elucidate these two ideas, Bernstein introduced the concepts of classification and framing.

Classification

By classification, Bernstein referred to the structural relationship between the various contents of the curriculum—that is, whether the contents of a curriculum stood in complete isolation from each other or not. He used the terms 'strong' and 'weak' to describe the degree of boundary insulation between contents:

> "Where classification is strong, contents are well insulated from each other by strong boundaries. Where classification is weak, there is reduced insulation between contents, for the boundaries between contents are weak or blurred. *Classification thus refers to the degree of boundary maintenance between contents.* Classification focuses our attention upon boundary strength as the critical distinguishing feature of the division of labour of educational knowledge" (Bernstein 1977, p. 88: emphasis in the original).

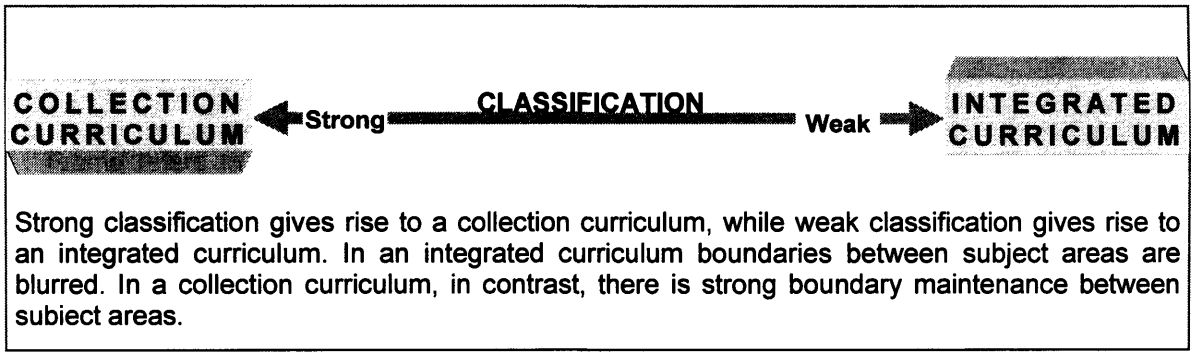
This definition highlights the fact that classification is not a fixed entity but exists as a continuum extending from weak to strong. Variations in classification strength give rise to two curricula types: collection and integrated. Bernstein differentiated between collection and integrated curricula as follows;

> "Any organization of educational knowledge which involves strong classification gives rise to what is here called a collection code. Any organization of educational knowledge which involves marked attempt to reduce the strength of classification is here called an integrated code" (Bernstein 1977, p. 90).

From this formulation, a collection curriculum is marked by strong classification. This means that the contents of the curriculum stand in a "closed relationship" (Bernstein 1977, p. 87) to each other. In contrast, an integrated curriculum is marked by weak

classification, with contents standing in an "open relationship" with each other (Bernstein 1977, p. 87). Figure 5.1 presents classification as a continuum extending from strong to weak, with the ideal forms of collection and integrated curricula occupying the opposite ends on the continuum.

Figure 5.1: Variations in Classification and the Two Curricula Types



Strong classification gives rise to a collection curriculum, while weak classification gives rise to an integrated curriculum. In an integrated curriculum boundaries between subject areas are blurred. In a collection curriculum, in contrast, there is strong boundary maintenance between subject areas.

In dental education strong classified curriculum is best illustrated by the pre-clinical component of a traditional undergraduate course, which is characterised by strong boundary maintenance between subject areas of physiology, biochemistry and anatomy. Weak classification occurs towards the end of the students' clinical training, during the outreach and polyclinics.

Framing

Bernstein was not only concerned with the structural relationship between the content of a curriculum but also in the social context in which knowledge is transmitted and received. He was interested in the "pedagogical relationship" (Bernstein 1977, p. 88) between teachers and students and he introduced the concept of 'frame' to explore this relationship. He defined 'frame' as, "...the range of options available to teacher and

taught in the *control* of what is transmitted and received in the context of the pedagogical relationship" (Bernstein 1977, p. 88 - 89. Emphasis in the original). Like classification, frame can be presented as a continuum extending from strong to weak as shown in Figure 5.2.

Figure 5.2: Variations in Frame Strength

Frame refers to the degree of control over a pedagogical encounter between lecturers and students. In a strong framed pedagogical interaction, lecturers have increased and students' have reduced control and vice versa.

Bernstein described what was implied by strong and weak framing as follows;

> "Strong framing entails reduced options; weak framing entails a range of options. *Thus frame refers to the degree of control teacher and pupil possess over the selection, organization, pacing and timing of the knowledge transmitted and received in the pedagogical relationship"* (Bernstein 1977, p. 89. Emphasis in the original).

Framing is not restricted to the teacher-student pedagogic relationships alone but can be extended to other encounters where there is differential allocation of power and control between agents (Hoadley 2003; Neves and Morais 2001c). Hoadley (2003) has coined the terms 'internal' and 'external' framing to distinguish between the pedagogic relationship between the teacher and pupils and the relationship between the teacher and external agents respectively.

In dental education, at the meso level, framing refers to the degree of control that dental schools possess over the selection, organisation, pacing and timing of the contents of the curriculum. In the UK, for example, under strong framing the dental schools would be expected to work within a highly prescriptive set of GDC curriculum guidelines. Under weak framing, dental schools would exercise greater control over the curriculum. That is, strongly framed curriculum guidelines would offer little choice to dental schools; while weakly framed curriculum guidelines would permit greater flexibility and variation in the curriculum (cf. Hoadley 2003). At the micro-level of subject transmission, strong framing means that lecturers exercise greater control, relative to students, over the selection, pacing, organisation and timing of knowledge in a pedagogic interaction. In a weak framed curriculum students' have increased control over the pedagogic interaction. A lecture in paediatric dentistry or anatomy is an example of a strong framed pedagogic interaction, while a poster assignment or an authentic problem-based learning (PBL) are examples of relatively weak framed pedagogic interactions.

There is another aspect to framing. This relates to the degree of insulation between what Bernstein (1977, p. 89) terms as 'non-school everyday community knowledge' possessed by the teacher and the students and the 'educational knowledge' transmitted in a pedagogical relationship. He defines this aspect of framing as;

> "...the strength of the boundary between what may be transmitted and what may not be transmitted, in the pedagogical relationship. Where framing is strong, there is a sharp boundary, where framing is weak, a blurred boundary, between what may and may not be transmitted" (1977, p. 88).

The focus here is the degree of boundary maintenance between everyday common knowledge experienced by the teacher and the pupil and the knowledge found in

school. He differentiates between community knowledge and educational knowledge as follows;

> "In a sense, educational knowledge is uncommonsense knowledge. It is knowledge freed from the particular, the local, through the various languages of the sciences or forms of reflexiveness of the arts which make possible either the creation or the discovery of new realities" (1977, p. 99).

It is the frame strength between educational knowledge and everyday knowledge that sets educational knowledge apart and makes it mysterious. The stronger the frame the more arcane educational knowledge becomes and therefore the more cherished and highly protected it is to those who possess it. Bernstein (1977, p. 99) observes that, "Such framing also makes of educational knowledge something not ordinary or mundane, but something esoteric, which gives a special significance to those who possess it." This means the stronger the boundaries between everyday community knowledge and educational knowledge the more esoteric, 'pure' and 'sacred' (Atkinson 1985, p. 137) education knowledge is seen to be. Instances of weak framing between everyday community knowledge and educational knowledge are found in pre-school education (Bernstein 1977; Tsatsaroni , Ravanis and Falaga 2003) as well as in the education of the 'less able' children in society. Bernstein (1977, p. 99) argued that frame strength was "relaxed to include everyday realities" in the education of less able children in order to establish some social control.

Although Bernstein had general education in mind in formulating this aspect of framing, the general principle may be applied to professional education. Within the dental profession two knowledge areas may be discerned: basic dental knowledge transmitted through the undergraduate dental curriculum and the specialist dental knowledge that is acquired through postgraduate professional training. Nearly all

specialist and sub-specialist disciplines of dentistry strive to have some control over the knowledge transmitted in the undergraduate curriculum and have formulated some guidelines for undergraduate education (See, for example, Dental Sedation Teachers Group 1999; Eaton, Adamidis, Mcdonald et al. 2000; European Society of Endodontology 2001; Odell, Farthing, High et al. 2004). Some disciplines even advocate strong framing between basic and specialist dental knowledge and suggest weakening of the frame strength only to some students as a way of rewarding excellence and a means of attracting them into the specialties once they qualify (cf. Eaton et al. 2000; O'Brien 1997). This is explored further in Chapter 8 in relation to the undergraduate orthodontic syllabus.

Collection and Integrated Curriculum

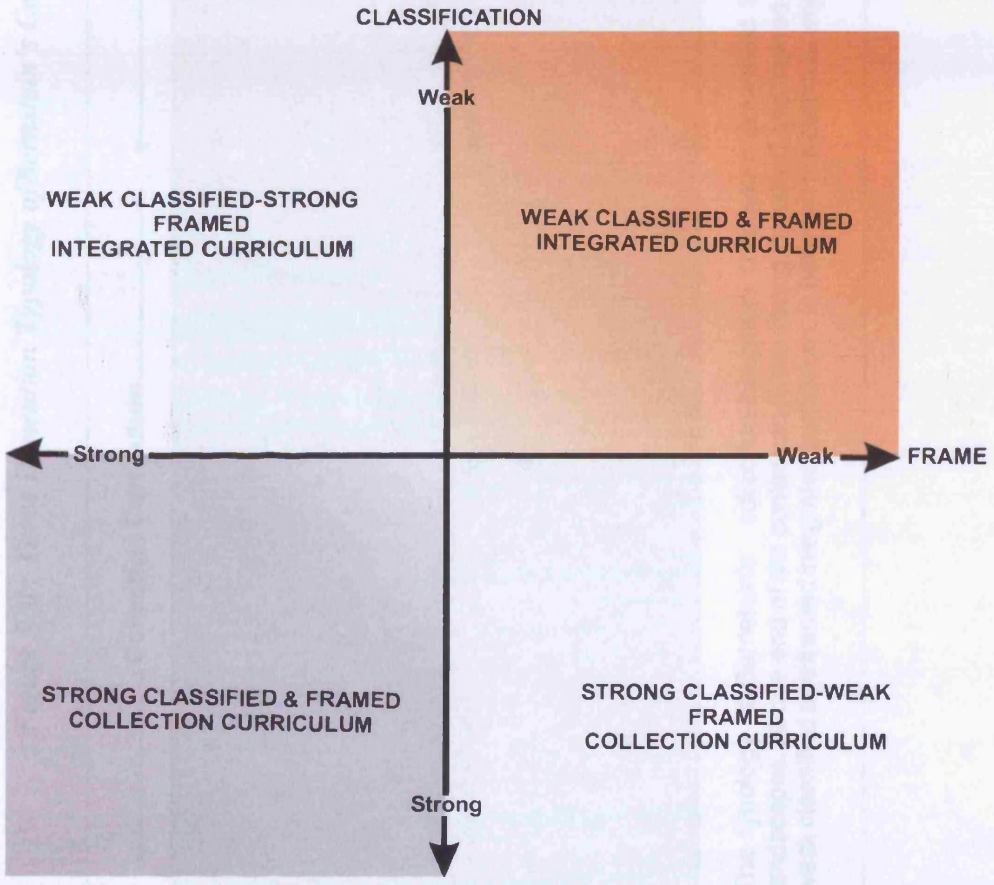
Variations in classification and frame strength give rise to a series of curriculum types. Bernstein (1977, p. 90) pointed out that;

> "Any organisation of educational knowledge which involves strong classification gives rise to what is here called a collection code. Any organisation of educational knowledge which involves a marked attempt to reduce the strength of classification is here called an integrated code. Collection codes may give rise to a series of sub-types, each varying in the relative strength of their classification and frames. Integrated codes can also vary in terms of the strength of frames, as these refer to the *teacher / pupil / student* control over the knowledge that is transmitted."

When classification and frame are presented as vertical and horizontal continua respectively, they give rise to four main types of curricula as illustrated in Figure 5.3a and 5.3b. However, because classification and frame exist as continua, this can theoretically give rise to a range of curriculum varieties. But, Bernstein focused mainly

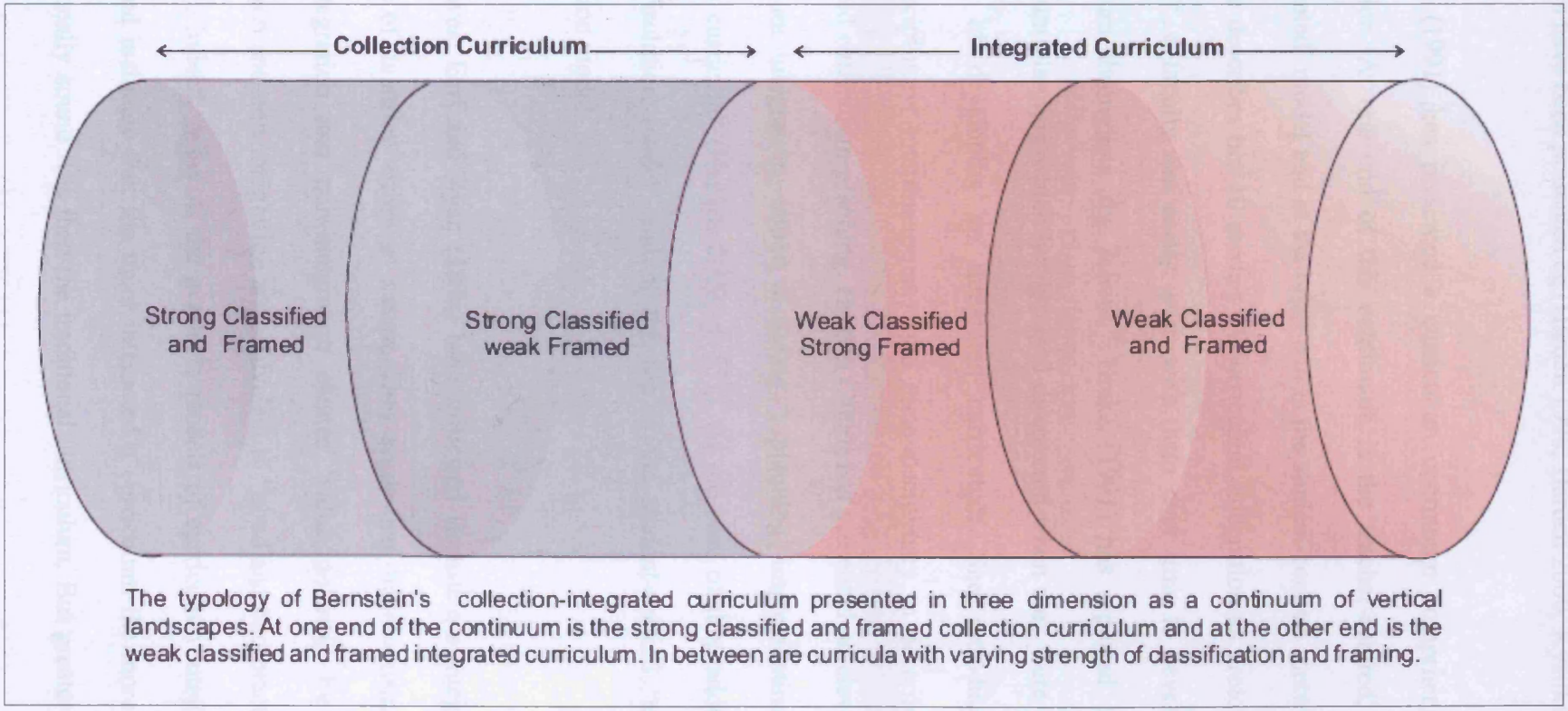
on the strong classified and framed collection and the weak classified and framed integrated curriculum types. Bernstein was attracted to the two curricula, to which he assigned the terms visible and invisible pedagogy respectively (Atkinson 1985; Bernstein 1977; Delamont 1989), to show how different models of pedagogic practice reproduced and produced the culture of the 'old middle class' and the 'new middle class' respectively (Arnot 2002; Delamont 1989). In their application of the concept of collection and integrated curriculum to medicine, Armstrong (1977; 1980), Colditz and Sheehan (1982) and Jacobsen (1981) all appeared to have the two curricula in mind.

Figure 5.3a: Typology of Bernstein's Collection-Integrated Curriculum



When classification and frame strength are presented as vertical and horizontal continua, four curricula types are realisable: strong classified and framed (SC&F) collection; weak classified- strong framed (WC-SF) integrated; weak classified and framed (WC&F) integrated; and strong classified-weak framed (SC-WF) collection curricula. However, the most common discussed curricula in the literature are the two highlighted in the figure: the SC&F and the WC&Fcurricula, which are also simply referred to as the 'traditional discipline-based' and the 'integrated' curriculum respectively.

Figure 5.3b: Three Dimention Typology ofBernstein's Collection-Integrated Curriculum



The typology of Bernstein's collection-integrated curriculum presented in three dimension as a continuum of vertical landscapes. At one end of the continuum is the strong classified and framed collection curriculum and at the other end is the weak classified and framed integrated curriculum. In between are curricula with varying strength of classification and framing.

In the literature, integrated curriculum continuums comprising from three to as many as eleven have been presented eg (Harden 1998; Harden 2000; Kysilka 1998).

Fogarty (1991) has presented a curriculum continuum comprising 10 models of integration. At one end of this continuum is the teacher-centred, discipline-based 'fragmented' model and at the other end is the student-centred 'networked model' (p. 61). She describes her 10 models of curriculum integration as prototype 'organizers' which, "...a faculty can easily work with them over time to develop an integrated curriculum throughout the school." Drake (1991) has reported a framework for curriculum planning which her grouped discovered when they were went through the process of developing an integrated curriculum. She introduces three terms: multidisciplinary, interdisciplinary and trans-disciplinary to describe progression in integrated curriculum planning. Harden (2000) has presented an eleven-step ladder of curriculum integration, aimed at aiding "...planning, implementing and evaluating medical curricula" (Harden 2000, p. 551). At the base of this ladder is the subject-based 'isolation model' and at the top is the student-centred 'trans-disciplinary' integration model.

Hargreaves, Earl and Ryan (1996) have criticised Bernstein's integrated curriculum because of its strict 'either/or' nature. They argue that dichotomising the curriculum into integration and non-integration creates 'value polarity' by suggesting that integration and non-integration are equivalent to "good and bad practice" respectively (p. 102). Indeed, many of the available models of curriculum integration are value-laden and insinuate that the more integrated a curriculum the more progressive and educationally sound it is than the traditional curriculum. But greater integration does

not always lead to better education outcomes. Nor is it a sign of progress. Hargreaves et al (1996) have observed that,

> "...educational continuums often embody implicitly values where movement along the continuum is construed as growth or progress towards a better state. However, progress along a continuum does not guarantee continuation towards progress. Given the many different kinds of curriculum integration, more does integration is not always better (Hargreaves et al. p. 103).

The achievement of better curriculum outcome may not necessarily lie in the degree of integration. It is essential to gone beyond what Morais (2002, p. 568) describes as the "dichotomous" division of curriculum into collection and integrated. One way of achieving this is to apply more than one curriculum model and to take into account the the wider social environment in which the curriculum is embedded.

Application of Bernstein's Concepts of Classification and Frame Strength and the Collection and Integrated Curriculum

Bernstein's concepts of classification and frame have found application across a wide range of knowledge areas (Morais 2002) and covers a wide range of topics including pre-school education (Tsatsaroni et al. 2003), general education (Hoadley 2003), science education (Morais , Neves and Fontinhas 1999; Neves and Morais 2001c), higher and continuing education (Jacobsen 1981; Moore 2000; Walford 1981), gender studies (Arnot 2002; Bird 2001), nursing education (Webb 1981), medicine (Armstrong 1977; Colditz and Sheehan 1982) and postgraduate research studies (Delamont , Atkinson and Parry 2000). Other examples where Bernstein's work has been used to illuminate social issues include the work of Delamont (1989) on barriers to women's participation in elite professions and Mike's (1995) work on the structure and control of social relationships in education. Others examples include Walford's

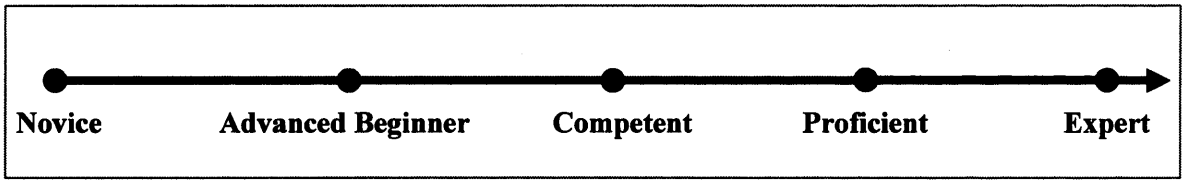
(1994) paper on curriculum continuity and discontinuity between school, higher education and work. Cookson and Persell's (1995) paper on the social advantages conferred by curricula of elite boarding schools also utilises Bernstein's concept classification and frame strength .

There appears to be no record in the literature of the use of Bernstein's concepts on curriculum in dental education. But, like in medicine (Armstrong 1977, 1980), in a traditional undergraduate dental curriculum, the pre-clinical component of the programme is characterised by strong classification and framing. It is characterised by segmentation into the autonomous disciplines of anatomy, physiology and biochemistry, with strong boundary maintenance between them. However, what comes close to a fully integrated curriculum is not the whole programme broadly referred to as clinical dentistry as Armstrong (1977; 1980) seemed to suggest for medicine. As Atkinson (1977) pointed out about the clinical component of the medical curriculum, the clinical dental curriculum is segmented into relatively strong classified disciplines and sub-disciplines of dentistry. Students only experience a fully integrated curriculum in the final year of their clinical training when they are exposed to an "extended clinical environment" (General Dental Council 1997, par. 56; 2002, par. 45). The extended clinical environment is intended to expose students to a mix of patients and a range of dental conditions similar to those encountered in general dental practice. In the process of carrying out care, students draw on and integrate knowledge from the various disciplines of dentistry (See Chapter 9 for a detailed discussion of outreach dental education).

The Novice-Expert Continuum Model of Skills Acquisition

The novice-expert continuum (NEC) (Benner 1984; Chambers and Glassman 1997; Dreyfus and Dreyfus 1986; English 1993) or competence continuum (Chambers and Geissberger 1997) is a five-stage incremental skills acquisition model developed by the Dreyfus brothers (Dreyfus and Dreyfus 1986; Dreyfus and Dreyfus 1980) and adapted to nursing education by Benner (1984). The model has since found application in other professional fields including dentistry (See, for example, Adea Commission on Change and Innovation in Dental Education, Hendricson, Andrieu et al. 2006c; Crespo , Torres and Recio 2004; Hendricson and Kleffner 1998; Hendricson and Kleffner 2002) where it has come to mean the "entire progression of professional learning" that commences with entry to undergraduate education and extends over a period of many years of professional life (Chambers and Gerrow 1994, p. 559). It is also the guiding principle behind competence-based education in medicine and dentistry (Chambers 1993, 1994; Harden 2002a; Yip and Smales 2000). Figure 5.4 presents the five stages on the NEC. Skills acquisition progresses through five stages from the novice to the expert stage.

Figure 5.4: The Novice-Expert Continuum



The NEC is based on the logic that during the process of acquiring skills needed to solve unstructured problems, humans go through five qualitatively different mental stages (Benner 1984, 2004; Chambers 1996; Dreyfus and Dreyfus 1986; Dreyfus and Dreyfus 1980). Dreyfus and Dreyfus (1986, p.19) note that,

> "As human beings acquire a skill through instruction and experience, they do not appear to leap suddenly from rule-guided "knowing that" to experience-based know-how. A careful study of the skill-acquisition process shows that a person usually passes through at least five stages of qualitatively different perceptions of his task and/or mode of decision-making as his skill improves."

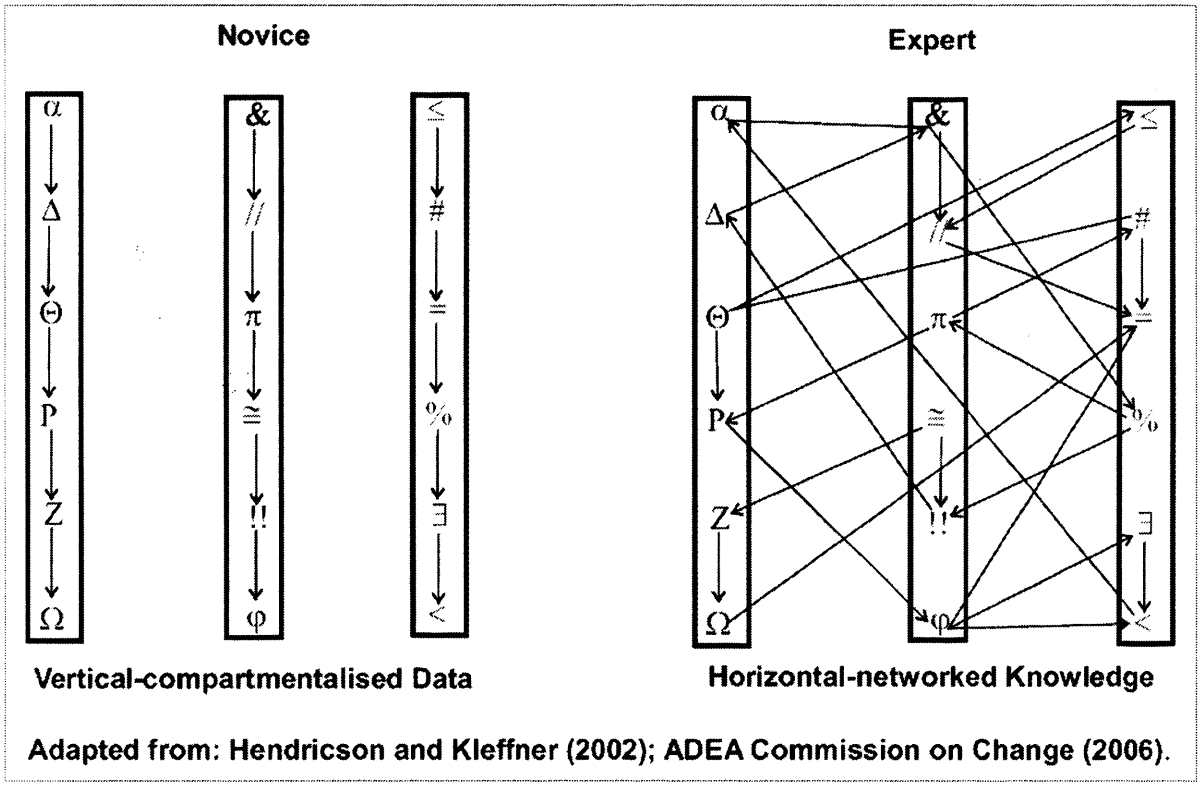
Dreyfus and Dreyfus differentiate between two types of problems: structured and unstructured. In structured problems all relevant information needed to solve a problem is available and solutions can therefore confidently be worked out. Unstructured problems, in contrast, contain unlimited number of both relevant and irrelevant facts and features. Consequently, solving unstructured problems such as those encountered in dental practice require prior practical experience with concrete cases. Dreyfus and Dreyfus note that,

> "A high level of skill in any *unstructured* problem area seems to require considerable concrete experience with some types of situations than with others. Consequently an individual will be at the same time expert with respect to certain types of problems in his area of skill, but less skilled with respect to others" (Dreyfus and Dreyfus 1986, p. 20).

The difference in the performance of novices and experts in solving unstructured problems is explained by cognitive theorists in terms of differences in the mental ability to process information (Crespo et al. 2004; English 1993). That is, novices are different from experts in the neural mechanisms involved in solving concrete problems (Adea Commission on Change and Innovation in Dental Education et al. 2006c; Hendricson and Kleffner 1998; Hendricson and Kleffner 2002). According to cognitive theory, information acquired from different sources such as lectures, textbooks and laboratory-based technical procedures is stored in the brain as vertically compartmentalised data. These fragments of largely unorganised and isolated bits of information are transformed and consolidated into useful knowledge that can be used

to solve problems through repeated use (Hendricson and Kleffner 2002). The process of reorganising isolated bits of information into useful knowledge involves developing horizontal networks between the vertically compartmentalised bits of data. The difference between novices and experts lie in the extent to which neural networks have developed as shown in Figure 5.5. Because experts have developed dense neural networks, they are able to rapidly retrieve "chains of knowledge" (Hendricson and Kleffner 2002, p. 47) and to solve problem effortlessly. Novices lack these networks and have to rely on an inefficient trial and error search to solve a problem.

Figure 5.5: Differences in the Mental Structuring of Information between a Novice and an Expert



Adapted from: Hendricson and Kleffner (2002); ADEA Commission on Change (2006).

The NEC model is widely accepted in dental education. Based on this model, Hendricson and Kleffner (1998) described learning events that are desirable at various

stages of the dental programme. Hendricson and Kleffner (2002) have used the model to propose a way of helping struggling students, while the ADEA Commission on Change et al. (2006b) have used the model at the conceptual level as the basis for proposing strategies that promote problem-solving, critical thinking and self-directed learning among dental students.

The NEC model is also the guiding principle behind competence-based dental education (Chambers 1993; Glassman and Chambers 1998). It has been widely used to guide the formulation of dental curriculum guidelines and/or assessment systems by many regional and national professional regulatory bodies (see, for example, American Dental Education Association 2005, 2006; Boyd et al. 1996; McCann , Babler and Cohen 1998; NHS Education for Scotland 2002; Plasschaert et al. 2004; Prescott et al. 2003).

I do not intend to engage in a detailed discussion of the NEC model but will focus my attention mainly on the first three stages, which are the key stages covered under the undergraduate dental education. It is acknowledged that the primary aim of the undergraduate dental curriculum is to facilitate progression of students from the novice to the competent stage (Chambers 1993; Marchese 1994; Yip and Smales 2000). Readers interested in a detailed exploration of the model are referred to Benner (1984; 2004), Dreyfus and Dreyfus (1980), Dreyfus and Dreyfus (1986), Dreyfus (2004), Chambers (1994), Chambers and Glassman (1997). The UWCM Dental School (2001b) has also presented a summary of the key stages of the model.

Novice Stage

A novice, or beginner, is defined in the Oxford dictionary as a person new to and inexperienced in a job or situation. This definition underscores one fundamental aspect of the novice-competence continuum—practical experience. First year dental students just commencing undergraduate dental studies are novices on account of their lack of both theoretical and practical experience of dentistry (Chambers 1993). Apart from, perhaps, recollections of some encounters with a GDP as recipients of dental care, like Benner's (1984) trainee nurses and Dreyfus and Dreyfus' (1980) trainee pilots, they lack any prior theoretical and practical experience of dentistry .

The starting point in students' progression on the NEC is the accumulation of a stock of foundational abilities (Conny 1994). Foundational abilities comprise foundation knowledge and psychomotor skills or what Chambers (1993, p. 792) simply referred to as 'foundation performance'. Both foundation knowledge and psychomotor skills are transmitted to the novice as chunks of isolated facts (Chambers 1993). Under a traditional dental curriculum, foundation knowledge in basic sciences is transmitted independently by the departments of anatomy, physiology and biochemistry, while laboratory based foundation dental skills are offered independently by the disciplines of restorative dentistry, paediatric dentistry and prosthodontics even though the principles and procedures underlying the skill may be the same across the disciplines. This led Chambers (1994, p. 343) to observe that knowledge and skills of novices are "locked within disciplines".

The accumulation of a compendium of foundation knowledge and performance is the first step in professional socialisation. The next step involves knowledge and skills application. This involves allowing students to carry out specific tasks on patients in a

"controlled" clinical setting (Chambers 1994, p. 343) and under very close supervision. These tasks are deconstructed into context-free features (Dreyfus and Dreyfus 1986; Dreyfus and Dreyfus 1980) which students can readily recognise even though they do not have any prior "situational experience" of the task (Benner 1984, p. 20). In order to facilitate performance, students are given explicit operational rules to follow. Dreyfus and Dreyfus (1986, p. 21) called this process of manipulating context-free elements using rules, as information processing;

> "...the novice learns to recognize various objective facts and features relevant to the skill and acquires rules for determining actions based upon those facts and features. Elements of the situation to be treated as relevant are so clearly and objectively defined for the novice that they can be recognized without reference to the overall situation in which they occur. We call such elements "context-free," and the rules that are to be applied to these facts regardless of what else is happening 'context-free rules.' The manipulation of unambiguously defined context-free elements by precise rules is called information processing."

In clinical dentistry, the task of administering local anaesthesia (LA) may be broken down into two tasks: preparation of the syringe and administration of the LA. The novice is given rules on how to load the syringe; how to position the patient, where and how to stand when administering LA, the precise site to inject, how to position the syringe, the steps to follow to produce safe and efficacious anaesthetic effect, etc. The novice is given strict rules to follow because at this stage although s/he may have some foundation knowledge of LA and regional anatomy, s/he does not have any practical experience of administering LA. In addition, the novice requires close supervision to ensure that all the rules are followed and for the safety of the patient.

Because the novice divides her/his attention between rules following and task performance, this severely limits her/his capacity to perform smoothly and successfully (Benner 1984). Therefore s/he experiences constant interruptions and is inefficient and fails to develop a 'coherent sense of the overall task' (Dreyfus and Dreyfus 1986, p.22). In addition, at this stage of skills acquisition, the novice has not developed adequate self-monitoring and problem solving capacity (Chambers and Geissberger 1997) and needs close monitoring. But, with repeated practice on carefully selected 'ideal' dental patients (Chambers 1994), the novice develops some context-dependent judgements and skills. Dreyfus and Dreyfus (1986, p. 22) noted that,

> "Performance improves to a marginally acceptable level only after the novice has considerable experience in coping with real situations. While that encourages the learner to consider more context-free facts and to use more sophisticated rules, it also teaches him a more important lesson involving an enlarged conception of the world of the skill."

The novices' unfamiliarity with theoretical and practical knowledge and the lack of judgement make them more dependent on teachers in the acquisition of knowledge and performance of tasks. Both cognitive and procedural knowledge is usually presented to them in a fragmented and compartmentalised manner as discrete subject disciplines. Where discipline means "accepting a given selection, organization, pacing and timing of knowledge realized in the pedagogical frame" (Bernstein 1977, p. 98). The focus during this stage should be on the inculcation of "conceptual understanding" (Venville , Rennie and Wallace 2003) of the scientific, technical and behavioural foundations of professional practice (Chambers and Glassman 1997). That is, during the novice stage of professional socialisation, emphasis should be on acquiring states of knowledge rather than on how to gain knowledge (Armstrong 1977, 1980; Bernstein 1977; Colditz

and Sheehan 1982). Using Bernstein's (1977) concepts of classification and frame, the novice stage is characterised by a strong classified and framed education environment.

Advanced Beginner

In addition to being able to recognise and apply rules to context-free situations, the advanced beginner demonstrates marginal improvement in performance (Benner 1984); has relatively greater understanding of principles and concepts underlying performance of tasks (Chambers 1994; Kozma and Russell 1997); and is capable of recognising recurring meaningful features called 'aspects' (Benner 1984, p. 22) or 'situational components' (Dreyfus and Dreyfus 1986, p. 23) of the problem or task. The critical factor in progressing from a novice to advanced beginner is practical experience in real-life settings. Dreyfus and Dreyfus noted that;

> "Through practical experience in concrete situations with meaningful elements, which neither an instructor nor the learner can define in terms of objectively recognizable context-free features, the advanced beginner starts to recognize those elements when they are present. ...We call the new elements "situational" to distinguish them from context-free elements. Rules for behaviour may now refer to both the new situational and context-free components" (Dreyfus and Dreyfus 1986, pp. 22-23).

Benner (1984) noted that unlike context-free features, situational components or aspects cannot be made completely objective and therefore require practical experience to recognise. Taking the example of LA, in deciding the site where to inject the LA, an advanced beginner takes into account anatomical variations between patients which may lead to anaesthetic failure if not taken into account. Similarly, when testing for the efficacy of the LA, an advanced beginner learns to distinguish between a case of genuine LA failure and an apprehensive patient. The ability to discriminate the

different aspects of a task such as anatomical variations does not require a set of rules but comes with experience.

Advanced beginners have accumulated a repertoire of discipline-based theoretical knowledge, demonstrate marginal ability in the performance of clinical procedures and are capable of performing in 'other-than-ideal' circumstances (Chambers 1994; Chambers and Glassman 1997). However, they still need support and constant monitoring from their tutors, especially in deciding when to begin and when to conclude a task (Chambers 1994) and to ensure that tasks are performed correctly. They benefit from an educational environment that encourages "intellectual engagement" (Fealy 2002, p. 563) with theoretical and procedural knowledge. Students at this stage benefit from exposure to varied clinical cases in realistic settings (Hendricson and Kleffner 1998). This helps them to develop confidence and to refine their skills. They also benefit from educational tasks which require them to elaborate on their experiences. This facilitates integration of experiential and theoretical knowledge (Patel, Arocha, Chaudhari et al. 2005). Although there is generally some tension between encouraging students' autonomy in carrying out dental procedures and the need to ensure patients' safety, Hendricson and Kleffner (1998) advise that during this stage lecturers must begin the process of weaning—gradually transferring the "responsibility for learning" to students (Chambers 1996, p. 818). In comparative terms, this stage may be strongly classified but relatively weak framed.

Competent

The competent stage is typified by fifth-year dental students close to graduation (UWCM Dental School 2001b). At this stage students are capable of carrying out,

unsupervised, most tasks expected of them at entry level independent general dental practice (Hendricson and Kleffner 1998; Yip, Smales, Newsome et al. 2001). Competent dental students approach the delivery of dental care from the perspective of a holistic approach to patient care. They have accumulated a modicum of judgement and professional values and possess a repertoire of procedures necessary to handle normal dental problems presented by most patients in general dental practice (Chambers 1994; Chambers and Glassman 1997). Although at this stage students have some feeling of mastery and are capable of coping and managing many "contingencies of clinical care" (Benner, 1980, p. 27), they are less fluid and effortless in their performance (Chambers and Geissberger 1997; Hendricson and Kleffner 1998) and they lack speed and flexibility exhibited by proficient and expert practitioners.

Another significant development of this stage is that, unlike the lecturer-dependent and rule-bound novice and advanced beginner stages, competent students are relatively independent. They are capable of formulating and operating with plans and, consequently, assume increasing responsibility over the outcome and quality of their work. Dreyfus and Dreyfus (1986, p. 26) noted that a competent performer,

> "...after wrestling with the question of the choice of a plan, feels responsible for, and thus emotionally involved in, the product of his choice. While he both understands and decides in a *detached* manner, he finds himself intensely *involved* in what occurs thereafter. An outcome that is clearly successful is deeply satisfying and leaves a vivid memory of the plan chosen and of the situation as seen from the perspective of the plan. Disasters, likewise, are not easily forgotten."

Students at the competent stage benefit from practicing in a clinical environment that exposes them to varied dental conditions and offers them opportunities to practice

planning and coordinating of multiple complex tasks similar to those found in general dental practice (Chambers 1994; General Dental Council 2002). However, although students at the competent stage are capable of carrying out a number of tasks to an acceptable standard, they have not yet attained the standard of a general dental practitioner or expert with many years of practice. They must, therefore, recognise their limitations and learn to seek help from senior colleagues. They must also learn to refer complex cases to appropriate specialists (General Dental Council 2002).

Proficient

A proficient dentist is the product of specialty training and/or many years of experience in dental practice (Chambers 1994). Because of years of practice, the proficient dentist develops the intuition to approach her/his task holistically without deconstructing it into component features (Dreyfus and Dreyfus 1986). This ability may be explained in terms of the development of relatively dense horizontal neural networks between stored data (English 1993; Hendricson and Kleffner 1998. See Fig. 5.6). This enables the proficient dentist to readily draw on what Benner (1984, p. 28) described as "brain-stored, experience-created" knowledge and to be more deeply engaged in her/his work. Dreyfus and Dreyfus (1986, p. 28) further observed that,

> "Usually the proficient performer will be deeply involved in his task and will be experiencing it from some specific perspective because of recent events. Because of the performer's perspective, certain features of the situation will stand out as salient and others will recede into the background and be ignored. As events modify the salient features, plans, expectations, and even the relative salience of features will gradually change. No detached choice or deliberation occurs. It just happens, apparently because the proficient performer has experienced similar situations in the past and so associates with present situations plans that worked in the past and anticipates outcomes that previously occurred."

The ability to perceive situations holistically enables the proficient dentist to predict before hand the likely outcome of her/his actions, to recognise when the expected outcome does not materialise and to changes her/his plans accordingly to accommodate contingencies. Benner (1984, p. 28 -29) notes that,

> "Holistic understanding improves decision making; it becomes less laboured because the operator now has a perspective on which of the many existing attributes and aspects present are the important ones."

Benner (1984, p. 31) suggested that a proficient operator is best taught inductively with case studies containing complex and ambiguous material and/or insufficient information similar to real clinical situations.

Expert

An expert possess an enormous stock of both theoretical and practical knowledge (Chambers 1994) and operates from a "deep understanding of the total situation" (Benner 1984, p. 32). What sets the expert apart is her/his fluid, almost effortless and non-reflective performance, or what Hendricson and Kleffner (1998, p. 185) termed as the 'unconscious competent'. Dreyfus and Dreyfus (1986, p. 30) note that,

> "An expert generally knows what to do based on mature and practiced understanding. When deeply involved in coping with his environment, he does not see problems in some detached way and work at solving them, nor does he worry about the future and devise plans. ...An expert's skill has become so much a part of him that he need be no more aware of it than he is of his own body."

Unconscious competence is the product of many years of experience and professional training resulting in the development of "integrated knowledge networks, which allow the expert to instantly retrieve pertinent information relevant to the solution of a problem or performance of a task" (Hendricson and Kleffner 1998, p. 185). The expert's performance is fluid, flexible and highly efficient because s/he is not stalled by following features and rules. But, when faced with a new situation, the expert turns to analytical rule-bound practice. Dreyfus and Dreyfus (1986, pp. 31-32) observe that, "While most expert performance is ongoing and nonreflective, when time permits and outcomes are crucial, an expert will deliberate before acting." Chambers and Geissberger (1997) observe that when faced with a new procedure, an expert spends more time at the beginning processing information in order to fully comprehend the subtleties of the problem before acting. The result is the observed fluid and effortlessness in professional judgement and practice.

Educational Implications of the Novice, Advanced Beginner and Competent Stages

The educational significance of the novice-expert continuum is that it maps out the educational needs of students as they progress from the novice to the competent stages. One of the aims of curriculum planning should be the creation of an education environment that best supports and is "consistent with the student's skill level" (Hendricson and Kleffner 1998, p. 184). In Table 5.1, some characteristic features and educational needs of the novice, advanced beginner and competent stages are summarised. In comparative terms, the education environment that best supports the novice stage closely corresponds to Bernstein's collection curriculum, while the integrated curriculum best supports the competent stage. The next section, the relationship between the Bernstein's CIF and the NEC is established.

Table 5.1: Summary of Characteristics and Educational Needs of Learners during the First Three Stages of the Novice-Expert Continuum

Novice	Advanced Beginner	Competent
• Action driven by context-free rules: slow, detached, hesitant and rigid in performance • Operate best under ideal conditions, easily overwhelmed by uncertainty and ambiguity • Totally dependant on lecturers/tutors for correct performance. • Lacks deep understanding of theory behind practice	• Applies rules based on attributes and aspects of a situation • Demonstrates marginally acceptable performance • Begins to integrate knowledge gained from different disciplines • Marks beginning of gradual weaning of lecturer/tutor support	• Formulates and operates with a plan and at reasonable speed • Capable of carrying out tasks unsupervised • Adopts a holistic approach to patient care • Copes and manages most contingencies of practice
Educational Needs: • Acquisition of foundation knowledge and skills underlying practice (lectures and labs) • Orientation to professional practice • Constant extrinsic feedback to correct and fine-tune performance	***Educational Needs:*** • Mixture of learning experiences (seminars, projects, laboratory, clinical practice, etc.) • Small group tutorials • Must be encouraged to self-critique own work	***Educational Needs:*** • Emphasis on learner self-critique (intrinsic feedback) • Repetitive practice in varied realistic settings • Must assume increased control over own learning

Sources: ADEA Commission on Change (2006b); Benner (1984); Chambers (1993); Chambers and Glassman (1997); Dreyfus and Dreyfus (1986; 1980); Hendricson and Kleffner (1998).

Re-conceptualising the CIF and the NEC: A Framework for Analysis

In this section, the relationship between Bernstein's collection-integrated curriculum framework and the NEC are established by conceptualising professional education as a trajectory or a path (Chambers 1993) on which both tutors and students embark. On this journey there is differential allocation of power and control between tutors and students. At the beginning of the journey the tutors possess more power and control over the learning environment. However, as students progress along the trajectory, tutors must gradually cede control and, at the competent stage, total responsibility for learning must be transferred to students (Chambers 1993; Taleghani , Solomon and Wathen 2004). That is, the competent stage marks the point along the novice-expert continuum trajectory (NECT) where the "learner understands the foundations of his or her skills and has internalized appropriate professional values to work independently in normal settings" (Chambers, 1993, p. 792).

What Chambers and many others see as students moving from a state of dependence to one of independence during professional socialisation, in Bernstein's terms this indicates progressive weakening in classification and frame strength along the NEC trajectory as one moves from the novice to the competent stage. It indicates a "shift in the balance of power, in the pedagogical relationship between teacher and taught" (Bernstein 1977, p. 101). As students progress on the trajectory and become more 'expert' (Bruer 1993), the tutors' power and control over pedagogical encounters progressively diminish while the students' increase. The end of 'the first five years' (General Dental Council 1997) of undergraduate education, marks the transition from the protected shelter of the dental school to 'independent' professional practice.

Relationship between the CIF and the NEC

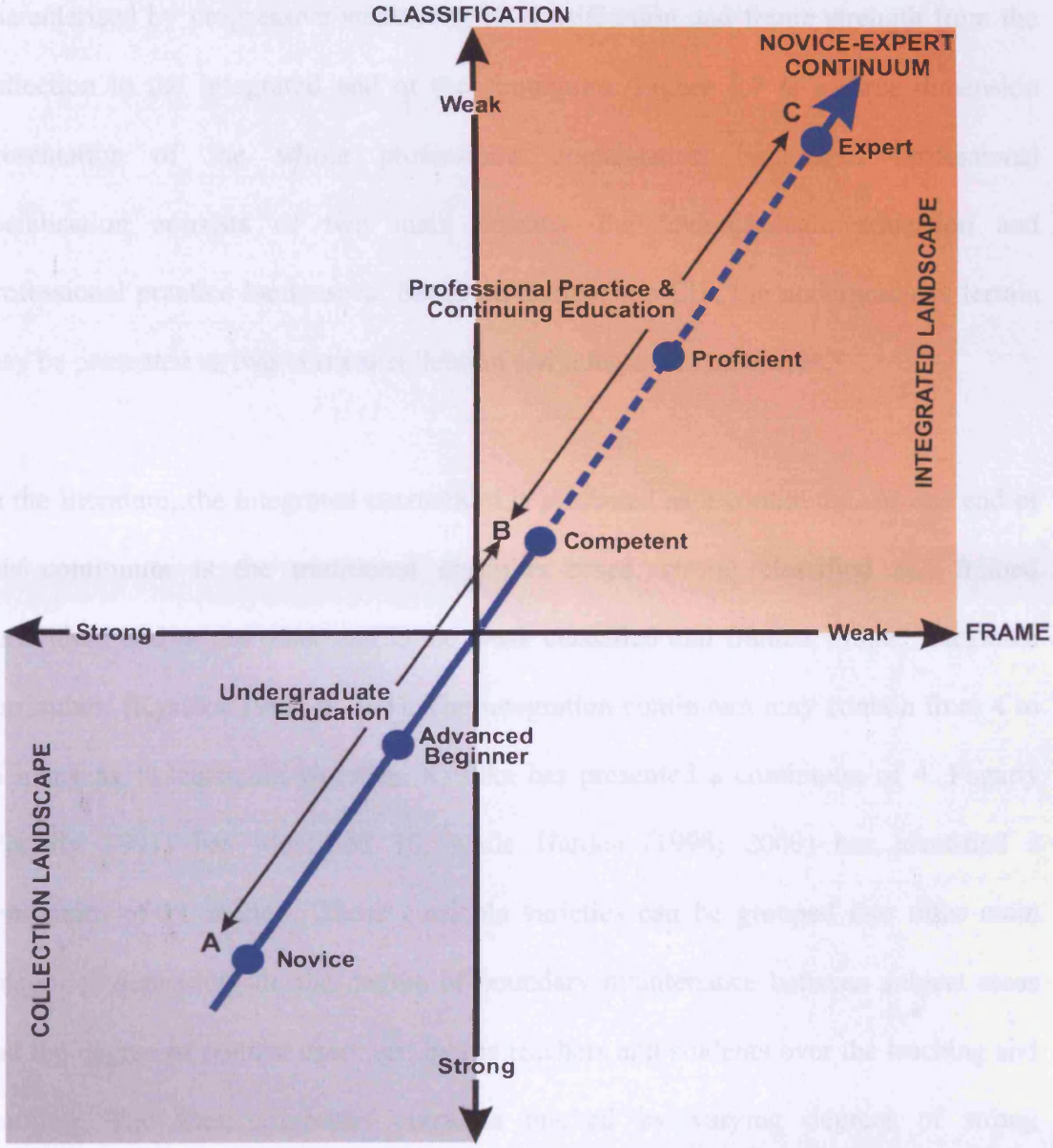
The relationship between the CIF and the NEC may be established by conceptualising the CIF as a landscape and the NEC as a trajectory. The path of the NECT can be traced by mapping the novice, advanced beginner and competent stages onto to the appropriate quadrant of the CIF. Novices are characterised by enthusiasm to learn (Hendricson and Kleffner 1998), lack of judgement, adherence to abstract rules when carrying out tasks (Dreyfus and Dreyfus 1986) and high dependence on their tutors in the acquisition of knowledge and in the performance of tasks. These characteristics are best supported in a strong classified and framed education environment. That is, the novice stage maps onto the strong classified and framed collection landscape.

The advanced beginner accumulates a repertoire of theoretical knowledge, exhibits marginal ability in the performance of clinical procedures (Chambers 1994; Chambers and Glassman 1997) and shows "intellectual engagement" (Fealy 2002, p. 563) with theoretical and procedural knowledge. This stage should mark the beginning of progressive transfer of power and control over learning from tutors to students (Hendricson and Kleffner 1998) and should mark the transition from the strong classified and framed to weak classified and framed landscape.

Students at the competent stage are characterised by "involved skilled behaviour" (Dreyfus and Dreyfus 1986, p. 35). They posses a modicum of judgement and professional values (Chambers and Glassman 1997) and adopt a holistic approach to problems and tasks. This stage marks the transition to independent professional practice. To facilitate this transition, students must be permitted greater control over their learning but without compromising the safety of patients. This stage of the NEC maps onto the weak classified and framed curriculum. If Bernstein's CIF is conceived

of as a landscape with four terrains, the NECT can be mapped onto this landscape as shown in figure 5.6.

Figure 5.6: The Relationship between the CIF and the NEC



The Collection-Integrated Framework is shown as two adjacent landscapes with a pin-point interface. The Novice-Expert continuum is shown as a trajectory through the two landscapes. The function of undergraduate education is to facilitate students' progression along the trajectory from novice (**A**) to the competent stage (**B**). From the competent stage onwards (**B** to **C**) the practitioner assumes full responsibility for her/his own continuing personal and professional development.

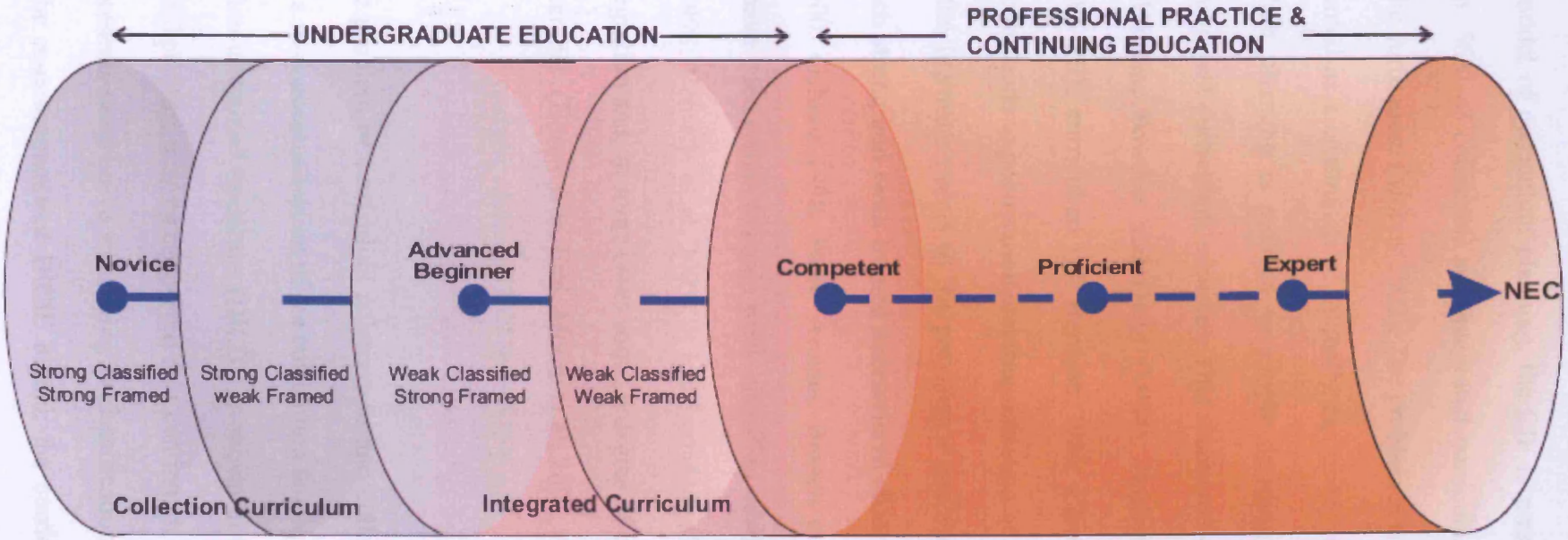
Note: From the novice to the competent stage the trajectory is shown as a solid line to show that this period of professional socialisation is fixed (usually 5 years). From the competent to the expert stage the trajectory is shown as a dashed line indicating that the length of time it takes to reach proficient and expert stages is variable and dependent on the individual practitioner.

Vertical Collection-Integrated Landscape

In the re-conceptualised CIF, the advanced beginner stage maps onto the strong classified-weak framed quadrant, which apparently lies outside the path of the NECT. This problem may be resolved by presenting the CIF not as quadrants, but as a continuum of vertical collection-integrated landscapes (VECIL). These landscapes are characterised by progressive weakening in classification and frame strength from the collection to the integrated end of the continuum. Figure 5.7 is a three dimension presentation of the whole professional socialisation landscape. Professional socialisation consists of two main terrains—the undergraduate education and professional practice landscapes. Based on Bernstein's CIF, the undergraduate terrain may be presented as two vertical collection and integrated landscapes.

In the literature, the integrated curriculum is presented as a continuum. At one end of this continuum is the traditional discipline-based, strong classified and framed curriculum and at the other end is the weak classified and framed, "total" integrated curriculum (Kysilka 1998, p. 204). The integration continuum may contain from 4 to as many as 11 curricula varieties. Kysilka has presented a continuum of 4. Fogarty (Fogarty 1991) has identified 10, while Harden (1998; 2000) has identified a continuum of 11 models. These curricula varieties can be grouped into three main categories depending on the degree of boundary maintenance between subject areas and the degree of control exercised by the teachers and students over the teaching and learning. The first comprises curricula marked by varying degrees of strong classification and framing. The middle group comprises curricula characterised by a varying mix of strong and weak classification and framing. The last consists of curricula with varying degrees of weak classification and framing.

Figure 5.7: Three-Dimension Presentation of Vertical Collection-Integrated Landscape



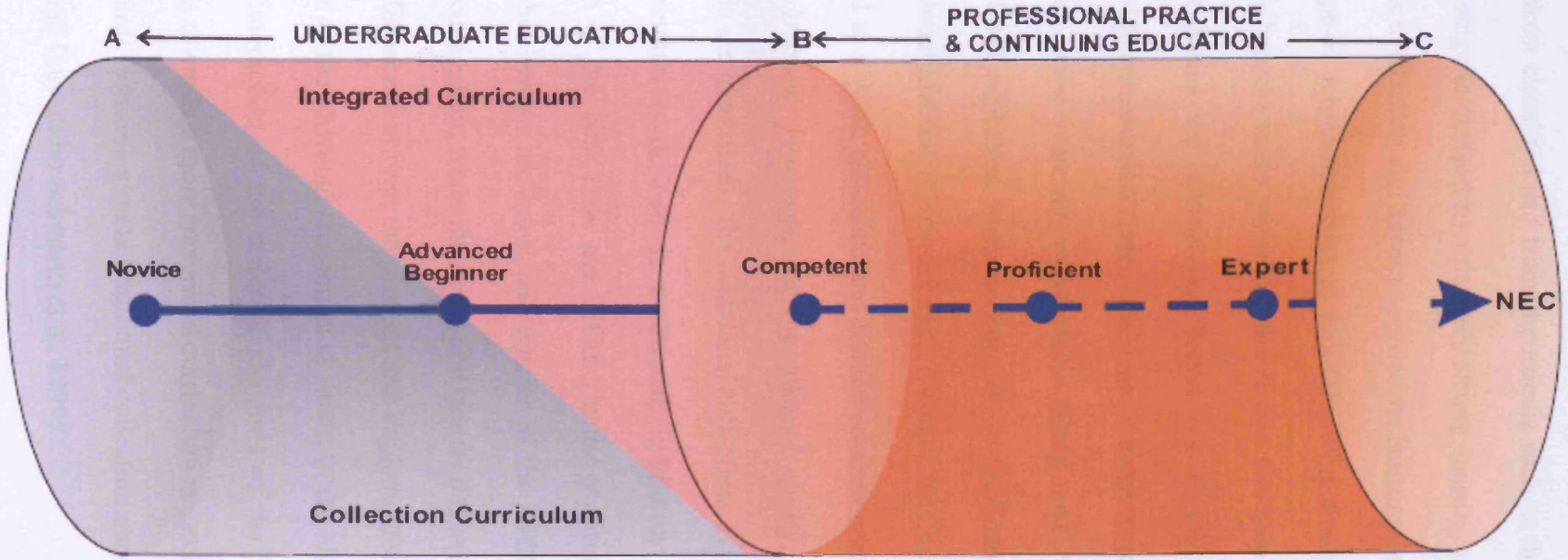
Bernstein's formulation of collection and integrated curriculum is presented as a continuum of four vertical landscapes. At one end of the continuum is the strong classified and framed collection curriculum and the other end is the weak classified and framed integrated curriculum. The novice-expert continuum (NEC) is presented as a trajectory through the undergraduate education and professional practice landscapes. The competent stage marks the transition from undergraduate education to professional practice. From this point onwards the newly qualified dentist is expected to assume responsibility for her/his own personal and professional development.

Diagonal Collection-Integrated Landscape

In the vertical model of curriculum planning, the CIF is presented as a "dichotomy" (Morais 2002, p. 568) of collection and integrated curricula. But this only leads to polarisation of the curriculum (Morais 2002). The problem is compounded further when the CIF is presented as a continuum of mutually exclusive vertical curricula, and the task of curriculum planning is reduced to simply deciding which segment on the continuum the proposed curriculum occupies. This seems to be implied by Harden and Davis (1998), Harden, Sowden and Dunn (1984), Harden (2000) and by many proponents of the PBL curriculum (cf. Barrows 1986; Charlin , Mann and Hansen 1998). But this only leads to polarisation and fragmentation of the curriculum. However evidence from the literature points to the prevalence and value of hybrid pedagogic practices in which strong and weak framed instructional strategies are employed (Doig and Werner 2000; Gehrke 1998; Patel, Arocha, Branch et al. 2004). In addition, although there have been trends towards weak classified curricula (Jippes and Majoor 2008; Kysilka 1998; Venville et al. 2003), it is acknowledged that not all subjects are amenable to integration and, in some cases some, a degree of curriculum differentiation may even be desirable (Hargreaves, Earl, Moore et al. 2001; Patel, Buck, Dornan et al. 2002).

To minimise the problem of curriculum polarisation into collection and integrated, the starting point is a re-conceptualisation of the curriculum landscape from the VECIL to a diagonal collection-integrated landscape (DICIL) as shown in Figure 5.8. In the DICIL, the diagonal interface (AE) may be conceived as a continuum. Moving up the diagonal from E to A represents progressive weakening in classification and frame strength, and vice versa. In the re-conceptualised DICIL model, the curriculum is defined by the location of the NECT on the landscape.

Figure 5.8: Three Dimension Presentation of a Diagonal Collection-Integrated Landscape



The collection and integrated curricula are presented as two diagonal landscapes. In this model, the novice-expert continuum (NEC) trajectory lying within the lower one quarter (1/4) of the diagonal collection-integrated landscape (DICIL) represents a strong classified and framed traditional curriculum, while the trajectory located within the upper one quarter (1/4) of the DICIL represents a weak classified and framed integrated curriculum. A trajectory located within the middle half of the DICIL represents a hybrid curriculum. In this model, changes in classification and frame strength occur on two continua: along the DICIL and the NEC.

The DICIL raises a number of practical and analytical implications:

1. From a practical point of view, all curricula may be considered as hybrid. Even in the weakest classified and framed curricula such as the problem-based learning, the novice stage is marked by relatively strong framing and this may involve assisting students to identify and access appropriate learning resources (Charlin et al. 1998). This type of help is necessary to avoid throwing students at the deep end. But as the students become more mature academically, this help becomes unnecessary. Strong framing during the novice stage serves two functions. It lays the foundation for knowledge construction (Bratt 2003) and it helps to accommodate differences in the students' prior learning experiences (Doig and Werner 2000). Similarly, in professional education such as dentistry, to facilitate the transition to independent professional practice (General Dental Council 2002), it is inevitable that students are exposed to a weak classified and framed education environment towards the end of the programme. However, for the sake of clarity, in this study three types of curricula are identified—the traditional collection, hybrid and integrated curricula.
2. A curriculum is defined as traditional, hybrid or integrated depending on the location of the NECT on the DICIL. In the traditional collection curriculum the NECT lies within the lower one quarter of the DICIL. The middle half defines a hybrid curriculum, while the upper one quarter defines an integrated curriculum.
3. The differences between the planned and implemented curriculum may be explained in terms of the 'drifting' (Robins et al. 2000) of the NECT on the DICIL. As a result of the interaction of the different elements of the TESE, the NECT may drift upwards towards a more integrated curriculum or, as is mostly likely to be the case, downwards towards a more traditional collection curriculum (cf. Miller et al. 2000; Porter and Carr 1999; Schwartz et al. 1999).

4. The proposed analytical model shows continuity between undergraduate education and professional practice. This underscores the fact that undergraduate education is only the first phase on a continuum of life-long professional socialisation (General Dental Council 1997, 2002).

Based on the re-conceptualised DICIL, decisions about the curriculum type are essentially decisions about the location of the NECT on the DICIL. These should in turn be informed by a careful analysis of the immediate and long term impact of the various elements of the TESE. One of the tasks in curriculum planning should therefore be a systematic identification and critical evaluation of all the relevant elements of the TESE and their implications on the type of curriculum chosen. Glenn (2001, p. 339) has argued that the study of the curriculum should go hand in hand with the study of the "environments that comprise, or that are linked with, the curriculum".

In this chapter a theoretical framework for analysing dental curriculum has been presented. In the next chapter, Bernstein's concepts of collection and integrated curriculum are applied to analyse the rationale for restructuring the undergraduate dental curriculum at the WDS. The educational and social implications of collection and integrated curriculum are also explored.

Chapter 6

From Collection to Integrated Curriculum: the rationale for curriculum restructuring at the Welsh Dental School

Introduction

> The concept of relatively weak boundary maintenance which is the core principle of integrated codes is realized both in the structuring of educational knowledge and in the organization of the social relationships (Bernstein 1977, p. 61).

The two major changes in the Welsh Dental School (WDS) 2001 restructured curriculum are a paradigm shift from the traditional collection to an integrated curriculum and the transfer of the management and delivery of the curriculum from department heads to theme leaders. In the curriculum framework document, the aim for restructuring is stated as follows; "The traditional, department-based model of curriculum delivery is to be restructured to provide a topic-led integrated curriculum" (UWCM. Dental School 2001, par. 2.4.1). The move to the theme-based integrated curriculum was seen by many participants as an innovative and practical approach to the management and delivery of undergraduate dental knowledge.

To justify and make sense of the paradigm shift from the traditional collection to an integrated curriculum, participants extensively deployed contrastive rhetoric (Hargreaves 1981). They pointed to fundamental differences in the structuring of knowledge and the social relationships realised under the collection and integrated curricula. This is illustrated in the following interview excerpt with Professor Jackson Gerard (JG), the Foundation Theme leader:

AK: What would you say was the main thrust for restructuring the curriculum? Were you addressing some deficiencies in the old curriculum?

JG: No, no! It was really to start from the scratch. I mean, we could decide on anything. [...] *We obviously wanted* to be more integrated. *We wanted* divisions between subjects blurred. *We wanted* a new management structure. We saw that the idea of departments controlling the curriculum was not a desirable one. What *we needed* was a more generalistic one. *We wanted* a new range of assessments put into place. *We wanted* competency statements put in. *We wanted* all kinds of... obviously *we wanted* early clinical exposure whereas before there has been a divide—a traditional divide between pre-clinical and clinical.

AK: And in terms of how things are shaping up, how much are you achieving your original intentions? What has been achieved so far?

JG: We have only had three years going through this programme. And, as far as we are concerned, on the basic sciences side, all the objectives have been achieved. *We got rid* of departmental barriers. *Students no longer* have anatomy, physiology and biochemistry. They have a complete... what we call 'foundation theme' course which is fully integrated. Twenty-five percent of the content has been cut out. The examination process has been integrated, and completely changed. We have early clinical exposure, so every Friday the students are involved in clinical work. So, I think, that has proved very successful. It's popular among the staff and it is popular among the students (Interview excerpt with Gerard, Foundation Theme Leader, Cardiff University. 27/01/2004).

Gerard singles out 'integration' among the key features of the restructured curriculum at the WDS. Like most participants, he justifies the paradigm shift from collection to the integrated curriculum by deploying the contrastive rhetoric (Hargreaves 1981). He achieves this by portraying the features of the restructured curriculum as absolutely

essential. This is emphasised by the repeated use of the phrases *'we wanted'* and *'we needed'*, shown in italics in the second paragraph of the excerpt. This is in sharp contrast to the phrases *'we got rid of'* and *'students no longer'* which are used in reference to the eliminated features of the traditional curriculum such as departmental control of the curriculum. In addition, features of the new curriculum such as the blurring of boundaries between subject areas and the introduction of early clinical contact are all cast in very positive light and their popularity among lectures and students is emphasised. For example, Gerard sums up the impact of early clinical contact as very successful, "It's popular among the staff and it is popular among the students."

The WDS is not alone in its celebration of the integrated curriculum. Integration is a recurring theme in dental education (Boyd 1988; Snyman and Kroon 2005) and other professional fields including medicine (Bernier et al. 2000; Saffran 1973), engineering (DiBiasio et al. 1999), accountancy (Porter and Carr 1999) and education (Arredondo and Rucinski 1998; Sturman 1994). In the UK, the regulatory body on dental education—the GDC—does not seem to privilege one curriculum model over another. Instead it has left it to the individual dental schools to decide what was best for their students. However, the GDC advises schools that opt for modular curricula to ensure that the different components of the course are integrated and to blur the traditional boundaries between pre-clinical and clinical components of the curriculum:

> "The dental programme has three main components, which may be taught sequentially or concurrently in an integrated or modular arrangement. In the latter arrangements, co-ordination of subjects and subject areas within the curriculum should be ensured. Integration of scientific, applied scientific and clinical elements throughout the whole five years, rather than polarisation of

> pre-clinical and clinical aspects, is encouraged" (General Dental Council 2002, par. 26)

At the regional level, the European Union's recommendations on dental education have come out in full support of integrated curricula, arguing that traditional curricula are outmoded and incapable of meeting the educational needs of students in the contemporary knowledge society;

> "It is becoming evident that traditional curricula and traditional methodologies of teaching, e.g. those based upon lectures and acquisition of knowledge by rote, are not efficient in the fostering of learning habits that instil a culture of selfdirected learning, which is so necessary in the current knowledge society. The solution to this problem is the introduction of flexibility in curricular models and the need to integrate basic, medical and dental sciences both vertically and horizontally" (Plasschaert et al. 2006, p. 125).

Plasschaert, et al. (2006) deploy a contrastive rhetoric to portray the 'traditional' curriculum as directly responsible for the failure to develop self-directed learning skills in students. At the same time they implicitly portray the integrated curriculum as efficient in fostering learning habits that are compatible with the demands of the knowledge society.

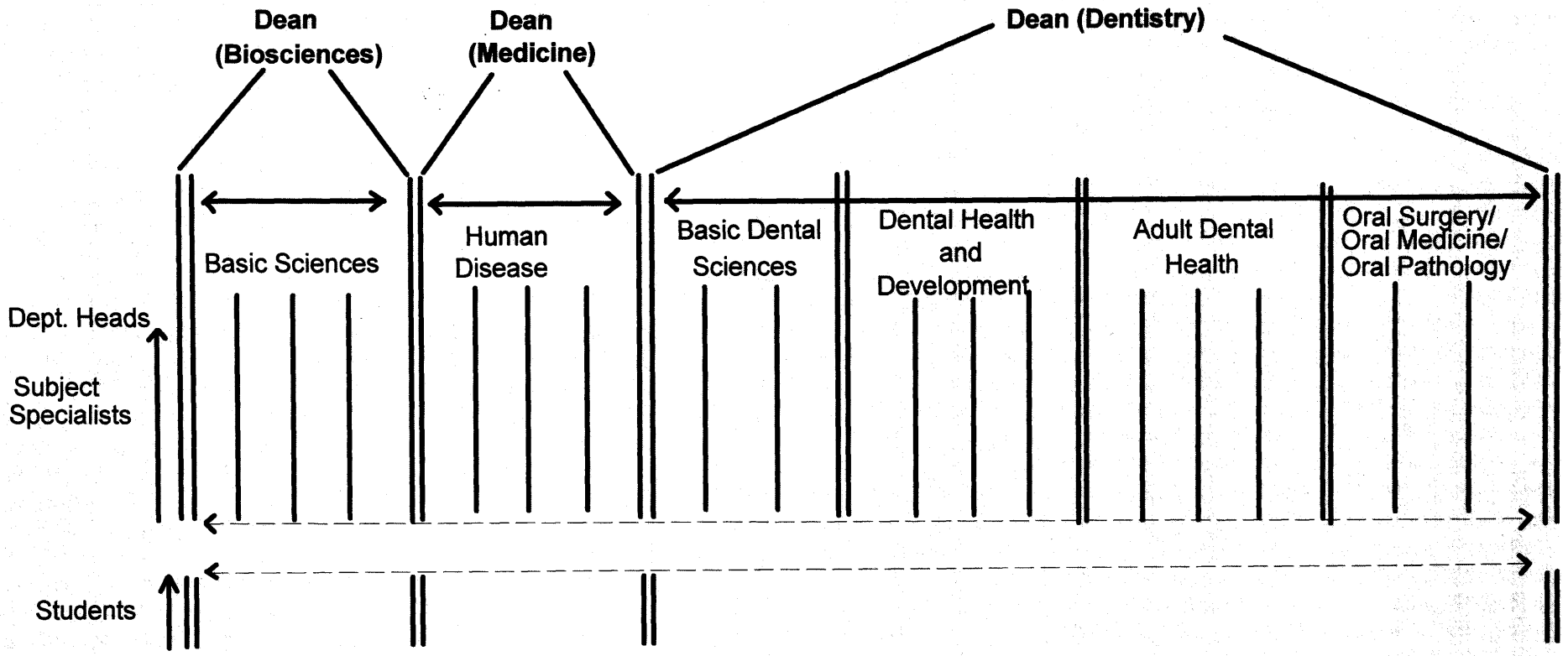
Structure of Knowledge under a Traditional Dental Curriculum

The General Dental Council (2002) categorises the dental curriculum into three main divisions—preclinical basic sciences; clinical medical sciences (human disease) and clinical dental sciences. Under the traditional curriculum, these three components were delivered in a hierarchical order starting with basic sciences followed by human disease and clinical dentistry. Bernstein (1977, p. 103) pointed out that, "Where knowledge is regulated through a collection code, knowledge is organized and distributed through a

series of well insulated subject hierarchies." At the WDS, the three components of the dental curriculum were delivered under three different schools—the Schools of Biosciences, Medicine and Dentistry respectively, thus leading to what may be described as symbolic and physical isolation between the three areas of the curriculum.

At the WDS, under the traditional curriculum, clinical dentistry was further segmented into basic dental sciences, preclinical laboratory-based skills training and clinical practice. Preclinical basic sciences were organised and delivered in the first year by the Departments of Anatomy, Physiology and Biochemistry. The human disease component was conjointly delivered by the disciplines of general pathology, microbiology, pharmacology and therapeutics, general medicine and surgery. Clinical dentistry was organised under four divisions: Basic Dental Sciences; Dental Health and Development (DHD); Adult Dental Health (ADH); and Oral Surgery, Oral Medicine and Oral Pathology (OSMP). Apart from the Department of Basic Sciences, all the departments under clinical dentistry were multi-discipline, meaning that each department was made up of two or more disciplines and sub-disciplines of dentistry. The division of DHD, for example, comprised paediatric dentistry, orthodontics, preventive dentistry and behavioural sciences. The structural organisation of the three major components of the dental curriculum is presented in Figure 6.1. The collection curriculum was characterised by segmentation into several strong classified and framed subject areas. The planning and delivery of the curriculum was controlled by department and subject heads and there was little or no coordination between the different departments.

Figure 6.1: Structural Organisation of Knowledge under a Traditional Collection Dental Curriculum



Key

Double continuous line represents strong boundaries between schools/disciplines

Single continuous line represents strong boundaries between subject areas

Continuous arrow represents direction of strong relatioship

Dotted line arrows represents direction of weak relationships

In the literature on curriculum innovations, including integrated curriculum, two interpretative repertoires—the pragmatistic and abstractionist repertoires—are commonly deployed. However, as noted in chapter 4, in their discussion of curriculum change, participants at the WDS and the GDC placed more credence on the pragmatistic to almost the exclusion of the abstractionist repertoire. They extensively drew on their personal experiences as former students and as lecturers, rather than on education principles, to make sense of and to justify the paradigm shift from a collection to an integrated curriculum. This is similar to the finding of Hargreaves, Earl, Moore et al. (1984) about the staffroom accounts of teachers during curriculum planning meetings.

In their accounts, the WDS participants extensively made use of the contrastive rhetoric (Hargreaves 1981) to highlight differences in the structuring of knowledge and in the social relationships between the two curricula. They justified their claims by drawing on their experiences as former dental students and as lecturers.

When asked what he found fundamentally different between the old and the restructured curriculum, Joseph Smith, a subject head and former graduate of the WDS, turned to his experience as an undergraduate dental student to underline some deficiencies with the traditional dental curriculum:

> When I was a student here I spent the first year in the University I never, ever came to this building [Dental School]. I learnt anatomy, physiology and biochemistry and, apart from the obvious big points that you needed to know about physiology and anatomy to talk to people, it was never really applied or emphasised why we were doing it. So when I came here in my first clinical year, which was my second year in the University, I had no idea about this building, no idea about how it worked, what was what. I had very little...I mean I personally had no knowledge of dentistry because I had no personal experience of it and no dentist in the family. So it was a big shock. Then I did a

> phantom head course, a pre-clinical course, which was all of restorative dentistry in a year. At the end of that year we started to see patients, but it was impossible to apply what we did in phantom head pre-clinical practice skills laboratory to the real world. We just had no experience of it. As I said, you can see the students now they have been here in year one, just the fact that they are more relaxed about being here in year two makes a huge difference! (Joseph Smith, Subject head, WDS. 19/07/2004).

Smith's lament highlights three problems commonly associated with collection curricula: the polarisation of the curriculum into pre-clinical and clinical; the lack of contact with the dental school during the first year; and the lack of correlation between pre-clinical dental sciences and clinical practice. Smith argues that as a student the interrelationship between the different strands of the curriculum were not clear. This resulted in lack of appreciation of the value of pre-clinical subjects such behavioural and basic sciences to clinical dentistry. He sums this up in the words, "...it was never really applied or emphasised why we were doing it." He also points to the difficulties experienced during the clinical component of the programme as a result of the large time lag between the transmission of the pre-clinical laboratory technical skills and the clinical application of these skills on patients. The problems highlighted by Smith arise from the structuring and sequencing of the content of the curriculum.

The undergraduate dental curriculum can be divided into three main knowledge areas: theoretical knowledge, psychomotor skills and clinical practice. Under the traditional curriculum, these three knowledge areas are hierarchically structured. Students are first socialised in the lecture- and seminar-based theoretical knowledge, followed by the laboratory-based psychomotor skills training. This is finally followed by clinical practice in a tertiary care environment of the university dental hospital. The underlying logic of 'frontloading' students with cognitive and procedural knowledge before

exposing them to clinical practice was that, having acquired requisite knowledge and technical skills, students would be ready to carry out clinical procedures on patients. But, as Boshuizen (2003; 2004) argues, the transition from pre-clinical to clinical is not smooth because the demands on students of the two environments are different.

When asked what his exact role was in the restructuring curriculum, Ian Carr, the head of behavioural sciences, responded with a personal narrative in which he highlighted some of the challenges he faced under the old curriculum. He noted particularly two problems associated with the structural organisation of the content of the curriculum:

> Previously when I came here, behavioural sciences were taught in one ten-week block in third BDS. [...] ... they used to have ten weeks with me at the beginning of that year up to around Christmas time. All the behavioural sciences was taught then. I returned and did a little tiny bit in fifth BDS. The problem with that was it was too concentrated and it was too early because they hadn't really had any clinical contact at that point. So they were sitting in a lecture theatre and in seminar rooms with me for ten weeks talking about the importance of communication skills and the importance of motivating people properly and they really didn't have any sense of it. So one of the big problems was that it was too early and it wasn't applied enough for them because they didn't have very much patient experience at that point (Interview excerpt with Ian Carr, head of behavioural sciences, WDS. 16/07/2004).

Carr implicitly refers to work overload in the old curriculum when he points out that 'all the behavioural sciences' were taught in a single block over a period of ten weeks at the beginning of the second year. He uses the metaphor 'concentrated' to draw attention to the volume of work that had to be covered within ten weeks. Carr then turns his attention to the problem of frontloading students with all the theoretical knowledge before they had come in contact with patients. He sees one of the consequences of this to be the failure to sufficiently embed theory into the clinical context (Boshuizen 2004).

He takes as an example the teaching of communication skills. He points out that in the old curriculum, because students were taught about the management of anxious and phobic patients before they had come in contact with any patient at all, they did not fully appreciate the worth of this knowledge. He emphasises this point by observing that, "It just wouldn't help them because those things came later on."

The problems of work overload and the failure to embed theory into clinical practice were compounded further by the lack of coordination among lecturers resulting in the transmission of theoretical and procedural knowledge that was characterised by what Saffran (1973, p. 50) described as a "patch quilt of unrelated topics that strain the ability of the student to learn and to bring together." Saffran (1973) and Cooke (1993) both noted that narrowing the gap between knowledge acquisition and its application in the clinical context helps to embed theory into practice and this facilitates retention.

The Theme-Based Integrated Curriculum

Two key features of the newly restructured curriculum are the elimination of departments in the planning, management and delivery of the curriculum and the introduction of an integrated approach in the transmission of knowledge. Five Themes were created and used as "tools to assist with the management of the curriculum" (Undergraduate Working Party 1999, p. 2). These are the foundation, oral eco-system (OES), human disease (HD), dentistry in the wider community (DIWC) and clinical dentistry (CD). The rationale behind the move to a theme-based integrated curriculum was summed up by James MacDonald, the chairman of the curriculum management group (CMG), as follows;

> The reason why we chose to have a theme-based curriculum rather than a departmentally led one was primarily to assist with integration, because we

> wanted an integrated course. Integration is very, very difficult if it is done in a departmentally led building. The idea was that themes would cut across those boundaries. For example, the foundation theme cuts across the anatomy department, the physiology department, the biochemistry department. And so you get basic science being integrated. The oral ecosystem theme gave us the opportunity to move things away from where they had traditionally been into somewhere a little bit more sensible. The example I am thinking there is dental materials that had traditionally been linked to the basic dental science department. We felt that it was much more appropriate in clinical dentistry to make the practical application of that stuff easy. So we wanted to move that out from the basic dental science umbrella, which was really the basis for oral eco-systems. Human diseases replaced medicine, surgery, pharmacology and pathology and bacteriology. That was again a bringing together in integration of what had been two separate examinations into one. Clinical dentistry then cuts across all the clinical departments: adult dental health, child dental health, oral surgery, oral medicine and pathology. Those are now all under clinical dentistry theme. And then dentistry in the wider community is to do with epidemiology, prevention, behavioural sciences and it sort of crosses into the clinical side with things like the family study, [...] (Interview excerpt with James MacDonald, WDS. 09/09/2004).

The main reason for transferring the management of the new curriculum from departments to themes was in order to achieve integration (Undergraduate Working Party 1999). According to McDonald, the elimination of departmental control in the management of the new curriculum was aimed at minimising resistance to change which arises from strong disciplinary loyalties. He emphasises that integration is impossible to achieve if the management of the curriculum is left in the hands of heads of departments. He points out that themes were established in order to blur disciplinary boundaries; "The idea was that themes would cut across boundaries."

In an integrated curriculum, spatial and temporal disciplinary boundaries, characteristic of the traditional collection curriculum, are blurred. The blurring of temporal boundaries

means that although year one is predominantly a 'Foundation Theme' year, basic science topics appear in the second year and some select topics are transmitted in the third and fourth years. Similarly, topics from other Themes, including OES, CD, DIWC, and a course in Information Technology, the European Computer Driving Licence (ECDL), have been allotted curricular time in year one. For distribution of subjects over the five year dental programme see UWCM Dental School (2001b; 2004) and course handbooks (e.g. see, UWCM and Cardiff University 2003; UWCM Dental School 2003). It is also worth noting that apart from transferring the responsibility for the management of the curriculum from departments to theme leaders, the theme-based structure minimally disrupts the traditional disciplinary boundaries. As will be discussed later, this may be seen as a strategy to minimise barriers to integration arising from strong disciplinary loyalties.

Features of the Integrated Curriculum

There are two forms of integration: vertical and horizontal (Plasschaert et al. 2006; Snyman and Kroon 2005; Watad and Ospina 1999). Snyman and Kroon (2005, p. 26) define vertical integration as the integration of "basic knowledge and skills, such as biology, in the clinical context." That is, in vertical integration, the pre-clinical theoretical and procedural knowledge are 'subordinated' to clinical practice (Boyd 1988; Camara 1988). Horizontal integration is defined as the "integration of knowledge and skills between the clinical subjects" with the aim of achieving "comprehensive and holistic approach to patient care" (Snyman and Kroon 2005, p. 26). Although Snyman and Kroon are concerned with clinical dentistry, these definitions can be applied equally well to non-clinical subjects.

Vertical Integration

As noted earlier, in a traditional curriculum knowledge is hierarchically structured with the transmission of theoretical and procedural knowledge preceding clinical practice. There is usually a large time lag between the transmission of knowledge and its application in clinical practice. In vertical integration this gap is narrowed by blurring the temporal boundary between cognitive knowledge, laboratory-based technical skills training and clinical practice. Metaphorically speaking, vertical integration involves 'stretching forward' the pre-clinical theory and laboratory-based courses into the traditional clinical-years (years 3-5), and 'stretching back' clinical courses into the traditional pre-clinical years.

At the WDS, the blurring of temporal boundaries between the pre-clinical and clinical components of the curriculum has been achieved by introducing early clinical contact and by spreading out pre-clinical topics into clinical years (Undergraduate Working Party 1999; UWCM Dental School 2001b). The first year dental students attend clinics to observe the delivery of care, carry out projects based on clinical dentistry topics and receive some introductory lessons in clinical dentistry.

Early Clinical Contact

One of the perceived social benefits of early clinical contact is the development of professional identity among first year dental student at a relatively early stage in their professional socialisation. Richard Mason, a member of the CMG, described the advantage of early clinical contact simply in terms of the students' having "a sense of the clinics". He explained that;

> [...] I said to you that we wanted students to get clinical exposure at an earlier stage. So what we did there was to ensure that students actually came up here [Dental School] in their first year, which traditionally was spent completely down the road [School of Bioscience] with very little contact at all up here. So the students now come up here on Friday afternoons of their first year to observe what happens in the clinic—not to do anything other than to actually see the interaction between the dentists or dental students and patients, and to get a sense of the clinics and how they are operated (Interview excerpt with Richard Mason, member of the CMG, WDS. 12/02/2004).

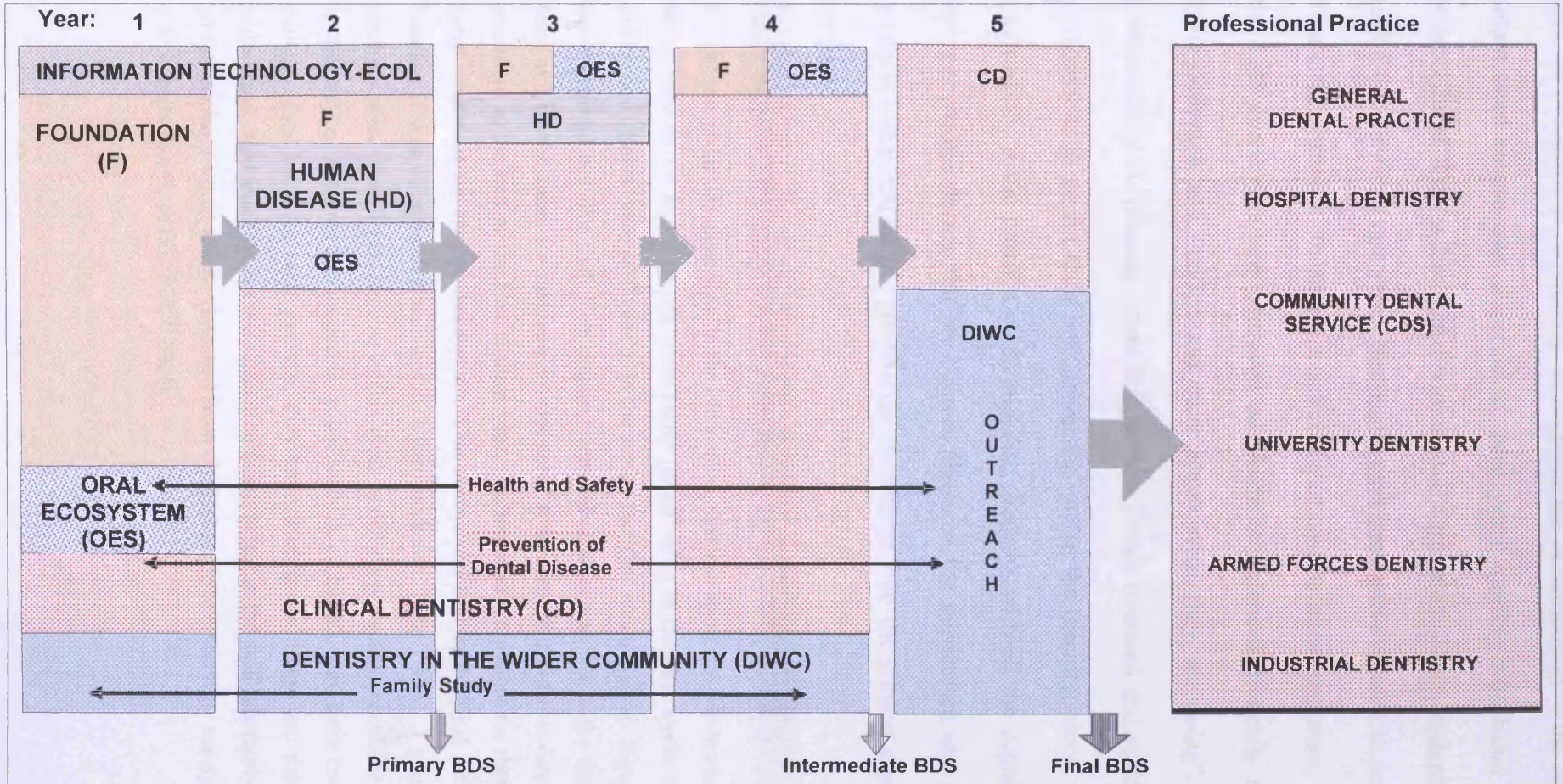
The importance of identifying with the profession during the early stages of the student's professional socialisation has been acknowledged by others. In the engineering curriculum, DiBiasio et al. (1999) observe that first year students who had early exposure to chemical engineering, through participation in a project, were more motivated and readily identified with the profession. In medicine, Martinez-Alvarez et al. (2001) have argued that early clinical contact facilitates the development of professional identity. In addition, early clinical contact may be helpful in making concrete decisions about career choice, especially for students for whom dentistry may not have been their first choice. This is particularly helpful at dental schools such those in France where the first year is common for medical, dental and nursing students and admission into the dental schools is dependent on performance in the highly competitive first year examinations (see, Roger-Leroi 2006). The other educational benefit attributed to early clinical contact is the facilitation of transfer of learning between theory and clinical practice (Chambers and Geissberger 1997). In his evaluation of an integrated pre-clinical course in basic clinical skills teaching in primary care settings, Hampshire (1998) reports that half of the participating students claimed that early clinical exposure motivated and helped them to develop a better understanding of basic medical sciences.

Within the Clinical Dentistry theme, the preclinical restorative phantom courses covering topics in endodontics and prosthodontics, which in the traditional curriculum were delivered in one block in the second year of the dental programme, are now vertically integrated over a three-year period. Other examples of vertical integration include the preventive dentistry course under the DIWC theme and health and safety. Figure 6.2 presents vertical integration of the five themes over the five-year undergraduate dental programme. Apart from information technology which is transmitted during the first and second years and Human Disease, which has remained relatively unchanged and is covered during the second and third years, topics in the remaining themes have been spread out at least over a period of four years. Topics in two themes: Clinical Dentistry and DIWC are distributed throughout the five-year undergraduate dental programme. Two topics—Health and Safety and Prevention of Dental Disease—are vertically integrated and thread through each of the five Themes (see, UWCM Dental School 2003).

Joseph Smith described the specific steps taken to achieve integration in the pre-clinical restorative dentistry course as follows;

> [...]. We stretched, if you like, our previous pre-clinical course, which previously used to be the whole of first year in the dental school. For instance, in restorative dentistry, they learnt all the restorative dentistry in a year. Now we don't do that. Now they do less in the year. For instance, in endodontics, I now teach root-canal treatment to a group of students who are far more experienced clinically and pre-clinically and they make so much better candidates. They understand more about what they are doing. In the previous course, we taught endodontics in summer. Everyone passed. They were fed up and all they wanted was to go for their holidays. They hadn't even met a patient at that point. They couldn't apply it at all. That side has been a huge success! (Joseph Smith, subject head, Clinical Dentistry, 19/07/2004).

Figure 6.2: Theme-Based Integrated Dental Curriculum showing Vertical Integration of Themes



In the vertically integrated dental curriculum, topics are presented with increasing complexity throughout the curriculum, with later topics building on earlier ones. Note that Clinical Dentistry topics are presented throughout the curriculum with clinical contact commencing in year one. Similarly, although the Foundation (F) Theme is a predominantly a first year Theme, some topics are presented in the second, third and fourth years.

Smith uses the metaphor of 'stretching' to illustrate the redistribution of the content of the phantom head course over a period of three years, starting with basic to more complex procedures. This is contrasted with the old curriculum where students "learnt all the restorative dentistry in a year". Smith also uses contrastive rhetoric to portray the old curriculum negatively. In apparent reference to early clinical exposure, students under the new curriculum are portrayed as "more experienced clinically and pre-clinically"; motivated and "understand more about what they are doing". This is contrast with the old curriculum where he insinuates work overload and students who were more anxious to go for their holidays at the end of the teaching block. Smith is also concerned about the practice of frontloading students with all the cognitive and procedural knowledge during the pre-clinical phase of the curriculum and resultant failure to sufficiently embed the pre-clinical knowledge into the clinical context. He points out that;

> [...] at one point the ideas was, in the old course, that you spent the whole year doing pre-clinical and then you were ready for anything in the first weeks of the second clinical year ((3rd year)). In the actual fact that was nonsense. It just never worked out like that. You couldn't remember what you did in the first term and by the time, for instance, in root-canal treatment, you did root-canal treatment at the end of the first clinical year, you never saw a patient for root-canal treatment for two or three years. You always did that in the final year because it was complicated and it didn't just work out. Now I see ...I meet students who, when I say, 'access to this tooth is difficulty because cheeks are in the way or because the tongue is going to be a problem', they have met patients, they have sat with patients, they have tried to do things and they understand. And that focuses their attention much better in the skill laboratory, which can be, I think, too far detached from clinical practice (Interview excerpt with Joseph Smith, WDS. 19/07/2004).

Smith describes it as a fallacy the underlying assumption in the old curriculum that once students had been taught all the requisite knowledge and skills during the pre-clinical phase, they would readily draw on this stoke of knowledge during the clinical phase. He dismisses this as a myth, "In the actual fact, that was nonsense". He substantiates his argument with an example of the teaching of root canal treatment (RCT) in the endodontics course. In the old curriculum, the laboratory skills training in RCT was done towards the end of the second year. But it was not until towards the end of the fourth year when students were finally allowed to practice RCT on patients, "because it was complicated and it didn't just work out". Smith re-emphasises the value of early clinical contact when he talks of teaching students who are more knowledgeable about the clinical implications of such anatomical structures as the cheeks and the tongue; "They have sat with patients, they have tried to do things and they understand." He concludes by emphasising that because of early clinical exposure, the students are more focused in the skills laboratory.

The large time lag between knowledge transmission and its application in the clinic was of concern not only in endodontics but in other disciplines of dentistry. Bertha Fraser, a senior lecturer in prosthodontics, saw the benefits of narrowing the gap between knowledge acquisition and its clinical application to lie in aiding recall. She argues that in the traditional curriculum because of large time lag between knowledge transmission and its clinical application, students experienced some difficulties to recall what they had learnt earlier in the course;

> [...]we have removed this area of teaching [phantom head course in prosthodontics] from earlier on in the course and trying to teach so that the students learn the knowledge-base and the clinical skills in our phantom head facility and then very quickly move that into the clinical environment under

> close supervision. I think the idea is right. It hasn't all gone according to plan but there has been continuity there and the teaching has given quite detailed amount of information on the subject. Previously, it was part of a much larger course that was run fairly early on and there was a large gap before students used that knowledge in clinical skill. Before, by the time they actually used the knowledge clinically they had forgotten what to do and they had to re-learn. So we are trying to bring it all together and structure it in a different way so that we are collaborating with colleagues who previously we wouldn't have collaborated with on this phantom teaching. So that has been very positive (Interview excerpt with Bertha Fraser, WDS. 21/07/2004).

Fraser alludes to the importance of blurring the temporal boundary between the pre-clinical knowledge acquisition and its application in clinical practice. She talks of moving the teaching of the phantom head prosthodontics course so that once the students have acquired the knowledge and technical skills in the laboratory, they immediately apply that knowledge in the "clinical environment". Like Smith and other participants, she uses the contrastive rhetoric to cast the restructured curriculum in positive light. She also points to the large time lag between the transmission of pre-clinical knowledge and its application in the clinic. Accord to Fraser, by the time students were called upon to use this knowledge clinically, "they had forgotten what to do and had to re-learn". Fraser then goes on to talk about collaboration with colleagues in the new curriculum, a prerequisite to achieving horizontal integration.

Both Smith and Fraser referred to the pre-clinical courses that were taught very early in the programme and the problem of failure to sufficiently embed theory into the clinical context. Gideon Pinnacle on the other hand, talked about a preventive dentistry course that was delivered towards the end of the undergraduate programme:

AK: What would you say is different between the old and the new curriculum?

GP: Speaking from my own area, I guess it is not vastly different. What we have done though, we changed the ordering quite a lot. For example, prevention, which I think is a very fundamental thing in dental curriculum, it was actually coming in too late in the curriculum. It has definitely been moved to try and get that in early and to try and get that going (Interview excerpt with Gideon Pinnacle, WDS. 16/07/2004).

According to Pinnacle, leaving the teaching of preventive dentistry until towards the end of the undergraduate programme diminished the importance attached to this subject by students. He talks of the prevention course coming "too late in the curriculum". To try and elevate the value of this course, in the new curriculum it has been spread out in order to 'get it in early' and to 'get it going'.

Vertical integration focuses on blurring of temporal boundaries between knowledge areas. This is achieved by sequencing the content of the curriculum from basic to more complex procedures as pointed out by Smith in the endodontics phantom course. Blurring of temporal boundaries between pre-clinical basic biomedical and dental sciences and clinical dentistry facilitates transfer of learning by embedding theory and technical skills training into clinical practice (Boyd 1988; Chambers and Glassman 1997). It also reduces the workload by spreading out the content of curriculum thereby creating opportunities for students to reflect on and assimilate what they learn. It can be argued that vertical integration facilitates seamless weaving (Miller et al. 2000) of theoretical knowledge, procedural knowledge and clinical practice. This facilitates the embedding of pre-clinical knowledge into clinical practice (Cooke 1993; Tabari Khomeiran, Yekta, Kiger et al. 2006).

Placing more complex procedures, such as RCT, later in the programme when students have developed some manual dexterity and are better grounded in theoretical knowledge, creates a learning environment "consistent with the student's skill level" (Hendricson and Kleffner 1998, p. 184). A staged approach in the delivery knowledge is consistent with the principles underlying the novice-expert continuum. During the early stages of their professional socialisation, students acquire basic knowledge and skills (Chambers 1993; Chambers 1996; Conny 1994) which then serve as the foundation for more advanced learning. In endodontics, deferring the technical skill training in RCT until later, allowed student to develop the necessary manual dexterity and to build confidence in carrying out this complex procedure. This makes the acquisition of complex skills less laborious.

The achievement of vertical integration involves the restructuring of the content of the curriculum. It specifically involves spreading out the content of the curriculum, sequencing topics from simple to more complex abstract concepts and technical procedures, and ensuring that once theoretical and procedural knowledge is transmitted, it is immediately applied in real life clinical situations. Bernstein's (1977, p. 61) argued that vertical integration is realised by "structuring of educational knowledge". But the structuring of educational knowledge is just one facet of the integrated code. Since professional knowledge is "locked within disciplines" (Chambers 1994, p. 343), there is the problem of presenting knowledge as a compendium of isolated, discipline-specific facts (Chambers 1993). This problem is addressed by horizontal integration, which involves the re-organization of social relationships.

Horizontal Integration

Horizontal integration requires a paradigm shift from the traditional segmented, discipline-based (Chambers 1996), procedure-oriented clinical training to an inter-disciplinary comprehensive programme (Allen 1988) marked by blurring of spatial boundaries between disciplines. This requires increased collaboration between lecturers from different disciplines. Asked what he considered the greatest achievement in the new curriculum, Jackson Gerard pointed to increased collaboration among basic sciences lectures in the restructured curriculum;

> *AK:* Apart from what you have already said, what do you consider to be the greatest achievement in the new curriculum?
>
> *SG:* [Pause]...Well, the greatest achievement is, definitely, bringing the anatomists, the physiologists, the biochemists together—to integrate under themes and topics—their material, to do so willingly and to understand some of the clinical relevance for the sake of passing over to the students, which they do. They learnt a lot about...how it is important... They no longer give standard biochemistry lectures. They give lectures, first of all, in the context of the whole theme. They know that the physiologists and the anatomists are talking about that material. They know the clinicians will be saying something about it, and they themselves have very often picked up on the clinical aspects and introduced it in their teaching, I think. That is only at stage one. I think there is more to do that way. But I can already see that there is a lot of the enthusiasm for having done this. That is an achievement! (Jackson Gerard, Foundation Theme Leader, 27/01/2004).

Gerard talks of "bringing the anatomists, the physiologists and the biochemists together" in reference to the increased collaboration among basic science teachers under the integrated curriculum. He sees the benefit of increased collaboration to lie in the elimination of redundancies. Taking biochemistry as an example, he points out that

biochemists no longer give standard lectures but give lectures "in the context of the whole theme". Gerard concludes by deploying a contrastive rhetoric; "I can already see that there is a lot of enthusiasm for having done this. That is an achievement!"

Morgan Maples, a member of the GDC Working Party, identified two other advantages of horizontal integration—a holistic approach to patient care and the minimising of duplication, both of which are a direct consequence of increased intra- and inter-disciplinary collaboration among the faculty. He points out that,

> Perhaps one of the most common forms of integration is to bring together conservative dentistry, prosthetic dentistry and periodontology into an area of restorative dentistry. And I think if that is done that encourages the student to think of the overall needs and concerns of the patient rather than compartmentalising them into discreet disciplines. I think that is one of the great advantages of integration in terms of clinical teaching. [...]In terms of integration of other things, I think in terms of teaching human disease—medicine, surgery, pathology, microbiology—there is an advantage in integrating the material there so that, for example, there isn't unnecessary duplication, to ensure that the right hand knows what the left hand is doing. I think in the past when there wasn't integration, you might find that antibiotics therapy was taught and touched on, on three or four occasions, which seems quite unnecessary. And then of course in the pre-clinical subjects, integrating anatomy and physiology one is bringing together form and function. That seems to me to be beneficial. The GDC had been preaching the importance of integration for a number of years and certainly, I think, it has improved (Interview excerpt with Morgan Maples, member of the GDC Working Party. 28/02/2005).

Within clinical dentistry, horizontal integration helps students to view patient care as a coherent whole rather than as a collection of segmented clinical procedures (Allen 1988). This is particularly important for a professional programme such as dentistry

which draws on knowledge from various disciplines and sub-disciplines of dentistry. Elmore used the metaphor of 'tunnel vision' to describe the potential impact on students of teaching clinical dentistry as isolated of the discipline-based:

> AK: How would you describe your experience of dentistry—teaching as well as the practice of dentistry—since the 1970s?
>
> LE: Basically when I took up the appointment at Midwest, I was asked to revise the final year course which was not terribly satisfactory. I did that, focused it and set up clear objectives. [...]In the major restructuring of the learning process, what we have been doing is trying to bring in a much more vertical and horizontal integration to the course so that instead of having separate discrete blocks, we are doing things like spreading the maintenance surgery for dental students. ...We are also trying to get horizontal integration so that we cut down on the duplication of teaching. Things like management of mixed dentition is jointly taught by orthodontists and paediatric dentists so that we don't get either mixed messages or inconsistence in teaching. What we are trying to do is stop the students getting this tunnel vision that today we are in orthodontics and therefore we don't have to think about caries and prevention. Today we are in paediatric dentistry so we can forget the fact that there is over-jet. We are trying to get more patient centred approach into the course, so that they look at the overall needs (Interview excerpt with Prof. Lee Elmore, member of the GDC Working Party. 25/01/2004).

Elmore began with a personal narrative of how, when he was appointed at the Midwest, he was given the task of revising the undergraduate curriculum, which he describes as "not terribly satisfactory". He then goes on to describe the new curriculum and what has been achieved so far. According to Elmore, horizontal integration has helped to reduce duplication and inconsistencies in teaching and promotes "patient-centred approach" or holistic clinical care.

The success of horizontal integration depends on the coming together of faculty previously divided on disciplinary loyalties, to perform common educational tasks. Bernstein noted two conditions for achieving horizontal integration. The first involves the establishment of social relationship between staff from different disciplines. He pointed out that, "With integrated codes both the role and form of the knowledge have to be achieved in relation to a range of different others..." (Bernstein 1977, p. 108). The second is the "*subordination* of previously insulated subjects or courses to some *relational* idea, which blurs the boundaries between the subjects" (Bernstein 1977, p. 93 emphasis in the original). Three examples from the WDS curriculum—fixed and removable prosthodontics (FARP) course, restorative dentistry phantom course and the Patient Management topic—help to illustrate the forging of inter-disciplinary and inter-thematic social relationships. These three examples also help to elaborate on the concept of 'supra-content' relational idea (Armstrong 1977, p. 246; 1980, p. 87; Bernstein 1977, p. 379) in relation to dental education.

Fixed prosthodontics involves the restoration of broken down teeth by fixed prostheses such as in-lays and crowns, which are fabricated in the laboratory and cemented into position on the patient in the clinic. Removable prosthodontics, on the other hand, involves the replacement of lost teeth by removable prostheses such as partial or full dentures. Although these two belong to the broad dental discipline of prosthodontics, under the traditional curriculum FARP was delivered as two separate courses. In the new curriculum, the FARP phantom course has been integrated, bringing fixed and removable prosthodontists together. Bertha Fraser explained the advantages of collaboration between teachers from the two sub-specialties;

BF: [...]. We are trying to bring fixed and removable prosthodontics together and structure it in a different way so that we are collaborating with colleagues who previously we wouldn't have collaborated with in phantom teaching.

AK: And which people are those you are collaborating with?

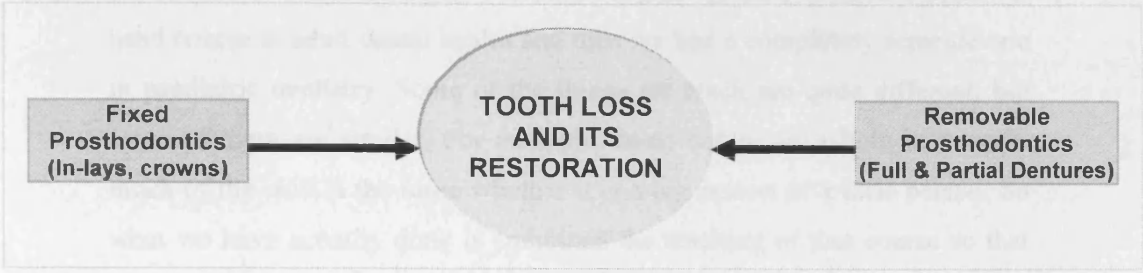
BF: Basically we are doing prosthodontics. I am doing what we call fixed prosthodontics and they are doing removable prosthodontics. Basically we have put all prosthodontics into one and we are teaching it together, which previously wasn't done this way. It was completely separate. I think that has given us benefits and will give us more benefits next year.

AK: And which are those benefits?

BF: The benefits are that we are looking at a particular problem, that is, tooth loss and its restoration. We are not looking at it individually as a fixed prosthodontist or a removable prosthodontist. We are looking at it as a problem: how best do we deal with that problem. I think that is a more sensible way of approaching it. (Interview excerpt with Bertha Fraser, senior lecturer in prosthodontics, Clinical Dentistry, WDS. 21/07/2004).

Fraser identifies one of the benefits of an integrated FARP course to be a more holistic approach to addressing the problem of tooth loss and its restoration. Bernstein (1977, p. 60) observed that, "In order to accomplish any form of integration...there must be some relational idea, a supra-content concept, which focuses upon general principles at a high level of abstraction." In the FARP course the integrating idea is 'tooth loss and its restoration' as shown in Figure 6.3. The boundaries between the two sub-disciplines are blurred in order to collectively address this problem.

Figure 6.3: Intra-disciplinary Horizontal Integration between Fixed and Removable Prosthodontics



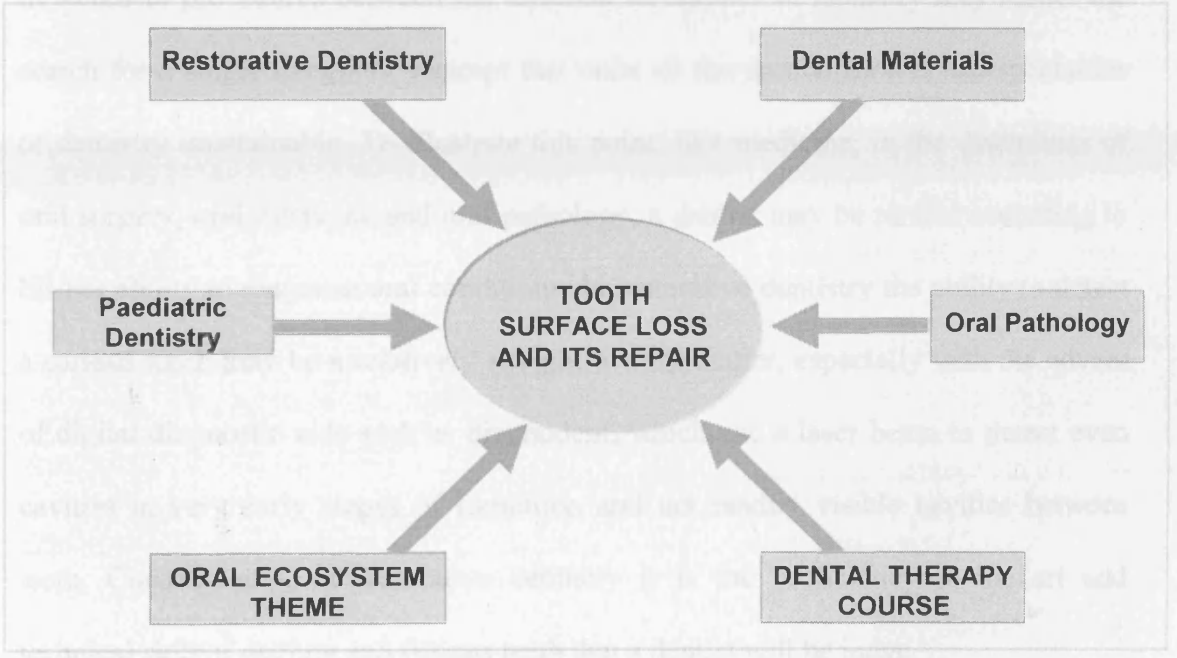
The FARP phantom course is an example of intra-disciplinary horizontal integration involving two sub-disciplines within the CD Theme. However, horizontal integration can involve the coming together of several disciplines in order to address a common problem as illustrated in the next example.

The integrated operative dentistry course offers an example of intra-thematic, inter-thematic and inter-professional horizontal integration. This course covers topics in the causes, prevention and treatment of dental caries and tooth surface loss caused by non-bacteria agents in both primary and permanent teeth. The theory part of the course brings together lecturers from the disciplines of oral pathology, restorative dentistry and paediatric dentistry, as well as from dental materials, within the CD Theme. There is also inter-thematic collaboration with lecturers from the OE and inter-professional collaboration with lecturers from the dental therapy course as shown in Figure 6.4.

The laboratory-based operative dentistry phantom course brings together lecturers from paediatric dentistry, restorative dentistry and dental therapy. Gideon Pinnacle identified the logic of having a combined phantom course between restorative and paediatric dentistry:

We have made much bigger attempt to, as far as possible, cross the boundaries between departments. For example, we used to have a phantom head course in adult dental health and then we had a completely separate one in paediatric dentistry. Some of the things we teach are quite different, but some of them are similar. For example, basic cutting of a hole in a tooth, much of the skill is the same whether it is a big person or a little person. So what we have actually done is combined the teaching of that course so that most of the operative technique course, where it is relevant, considers both paediatric dentistry and adult dentistry skills and there are paediatric staff, adult dental health staff and dental therapy staff involved in those. So that has been one change (Interview excerpt with Gideon Pinnacle, head of Paediatric dentistry, WDS. 16/07/2004).

Figure 6.4: Intra-and Inter-Thematic Horizontal Integration: Operative Dentistry



Pinnacle points to the similarities in the basic principles and technical skills required to prepare a cavity in both adult and milk teeth. He argues that the basic principles involved in cutting a hole in a tooth are the same, "whether it is a big person or a little person". This observation helps to highlight the fact the integration of procedural

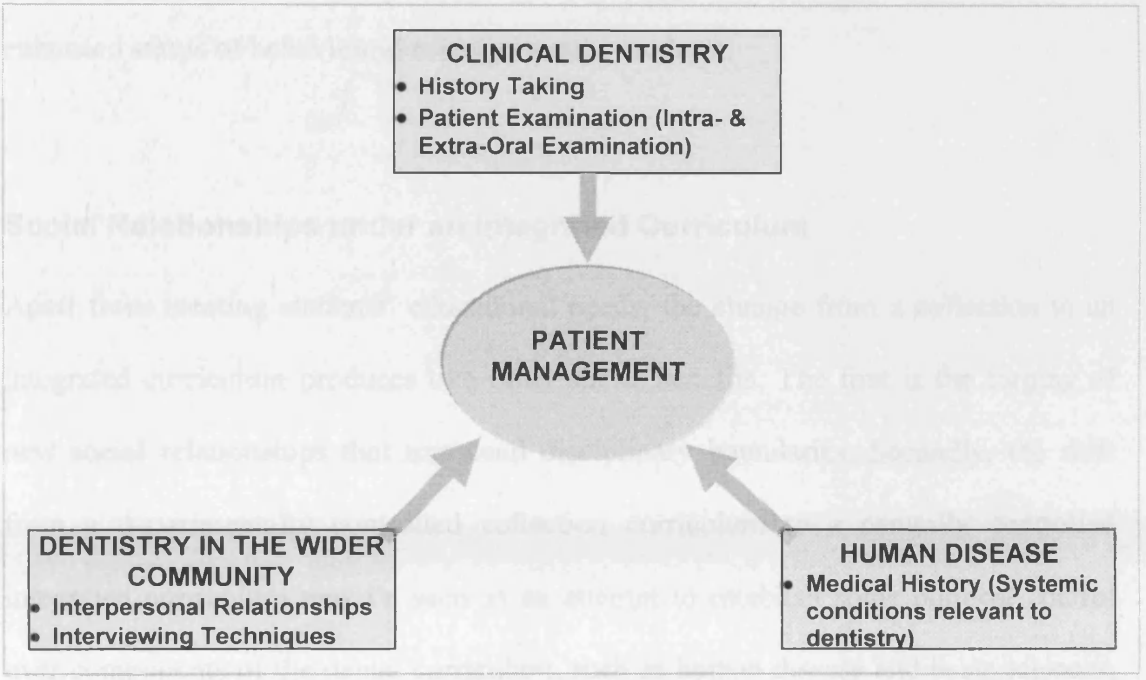
knowledge can be achieved if there are common principles between procedures. In this case, paediatric and adult dentistry utilise common principles in cavity preparation. It also follows that attempts to integrate two or more disciplines which do not share a well defined universal idea and/or shared principles, may prove difficult to achieve (cf. Patel et al. 2002).

Bernstein (1977) emphasised that for any form of integration to be achieved, there must be a relational idea. Armstrong (1977, p. 246; 1980, p. 87) applied the concept of supra-content relational idea to the undergraduate medical curriculum and identified 'disease' as the integrator concept. He argued that a doctor was ranked according to his/her ability in the art of diagnosis. However, differences in emphasis in technical procedures between the different disciplines of dentistry may render the search for a single integrator concept that units all the specialties and sub-specialties of dentistry unattainable. To illustrate this point, like medicine, in the disciplines of oral surgery, oral medicine and oral pathology, a dentist may be ranked according to his/her ability to diagnose oral conditions. In restorative dentistry the ability to detect a carious tooth may be a relatively straightforward matter, especially with the advent of digital diagnostic aids such as diagnodent, which use a laser beam to detect even cavities in very early stages of formation and not readily visible cavities between teeth. Consequently, in restorative dentistry it is the proficiency in the art and technical skill of drilling and fillings teeth that a dentist will be judge.

The topic on patient management helps to illustrate inter-thematic horizontal integration involving three Themes: CD, DIWC and HD as shown in Figure 6.5. This topic covers, dental history taking and intra-oral and extra-oral patient examination under the CD Theme. History taking links on to the HD Theme, which looks at

medical history, paying attention particularly to medical conditions with implications for dental care. But history taking and patient examinations requires some grounding in interpersonal relationships and communication skills. These two are provided by the DIWC Theme.

Figure 6.5: Inter-Thematic Horizontal Integration: Patient Management



Ian Carr, the behavioural science lecturer, explained that under the integrated curriculum his subject has been meshed into clinical dentistry. He emphasised that this was a significant development in the delivery of behavioural sciences;

> I teach interviewing techniques because of family study where they go and do projects and we give then a questionnaire. So very early on I teach them interviewing techniques. And we teach that at the same time and in the same sessions as we teach history taking because they are very similar skills. You are trying to get information for a specific purpose—how you do it—those are the sort of skills. So we teach those two things together. And more of that goes on now—an integration of those things that I teach them about and what they are actually doing in the clinics and that has been a really big help

(Interview excerpt with Ian Carr, head of behavioural sciences, DIWC, WDS. 16/07/2004).

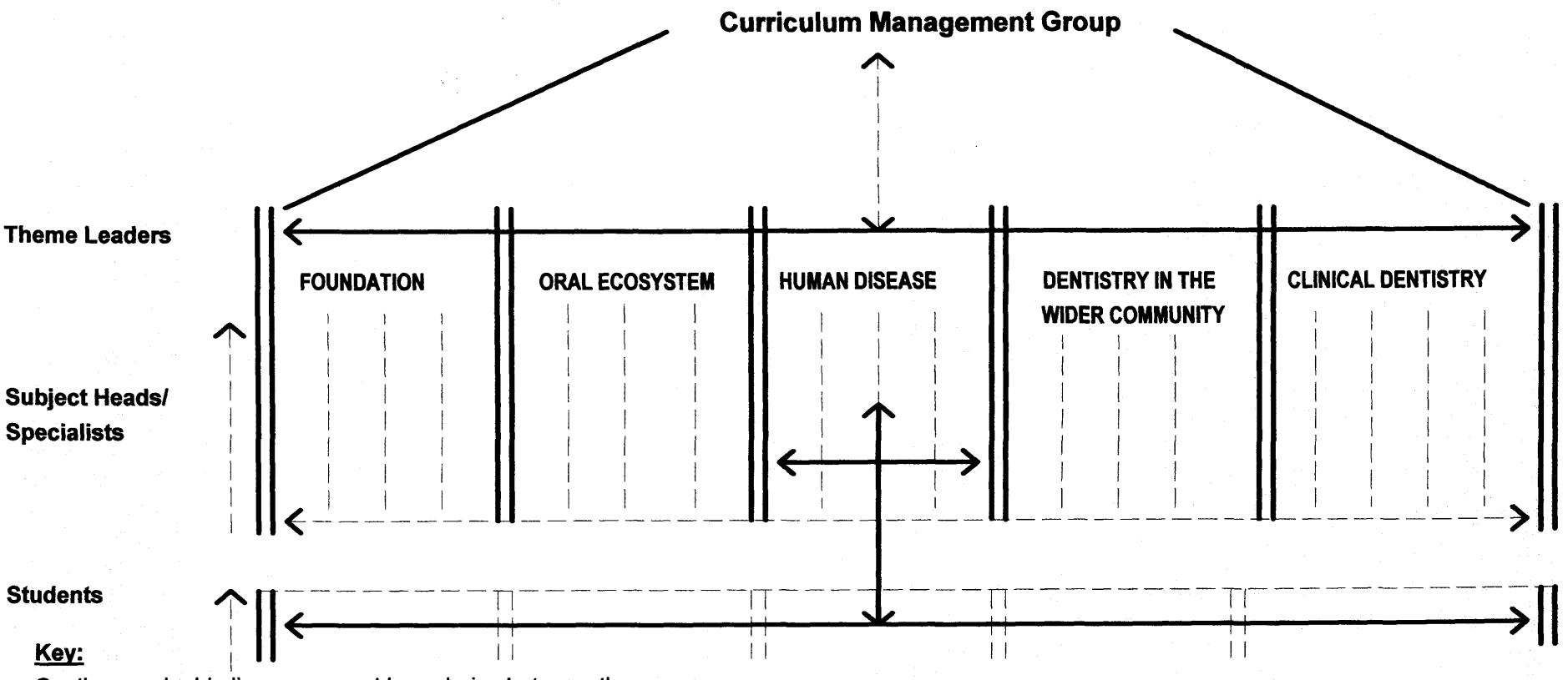
Carr went on to identify some of the social benefits of teaching behavioural sciences alongside clinical subjects. These include reduced social isolation, increased awareness among clinical staff of the relevance of behavioural sciences to dental clinical practice, embedding of behavioural sciences into the clinical context and an enhanced status of behavioural sciences among students.

Social Relationships under an Integrated Curriculum

Apart from meeting students' educational needs, the change from a collection to an integrated curriculum produces two other social benefits. The first is the forging of new social relationships that transcend disciplinary boundaries. Secondly, the shift from a departmentally controlled collection curriculum to a centrally controlled integrated curriculum may be seen as an attempt to establish some political control over components of the dental curriculum, such as human disease and basic sciences, which are delivered by departments outside the dental school.

A key feature of the integrated curriculum is the development of strong horizontal social relationships between lecturers previously isolated on disciplinary lines. Bernstein (1977, p. 384-385) observed that, "With integrated codes both the role and form of the knowledge have to be *achieved* in relation to a range of different others." Figure 6.6 shows the structuring of knowledge and the organisation of social relationships under a theme-based integrated curriculum.

Figure 6.6: Structure of Knowledge and Social Relationships under a Theme-Based Integrated Curriculum



Key:

Continuous double lines represent boundaries between themes

Dotted lines represent boundaries between subject areas within themes

Continuous arrows represent direction of new (interdisciplinary) relationships

Dotted line arrows represent direction of traditional (discipline-based) relationships

(Adapted from Bernstein (1971, p. 62))

John Armstrong (JA) and Paul Walker (PW) observed that increased interdisciplinary socialisation among the faculty resulted in the development and strengthening of formal and informal social relationships among them. This resulted in more purposeful and productive curriculum meetings:

> *AK:* When you look back at the past three years since the inception of this program, what are the big highlights that come to your mind?
>
> *JA:* I think in the last three, four years, since I have been here, one of the kinds of highlights is actually seeing close interaction between academics. They have been forced effectively to sit in one room and liaise between themselves to put the curriculum together. I think...may be not to some people...I definitely can see that the liaison that goes on is becoming increasingly stronger as staff from different departments teach on the theme. It is a lot more integrated now. There is a lot more communication flowing.
>
> *PW:* At a more informal level as well, I think. Initially, as John has said, we found it hard to get people into a room. And when we did get people into a room, they were looking for directions. There were stages...I used to worry about the...in some ways perhaps, the lack of direction. But I feel that has improved, that has matured over the past few years. There are now informal contacts that are being made. We still have management groups looking at various things. But most of those have a focus to them. We have a group looking at assessment and the specifics of certain assessment issues. But on the whole, there is a certain amount of co-operation going on.
>
> *JA:* I mean, especially from the core group of people who started with the kind of working groups. Now it is extended to all areas, clinicians, laboratory staff, are all involved in the dialogue as well. (Interview excerpt with John Armstrong and Paul Walker, CMG members, WDS. 05/03/2004).

Drawing from his personal experience, Armstrong reports progressive increase in interdisciplinary social interactions among the faculty. He points to the close interaction among members of the curriculum management group (CMG) as they "liaise between

themselves to put the curriculum together". Improvement in interdisciplinary social interactions is not limited to members of the CMG. Armstrong notes an increase in interdisciplinary socialisation at the micro-level of knowledge transmission, "...as staff from different departments teach onto the theme". He further notes a surge in horizontal collegial relationships among non-academic staff including clinicians and laboratory staff. The positive social consequence arising from the blurring of disciplinary boundaries noted by Armstrong has been reported by others. In their study of curriculum change at two medical schools, Matson et al. (2000) note that increased interactions among faculty as result of participating in curriculum planning meetings helps to bridge disciplinary gaps. While Matson et al. (2001) have noted the forging of new interpersonal relationships among participants as a result of collaborative planning and implementation of a generalist medical curriculum.

Walker draws attention to the positive impact of increased interdisciplinary socialisation during curriculum meetings. He points to the lack of sense of direction and purpose in earlier curriculum meetings. But, the development of strong horizontal social relationships has changed all this and now "most have a focus to them". Matson et al. (2001) observe that because of improved communication in an integrated curriculum, lecturers approach their educational tasks in a more purposeful and cooperative way.

A paradigm shift from a collection to an integrated curriculum offers at least two social benefits. The development of strong horizontal social relationships leads to increased interdisciplinary social interactions among lecturers both at the formal and informal levels as noted by Armstrong and Walker. This results in what Bernier et al. (2000, p. 599) have described as a "cultural change in the direction of greater collegial relationships." Strong horizontal social relationships among lecturers also facilitate the

development of a collaborative organisational environment, an essential factor in the achievement of broad-based curriculum changes and in the management of change (Bland et al. 2000). In their review of the literature on successful curriculum change in medical education, Bland et al. (2000, p. 582) note that curriculum restructuring was more likely to succeed at institutions with "high interaction, connection, and participatory, team-focused networks" than at institutions with deeply entrenched departmental loyalties.

The establishment of horizontal social relationships that cut across disciplinary lines was significant for another reason. It rendered visible and improves the appreciation of the value of non-clinical subjects to clinical dentistry. Because the traditional collection curriculum promotes strong vertical intra-disciplinary social relationships, lecturers in non-clinical disciplines such behavioural sciences may experience some symbolic educational and social isolation. Ian Carr, the head and only lecturer in behavioural sciences, gave a personal narrative of how under the old block system his subject was rendered invisible. He bemoans feeling socially isolated;

> IC: In the old curriculum it was just me for ten weeks in the lecture theatre and seminar rooms; nobody else was really involved in what I was doing; there were no clinical members staff involved in it. It was very isolated. It was very difficult for other members of staff to see the worth of what I was doing. But now I teach with them in certain subjects and they say to students, "You know from the classes you did with Dr Carr that..." and it helps.
>
> *AK:* Looking back at the last two years of the new curriculum, what would you say have been the achievements and which would you say have been the difficulties areas?
>
> *IC:* [...] The best thing I think has been the added integration for my subject. The isolation that there was in the old curriculum has gone. There is still room for improvement. We don't do any clinical teaching. I don't have to

> do any teaching on the clinics yet, which is something that we would like to be able to do for my subject. But in terms of teaching with members of staff from other departments and members of staff in other subjects areas, that has been really good both in terms of letting colleagues know that I am here and what I do. And they tend to be very interested in the subject once they know it is there. But also in terms of making it more practical knowledge for the students: that they can see how it fits into being a dentist because it is being taught alongside what they think obviously has to do with dentistry. I think that has been the greatest thing about it for my subject. (Interview excerpt with Ian Carr, subject head of behavioural sciences, WDS. 16/07/2004).

Carr uses contrastive rhetoric to highlight the benefits of increased horizontal social relationships in the integrated curriculum. He identifies two problems associated with the collection curriculum—teaching alone without the involvement of other academic staff and the lack of appreciation of the worth of his subject to clinical dentistry. He moans that in the old curriculum, "...nobody else was really involved in what I was doing" and that, "It was very isolated", but in the new curriculum the "isolation...has gone". Carr is not alone in his experience symbolic isolation as lecturer of a non-clinical subject. In medicine Stone (2000) and in nursing education Cooke (1993) have hinted at the problem of some form of academic social isolation experienced by lecturers of subjects considered peripheral to the core business of clinical practice. The problem was compounded further for Carr because he was the only behavioural sciences lecturer at the WDS. McGoldrick and Pine (1999) have reported that most dental schools in the UK do not employ full-time behavioural sciences lecturers.

The intensity of Carr's academic isolation was exacerbated by the lack of appreciation of the value of behavioural sciences to clinical dentistry by most senior clinical academics. He points to the difficulty of making other members of staff see the value of what he was teaching, "It was very difficult for other members of staff to see the worth

of what I was doing". In contrast, the integrated curriculum has opened up opportunities for interdisciplinary teaching, "But now I teach with them in certain subjects and ...it helps". This has rendered behavioural sciences more visible and enhanced it value among clinical academics and the students. He asserts that interdisciplinary teaching has helped in "letting colleagues know that I am here and what I do" and has helped students to appreciate the value of the subject "because it is being taught alongside what they think obviously has to do with dentistry".

Carr, however, is quick to point out one barrier to integration of behavioural sciences and clinical dentistry teaching. He laments that he has been excluded from the use of the clinical space, "...which is something that we would like to be able to do for my subject". The restrictions in the use of clinical space point to some subtle form of resistance by clinical dentistry in response to weakening in classification between clinical dentistry and behavioural sciences. Bernstein (1977, p. 97) observed that any weakening in classification can be regarded as "attempts to break or weaken existing monopolies" and this may be met with some form of resistance. Mizrachi et al (2005) and Shuval (1995) have identified 'labelling' and 'exclusion' as two forms through which intrusion into the profession space is resisted.

In the their study of the interaction between alternative and biomedical practitioners in an Israeli hospital, Mizrachi et al. (2005) have noted that the biomedical profession marked and secured its symbolic boundaries through exclusion and marginalisation. Exclusion was played out in the use of clinical space. The alternative medicine practitioners were restricted to non-clinical areas of the hospital. This has some parallel with the experience of behavioural sciences teaching. Even though Carr would want the use clinical space to deliver some aspects of social sciences lessons such as

communication skills, he is restricted to the non-clinical space of the lecture theatres and seminar rooms. It follows therefore that, although the marginalisation and isolation Carr experienced under the collection curriculum has been reduced as a result of the establishment of horizontal social relationships, it will take a long time for symbolic boundaries between clinical and non-clinical spaces to be finally blurred.

Barriers to Integration in Dental Education

Some challenges confronting the achievement of a fully integrated dental curriculum, particularly horizontal integration in clinical training, include the traditional structure of the dental hospital, the structure of postgraduate dental education and faculty commitment to change.

Physical Structure of the Dental Hospital

Lee Elmore pointed to the compartmentalisation of the dental hospital into discipline-based specialist clinics as an impediment to an integrated approach in the transmission of clinical knowledge and to the holistic approach in the delivery of dental care. He observes that,

> Historically we are a bit stuck with the structure of the dental hospital in that the clinical areas are on five separate floors. Paediatric and orthodontics are on the same floor. Joint and joining up care is relatively straight forward with children. But it becomes much more complex with the 20% or so of adults that we have. They might be receiving periodontics treatment on floor three, orthodontics on floor five, the oral surgery elements will be on floor one and crown and bridge work on floor two. The structure of the building doesn't help to that degree. We are beginning to overcome some of those problems (Interview excerpt with Lee Elmore, former member of the GDC Working Party. 25/01/2004).

Historically, dental hospitals were established to deliver primary oral care to the poor. They were usually located in areas of great dental need even though the type of care offered was limited mainly to infection control and the relief of pain (Campbell 1958, 1981; Wilson 1985. See also Chapter 2). The dental hospital has since evolved into a highly segmented complex structure, delivering mainly secondary and tertiary care in discipline-based specialist clinics, which are located on different floors of the building (Jones 1987).

The problem associated with the physical structure of the dental hospital has been noted by Snyman and Kroon (2005) who point out that although an integrated dental curriculum has been introduced at the University of Pretoria, clinical training still takes place in the discipline-based clinics. To minimised the effect of compartmentalisation of the transmission of clinical dentistry, the General Dental Council (2002) encourages the establishment of poly-clinics within the university dental hospital and exposure of the final year dental students to community outreach dental education (CODE). The concept of the CODE is explored further in chapter 9.

Professional Socialisation of Academic Dentists

Related to the structural organisation of the clinical training environment is the career path and postgraduate education of academic dentists. Drawing from his own personal experience of an academic career, Maples notes that both the professional socialisation and the career path of academic dentistry were impediments to curriculum integration,

> *AK:* Would you say there has been any impediments to integration and if so which are the sources of those impediments?

MM: I suppose it is probably the interest of the teachers. One of the aspects is postgraduate education and career prospects for the teachers. If I take, for example, restorative dentistry again, it is probably better now in that the postgraduate will need to progress through the broader discipline of restorative dentistry and therefore when it comes to teaching students, that person will have a good education in the three limbs of restorative dentistry. Having said that, there is probably still and there will remain still a need to major in one of those limbs of restorative dentistry in terms of research. Therefore it is quite difficulty to marry together the desires and interests of people to specialise but at the same time to have the broader view of teaching restorative dentistry. That is how I saw it. If I look at myself, I qualified in 1961. At that time the schools were generally departmentalised and I decided that I was particularly interested in prosthetic dentistry and that is the way I went. Later I had to try and improve my understanding of conservation and periodontology whereas these days the graduate who is deciding to go into teaching or specialisation is likely to do postgraduate study in a much broader area and therefore be able to teach in a much broader area. One of the impediments has been, as I have mentioned, the training pathway for the teachers. I think it is improving now. In my days we were very much compartmentalised (Interview excerpt with Morgan Maples, member of the 2002 GDC Working Party. 28/02/2005).

Maples identifies two barriers to an integrated curriculum, which are associated with the professional socialisation, the research and teaching functions of academic dentistry. Taking restorative dentistry as an example, Maples points to the narrow focus of postgraduate education in the past and the influence of disciplines in shaping the career path. He observes that now postgraduate education is broad based and gives some grounding in all the three limbs of restorative dentistry, which is helpful "when it comes to teaching students". Maples also draws attention to the tension between the desires and interests of individuals to major in one limb of restorative dentistry in order to meet the research obligation, and the need for broad grounding in restorative dentistry in order to be an effective teacher. In education, Hargreaves, Earl, Moore et al. et al. (2001) and Venville, Rennie and Wallance (2003) have identified a similar problem in

teacher education. They point to the problem of socialising teachers in narrow subject areas and the existence of strong disciplinary loyalties that are formed around subject systems. Hargreaves et al. (2001, p.103) have used the term "curriculum traditions" to describe the fact that the interest and career progression of teachers is embedded in the departmental structures, which are based on subject areas.

Faculty Commitment to Change

The most potent barrier to curriculum innovations has been identified as the beliefs and commitment of the faculty to change. Drawing on examples from the UK dental schools attempts at curriculum integration, Maples attributed the success or failure of curriculum integration to the enthusiasm and commitment of the faculty. He argues that;

> [...] There is another factor though and that is the approach of individual members of staff. Over the years, one look at different dental schools and you will see there are examples where there will be some schools which had different departments and yet they came together very happily and produced an integrated programme and the 'total patient care concept'. And you might find others who decided that they should have a restorative department. And yet when it came to teaching the students, there really wasn't a very robust programme of total patient care. In a way, however one constructs departments, or whatever one might call them, ultimately it is the enthusiasm and approach of the members of staff which is going to create success in establishing the 'total patient care' and integrated concept. It is the individual approach and outlook rather than necessarily where the boundaries of departments or divisions are created. (Interview excerpt with Morgan Maples, member of the 2002 GDC Working Party. 28/02/2005).

Maples observes that in some schools, different departments have successfully come together and produced integrated programmes and the 'total patient care concept', while some schools have failed to produce a robust programme of total patient care. He

concludes that the major determinant of the success or failure of curriculum integration is ultimately the commitment and enthusiasm of the members of staff and not necessarily the departmental boundaries. In education, Venville, Wallace, Rennie et al. (2002, p. 72), Kelly (2004), Schwartz (2006) and Bruner (1977) all agree that teachers are the major determinant of the success or failure of curriculum innovations.

Discussion

Integration is a celebrated and recurring theme in the restructured curriculum at the WDS. A number of reasons have been offered for the paradigm shift from a collection to an integrated curriculum. In the literature, drivers of curriculum restructuring are generally couched in terms of education philosophies and changes in the wider social environment (ADEA Commission on Change and Innovation in Dental Education, Pyle, Andrieu et al. 2006d; Allen 1988; Bertolami 2001; Goldon 2004; Moreno 1991). The rationale for a paradigm shift from a collection to an integrated curriculum centre around two main themes: the social relationships realised under the two types of curricula, including power and control relationships over the transmission of dental knowledge (Saffran 1973); and the structural organisation of knowledge, with particular emphasis on blurring of disciplinary boundaries (see, for example, Davies and Warfvinge 2003; Kerosuo et al. 2001; Rohlin et al. 1998; Snyman and Kroon 2005). The blurring of boundaries between the pre-clinical and clinical components of the curriculum is the most highlighted feature of contemporary dental curriculum restructuring.

Three features characterised the accounts of participants:

1. Participants extensively deployed the pragmatistic and almost excluded the abstractionist repertoire in their interview accounts.

2. The database participants constantly drew on to substantiate their claims was their personal biographies and their classroom experience as tutors. However, there were some notable difference in the data drawn by very senior academics, the theme leaders and the GDC participants, and the subject heads.
3. In their accounts of curriculum change, participants from the WDS excluded factors arising from the wider social environment among reasons for the paradigm shift from collection to the integrated code.

There are two probable reasons for the dominance of the pragmatistic repertoire in participants' accounts. The first is related to the social relationship developed between the participants and the researcher. It was apparent that the participants did not see themselves as research subjects but took on the role of advisors. As advisors, they felt duty bound to give accounts that were based on their personal practical experience rather than on abstractions. It is also plausible to argue that participants constantly drew on their classroom experience rather than on theory or empirical evident because this is the area over which they exercised greater control. Hargreaves suggested that teachers privileged their classroom experience above any other data source because they derived greater reward and exercised greater control over this aspect of their professional lives. In medicine, Bloom (1989, p. 239) made a similar observation about the potential impact of reward and control in shaping the career path of new doctors away from family medicine to the high technology specialist medicine and research. In dental education, the emphasis on practice rather theory as the main data source may also point to the pressure of work on academics.

There is evidence to suggest that the pressure of work and lack of education training by most participants may be a factor in the emphasis placed on pragmatistic repertoire.

There are three main professional activities in academic dentistry—teaching, research and clinical consultancy. Asked how she divided her time between these three areas, Bertha Fraser responded that this was a major challenge for all dental academics:

> AK: One of the major issues that crops up time and again is that of time. How do you divide your time between, teaching, research and clinical practice?
>
> BF: You can't really. There are different pressures for different times. At this time of the year the teaching is reducing and therefore you can get on and do other work. We have new contracts from the clinical side for clinical consultancy and that requires us to spend approximately six sessions on the clinical side, which leaves four for teaching and research. There is flexibility in there, but it is difficulty. I don't think any of us will get it right. Most people tend to have a bend towards one area or the other and so they will perhaps do more teaching, clinical work, or perhaps trying to concentrate on research. But then that causes problems elsewhere. So it is quite difficult (Interview excerpt with Bertha Fraser, WDS. 21/07/2004).

The views expressed by Fraser were echoed by other participants. Fraser observes that many academics lean towards one area at the expense of the other two. Because research and clinical consultancy are deemed more rewarding than teaching, many academics tend to be biased towards these two areas (cf. Bloom 1989). In addition, because many dental academics do not possess any education training, this may explain their inability to meaningfully articulate curriculum change in terms of education theories. For the few who may wish to extend their knowledge of education theories, the pressure of work may prove a barrier.

The subject heads repeatedly drew on their practical experience of 'classroom' teaching and their personal biographies as former dental students. Joseph Smith, for example, drew attention to his experiences as a dental student and his classroom experience as a

tutor in his support for the introduction of early clinical contact and horizontal integration. In contrast, the data very senior academics drew on extended beyond their classroom experience and included examples of curriculum trends at other UK dental schools and abroad, as well as their extensive experience of dental education. This is similar to the finding of Hargreaves (1984), who observed that in formal discussions of curriculum innovations, teachers gave little credence to education theory and excluded from their debate "non-classroom experiences that might be relevant to educational discussion" (Hargreaves 1984, p. 250). They instead repeatedly drew on their "personal classroom experience" (1984, p. 247).

The WDS participants excluded factors arising from the wider social environment from among the reasons for the paradigm shift from a collection to an integrated code. Socio-cultural factors such as changes in dental disease profile, demographic changes and economic factors did not feature among drivers of curriculum restructuring at the WDS. This may come as a surprise because in the literature, socio-cultural forces are widely acknowledged as drivers of contemporary dental curriculum change. One plausible explanation for this apparent omission may lie with how dental education is regulated in the UK. As pointed out in chapter 2, the GDC is given the mandate to regulate the standards of dental education in the UK. This involves setting up curriculum guidelines which all the dental school follow. It follows, therefore, that social factors affecting dental education are articulated and incorporated into the dental curriculum at the national level by the GDC.

The failure by the WDS and the GDC participants to draw on education theories and to learn from the experience of other professions in curriculum change, other than medicine, poses an obstacle to innovations in dental education. In education,

Hargreaves (1984, p. 252) observed that the failure by teachers to "draw on and accept wider experience and perspectives" presented an obstacle to education innovations. One of the problems of limiting curriculum debates to classroom and personal experiences is that the dental curriculum is shaped by a complex interaction of social forces most of which lie beyond the 'dental classroom'. Bloom (1989) pointed to the healthcare delivery system, the reward system and economic interests of doctors, and the rapid proliferation of knowledge and advances in science and technology among social forces shaping medical education. In dental education, Rohlin et al (1998) identified rapid changes in science and technology among drivers of dental curriculum restructuring at the Malmo University. While Fry et al (1998) identified the revised 1997 GDC curriculum framework, funding cuts, and curriculum restructuring at other UK dental schools among factors that informed the curriculum restructuring at the St Bartholomew's and the Royal London School of Medicine and Dentistry. Other socio-cultural factors such as changes in dental disease profile, demographic changes and funding cuts to higher education in general and dental education in particular, have also been cited as drivers of dental curriculum restructuring (cf. ADEA Commission on Change and Innovation in Dental Education et al. 2006d; Formicola 1991; Goldon 2004; Katz 1986; Kerosuo et al. 2001; Reed 1990).

The failure to embed curriculum restructuring in education principles and to draw on the experiences of others may result in re-inventing the wheel. Educators in education and other professions have some valuable lessons to offer because of their vast experience and many years of research in education. Examples include the research work of Arredondo and Rucinski (1998), Fowler and Poetter (2004), Hargreaves, Earl, Moore, et al. (2001), Kim, Andrews, and Carr (2004), Sturman (1994), Venville, Rennie, Wallace (2003). The papers by Gehrke (1998), Kysilka (1998), Rogers (1997) and Venville,

Wallace, Rennie, et al. (2002) on the integrated curriculum can also offer some valuable insights to dental educators.

Crawford et al. (2007) point to the importance of firmly grounding curriculum change in education principles. In education, Bernstein (1977, p. 110) theorised at least four reasons for the paradigm shift from the collection to integrated codes of weak classification and weak framing. Three of these have some relevance to dental education. He pointed out that the proliferation of knowledge required a form of socialization appropriate to the changes in the structure of knowledge; changes in the division of labour created the need for general principles from which a range of diverse operations could be derived; and explosion in legitimizing beliefs and ideologies created the problem of 'making sense'. He argued that the integrated code, with its focus on the underlying unity of knowledge through emphasis upon analogy and synthesis, offered some solution to the problem.

Although Bernstein had general education in mind, his theorising about the impact of knowledge proliferation, and his implicit reference to disciplinary segmentation and the problem of making sense have some parallels in dental education. When applied to dental education, Bernstein's theorisation of the popularity of the integrated curriculum may be articulated as follows:

1. The segmentation of dentistry into a range of specialties and subspecialties, with knowledge packaged and delivered under strong classified disciplines in a traditional curriculum, creates the problem of 'making sense' of highly segmented knowledge.

2. A highly segmented dental curriculum leads to a tunnel view and polarisation of dental knowledge. This makes the integrated code, with its emphasis on 'underlying unity of knowledge' the most logical approach.
3. Pressure from the external environment such as changes in demography and dental disease profile (Mojon et al. 2004; Nunn, Morris, Pine et al. 2000; Zarkowski et al. 2002), public attitude towards dental health (Bradnock, White, Nuttall et al. 2001) and heightened public expectations of the quality of oral care (Bradlaw 1974) has created the need for the dental curriculum to be more responsive to the wider social context (Hobdell, Mante, Finau et al. 1995a; Odlum 1995a; Tuisuva 1995). Dental educators have responded by revisiting the undergraduate dental curriculum, with reductions in curriculum time for some subjects and increase for others (O'Byrne et al. 1997). This point is explored further in chapter 8 which looks at social factors informing the selection of the content of dental knowledge.

This chapter has looked at the rationale for the dental undergraduate curriculum restructuring at the WDS. The main drivers of curriculum change were couched in terms of the structural organisation of knowledge and social relationships realised between participants in a pedagogic encounter. Education theories and wider social factors underlying curriculum change received little attention among participants at the WDS. In the next chapter, wider social factors informing the dental curriculum framework of the GDC are explored from the perspective of Bernstein's (1977) concepts of classification and framing.

Chapter 7

The 'What' to be Taught: factors informing the selection and sequencing of the content of the undergraduate dental curriculum

Introduction

> "Curriculum defines what counts as valid knowledge" (Bernstein 1977 p. 47).

The strength of Bernstein's definition of curriculum in the above quotation lies in his broad approach to curriculum as a social construction. Because the curriculum is socially constructed, what counts as valid knowledge is not static but subject to changes in the socio-cultural environment in which the curriculum is embedded. Atkinson (1983, p. 235) put it more bluntly that "all knowledge is arbitrary" and went on to add that,

> "There is no absolute, pre-given corpus of knowledge which self-evidently presents itself as 'curriculum' and which is inherently endowed with order, sequential organisation and so on. The curriculum is a device whereby knowledge is classified and combined: it is a cultural imposition."

Both Bernstein's definition and Atkinson's amplification on the social implication of curriculum fit in well with the practical description of the task of the WDS curriculum management group. James MacDonald, the Chairman of the WDS curriculum management group (CMG) outlined the task of deriving the content of the curriculum as follows,

> We [the CMG] decided that we would do the 'what' first when we looked at the curriculum content. Then we would look at the timing of things within the curriculum—what was appropriate to come early, what was appropriate to come

late (Interview excerpt with James MacDonald, Chairman of the CMG, WDS. 09/09/2004).

The focus of this chapter is highlighted in the above excerpt. That is, to explore factors informing the selection and sequencing of the content of the undergraduate dental curriculum. These factors are discussed in the light of Bernstein's (1977) concept of frame strength. Bernstein (1977, pp. 88-89) described frame strength as *"the degree of control teacher and pupil possess over the selection, organization, pacing and timing of the knowledge transmitted and received in the pedagogical relationship"* (emphasis in the original). I am however using the concept of frame in it broader sense to include the control possessed by the CMG over the selection, pacing and timing of the content of the curriculum. Bernstein's (1977) pointed out two aspects to frame. This chapter focuses on the degree of frame strength over the selection and sequencing of the content of the undergraduate dental curriculum.

Although the focus of the chapter is at the institutional or meso-level, I have extended my discussion to the national or macro-, and the classroom or micro-levels in order to give a more comprehensive picture. Both Bernstein (1977) and Delamont (1989) drew attention to variations in frame strength at different levels of analysis and between the levels of selection, organisation, pacing and timing of the knowledge transmitted in a 'pedagogical relationship' (Bernstein 1977, p. 89). Consequently, Delamont (1989) advised on the importance of specifying the level at which the analysis is done in order to avoid confusion.

The general approaches taken by the WDS curriculum management group (CMG) and the General Dental Council Working Party to derive the content of the curriculum are similar. Both relied on extensive consultations with significant stakeholder in dental

education. These include dental academics, the dental association and societies and practicing dentists within the UK and abroad. They also took into account trends in general dental practice. But the CMG was also cautious that what ever changes were instituted were not in conflict with the GDC curriculum policy. Prof. Martin Johnson, the theme leader of human disease emphasised that it was his duty to ensure that the restructured human disease course adhered to the 1997 GDC curriculum framework, which was then the document in use at the time the WDS was revising its curriculum. He points out that,

> When we were reviewing my subject, now of human disease, I had to ensure that the revised curriculum for human disease teaching, that is the medicine and the surgery now—so medicine, surgery, pathology, microbiology—these general subjects of medicine, the subjects we covered, do adhere to the recommendations made in *The First Five Years* document from the General Dental Council. When they come for visitation, they would want to see that we are addressing all their recommendations (Interview excerpt with Martin Johnson, Theme Leader, Human Disease, WDS. 29/03/2004).

Johnson points to the importance of adhering to the GDC curriculum recommendations. The failure to meet the GDC recommendation usually attracts some reprimand or some form of mild sanctions during the GDC visitations, "When they come for visitation, they would want to see that we are addressing all their recommendations". Other participants also expressed the importance of keeping within the GDC curriculum guidelines. Although the GDC guidelines are seen as central to curriculum decisions of dental schools, they are not considered overly prescriptive, but only act as the baseline or reference standard (Plasschaert et al. 2002) upon which curriculum committees in dental schools in the UK base their decisions. That is, there is relatively weak external framing in the selection and sequencing of the content of

the dental knowledge between the dental schools curricula and the GDC curriculum framework policy.

But weak external framing means that dental schools and individual lecturers are able to innovate as long as such curriculum innovations do not significantly depart from the GDC guidelines. This led Patrick McAllen to argue that because the GDC was not overly prescriptive; the content of the curriculum has remained relatively unchanged over the years. He candidly points out that,

> I think the syllabus is defined by the General Dental Council to a large extent. I think that you haven't got that much freedom really. But again you have, I mean, *The First Five Years,* it is not as prescriptive as the medical course. *Tomorrow's Doctors* is more prescriptive. I think that the content has really been very much at the will or the whim of those running the courses. I think that there has been no central directive on how you are supposed to own the content or how you are supposed to deliver this content or how the students are going to learn. I don't think that there has been any centralisation on that, which is a good thing to some extent. But it does mean that nobody at any stage has really analysed the content that much. (Interview excerpt with Patrick McAllen, subject leader, CD Theme, WDS. 15/07/2004).

Several factors were significant in informing the content and process of deriving the curriculum at both the GDC and WDS. These may be grouped under two main themes: the educational thinking of the day, particularly the competence curriculum movement; and changes in the socio-cultural environment.

Influence of Education Thinking: the Competence-based Curriculum

The competence curriculum is one of the education principles with significant influence on contemporary dental curriculum restructuring (Chambers 1993, 1994;

Harden 2002a; Plasschaert et al. 2002). It is closely related with the novice-expert continuum (Benner 1984, 2004; Dreyfus and Dreyfus 1986; Dreyfus 2004; Dreyfus and Dreyfus 1980). The competence curriculum begins with a clear identification of competencies expected in students on graduation. Learning outcomes at the different stages of the students' socialisation are then worked out from these competencies. That is, the starting point in planning a competence-based curriculum is a clear definition of what the end product should be able to do on graduation.

Defining Competencies

Stirrup and Murray (2002) have identified ten features which mark the GDC (2002) curriculum framework document apart from the 1997 document. Two interrelated developments which are particularly relevant to this chapter are a list of the key principles underpinning undergraduate dental education; and the identification of learning outcomes. This is a total departure from the previous GDC curriculum documents and appears to be in response to recent trends towards competence-based education in medicine and dentistry (Chambers 1993, 1994; Harden 2002a).

The influence of the GMC (2003) publication on the GDC document is undeniable. Brushwell Coleman, the chairman of the 2002 GDC Working Party drew attention to the similarities between the GMC's (2003) *Tomorrow's Doctors* and the GDC (2002) curriculum framework documents:

> If you go and look at the General Medical Council's document, *Tomorrow's Doctors,* you will see that there are key principles at the start, and that is what we have tried to do there. Those are the key principles (Interview excerpt with Brushwell Coleman, chairman of the 2002 GDC Working Party. 21/05/2004).

Coleman admitted the influence of medical education, including the GMC (1997) publication, *Student Health and Conduct,* and the work of the Scottish medical group (Simpson et al. 2002) on the educational thinking of work of GDC Working Party members. He further points out that,

> One of the ways in which they are looking at it—certainly in Scotland—they say we shouldn't look at it in terms of anatomy or physiology or medicine or surgery. ...We must look at it in three ways: 'what', 'how' and 'who'. What is the doctor able to do? How does the doctor approach the practice, understanding of basic sciences, appropriate attitudes, ethical understanding and legal responsibilities and appropriate decision making clinically and judgement? And then the last bit is the doctor as a professional: professional and personal development. Now that was published in 2000 at the meeting of the Scottish medical education universities. And that approach has affected many of the curricular in medicine. You may say to me, 'Why have you told me that information?' and the answer is this, ...We were listening to what the quality assurance people were telling us, to what educationalists were telling us that you don't just say, 'well we think that this is a good idea. You have to have learning outcomes' (Interview excerpt with Brushwell Coleman, chairman of the 2002 GDC Working Party. 21/05/2004).

Although Coleman admits the influence of the GMC publications on the work of the working party, there are some fundamental differences in the education thinking of the GDC and GMC. In defining the principles underpinning medical education, the GMC focuses on the product of medical education—the doctor (O'Byrne et al. 1997; Simpson et al. 2002) and presents a list of "principles of professional practice" (General Medical Council 2003, p.4) derived directly from the duties of a doctor registered with the GMC. These principles are then used to derive learning outcomes, which are based on the expected competences of a newly qualified doctor (Simpson et al. 2002). The learning outcomes are framed in terms of 'knowledge, skills, attitudes and behaviours expected of new graduates' (General Medical Council 2003, p. 2). This

approach is consistent with the general practice in competence-based education (Institute for International Medical Education 2002; Plasschaert et al. 2004). In contrast, the GDC principles focus on both the product (Yeager 2004) and on the education environment under which the dental students are educated.

Table 7.1 presents a list of the principles underpinning the GMC (2003) and the GDC (2002) curriculum framework. A notable difference is, whereas the GMC states its principles in terms of the attributes a graduating doctor, the GDC has paid attention to both the social context and the product of dental education. But approach by the GDC has resulted in placing more overemphasis on the process, with little attention on the product of dental education. The GDC introduces its principles with a statement that focuses on the product of dental education. But the list of key principles that follow, only the first addresses itself to the product of dental education. The remaining 8 principles are all devoted to the process, or what Mossey (2003, p. 350) has described as the 'context' of dental education. The net result is that, although the GDC expresses some commitment to competence-based education (O'Byrne et al. 1997), it is the process of dental education that permeate the GDC principles. This has led Clark et al. (1997) to describe the approach taken by the GDC as confusing and inconsistent with the principles of the competence-based education.

Table 7.1: Principles Underpinning the GMC and GDC Undergraduate Curriculum Policy

The General Medical Council	The General Dental Council
Principles of Professional Practice	**Key Principles**
The principles of professional practice as set out in *Good Medical Practice* must form the basis of medical education.	The purpose or aim of dental education is to produce a caring, knowledgeable, competent and skilful dentist who is able, on graduation, to accept professional responsibility for the effective and safe care of patients.
Good Clinical Care: Doctors must practise good standards of clinical care, practise within the limits of their competence, and make sure that patients are not put at unnecessary risk	In realising this aim, the GDC applies the following principles: 1. that dental graduates should be required to attain the highest standards in terms of knowledge and understanding, skills, including clinical skills, and professional attributes, in particular recognition of their obligation to practice in the best interest of patients at all times;
Maintaining Good Medical Practice: Doctors must keep up to date with developments in their field and maintain their skills.	2. that dental students should be provided with the high quality learning opportunities and experiences necessary to enable them to achieve those standards, including the opportunity to undertake clinical procedures and acquire competence across a range of skills;
Relations with Patients: Doctors must develop and maintain successful relationships with their patients.	3. that learning opportunities and experiences should be underpinned by adequate and appropriate support, including both educational and clinical support;
Working with Colleagues: Doctors must work effectively with colleagues.	4. that learning opportunities and experiences in biomedical sciences and clinical subjects should be integrated over the course of the programme;
Teaching and Training: If doctors have teaching responsibilities, they must develop the skills, attitudes and practices of a competent teacher.	5. that learning opportunities and experiences should be designed to encourage a questioning, scientific, and self-critical approach to dental practice and to foster the intellectual skills required for future personal and professional development;
Probity: Doctors must be honest	6. that learning opportunities and experiences should enable students to develop an understanding of audit and clinical governance;
Health: Doctors must not allow their own health or condition to put patients and others at risk.	7. that learning opportunities and experiences enable dental students and those of the professions complimentary to dentistry to work and train together;
	8. that learning opportunities and experiences prepare students adequately for the transition to vocational dental practice;
	9. that student progress is effectively monitored to ensure that only those who comply with relevant health and conduct requirements are allowed to complete the programme.

Source: GMC (2003, p. 4) and GDC (2002)

The GDC's attempts to incorporate principles of both the process and product of dental education points to the underlying tension between its official regulatory function of dental education and its advocatory role for dental schools. In what the dental profession perceives as a competitive and uneven higher educational environment, with many pressures such as funding cuts pitted against dental education (Daley 1985; Murry 2002), the GDC tacitly takes on the role of advocacy for dental schools (see the section on the 'education functions of the GDC' in Chapter 2). In its advocatory role, the GDC pays attention to the social context dental education with the primary aim of drawing the attention of the relevant authorities to the particular needs of dental education. Part 1 of the GDC (2002) document directly addresses universities (par. 29 and 31), the NHS Trusts (par. 39 and 43) and the Departments of Health and Education (par. 40), drawing their attention to the specific roles and responsibilities they must fulfil in the provision of dental education.

Brushwell Coleman stressed the importance of paying attention to the social context in which dental education takes place. He points out that,

> What we are saying is that learning opportunities and experiences should be underpinned by adequate and appropriate support, including both educational and clinical support. So we have to agree, you have got to have a reasonable hospital to train and teach doctors or dentists. That is reasonable. "Student progress is effectively monitored to ensure that only those who comply with relevant health and conduct are allowed to complete the programme." Some people may disagree with that, but we thought that was a key principle. What I am suggesting to you is you define your key principles. They may be slightly different for Zambia but that doesn't matter. If you have a clear idea of where you want to go, try and write it down. (Interview excerpt with Brushwell Coleman, chairman of the 2002 GDC Working Party. 21/05/2004).

Coleman stresses the importance of adequate support in the provision of dental education. This support includes the availability of appropriate education and clinical facilities. This aspect of the dental curriculum is illustrated in Appendix I by the branch: the 'Education and Training Facilities'. Although the GMC has also addressed issues pertaining to the process of medical education, it does so in a less emphatic manner in short paragraphs under the general heading "Delivery of the curriculum" (General Medical Council 2003, par. 42 - 55).

What the GDC terms as the key principles have been called by the QAA as 'skills and attributes of the graduating dentist' (Quality Assurance Agency 2002, p.4), the GMC (2003, p. 4) has termed them as 'principles of professional practice', while Plasschaert et al. (2004, p. 24) refer to them more broadly as 'profile for the new European dentist'. These principles form the basis for defining learning outcomes, structuring teaching and learning experiences, assessment and evaluation in competent-based education (Harden 2002a; Institute for International Medical Education 2002; Plasschaert et al. 2002; Prescott et al. 2003; Simpson et al. 2002).

Competence Statements

One significant development in contemporary medical and dental education is the trend towards competence-based integrated curricula (Chambers 1993, 1994; Harden 2002a; O'Byrne et al. 1997). The competence-based model is endorsed at the global (Baum et al. 2002; Institute for International Medical Education 2002), regional (Plasschaert et al. 2004), national (American Dental Education Association 2005; Boyd et al. 1996; General Dental Council 2002) and institutional levels. In the UK, at the national level the GDC (2002) curriculum framework encourages dental schools to adopt integrated approaches in the delivery dental education and has specified competences expected in

newly qualified dentists. At the institutional level, the restructured curriculum at the WDS is described as an integrated competent curriculum (University of Wales College of Medicine 2001) and competence statements have been specified. Jackson Gerard, the foundation theme leader, emphasised the importance of dental students attaining the specified competences. He point out that,

> We are trying to draw up what we call land marks to competency. Aside from having a lot of statements about what you have got to be competent in, and it doesn't matter what the student does academically, if they are not competent enough, if they have not satisfied all the competency statements, they can't qualify. So you know there are two phases in the education. First of all the students must show they are competent. They won't get their degree unless they have got that (Interview excerpt with Jackson Gerard, Foundation Theme Leader, Cardiff University. 27/01/2004).

Gerard draws attention to the use of competence statements as an assessment tool. He directly links the attainment of the required level of competence to qualifying, "if they have not satisfied all the competency statements, they can't qualify".

Although the restructured curriculum at the WDS was said to be competence-based, there appeared some lack of understanding among participants on how to move from the competence statements to the course content. This may point to the lack of familiarity with the competence curriculum among the participants as insinuated by Patrick McAllen. McAllen admitted that he was able to derive the course content from the school competence statements by drawing on his past experience,

> ...I suppose I have introduced the course from the Eastern Cape into Cardiff to some extent. I certainly had a competence-based curriculum there and what I did, I went through it right from the beginning. I went through the course based just on my subject—all the competences that I thought were required of

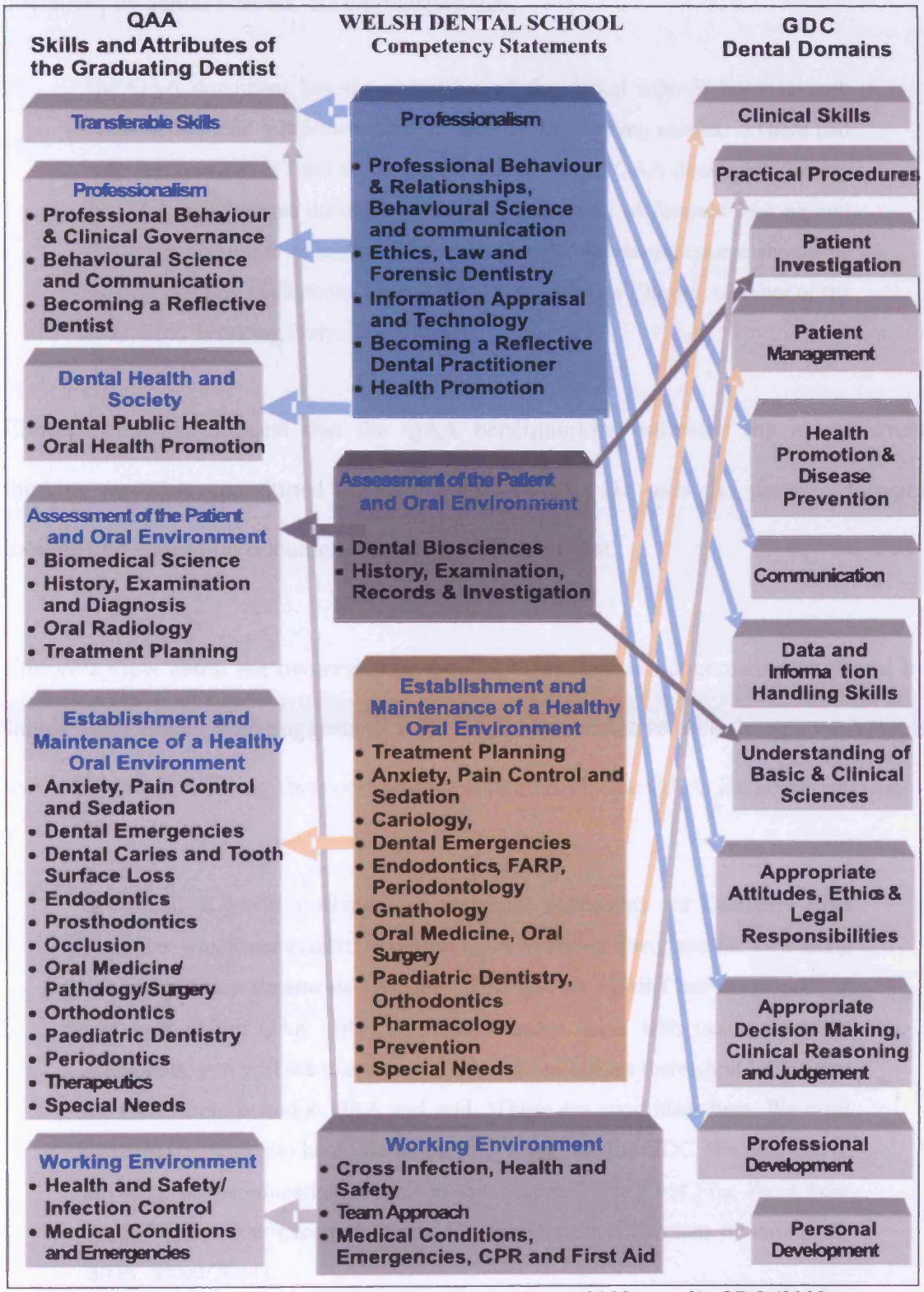
> students. From that I derived sub-competences or learning objectives. I then derived the course content from there. But I don't think that school-wide, in this School, people have derived their course from the competences (Interview excerpt with Patrick McAllen, Lecturer in Periodontology, CD Theme, WDS. 15/07/2004).

McAllen's revelation that most courses at the WDS have not been derived from the school competence statements also point to the lack of education training for most teaching staff. Disparities in approach to the competences are also found between the GDC, the QAA and the WDS, especially at the level of domains.

Comparison of the WDS, QAA and GDC Competence Domains

An examination of the WDS, QAA and GDC competence statements shows them to be similar. However, the grouping of these statements into domains shows some differences in approach between the three institutions. Figure 7.1 shows a map of the WDS, QAA and GDC competence domains. Whereas the WDS domains map almost one-to-one onto the QAA competence domains there are some significant differences between the WDS and GDC domains. There are two plausible reasons why the WDS and the QAA competence domains closely march. The first is that, the QAA document came out early than the GDC document and before the WDS was implemented. This would suggest that the WDS dental domains were influenced by the QAA, or vice versa as suggested by one of the participants below. The GDC document, on the other hand, came out when the WDS restructured curriculum was at the implementation stage. The second reason is related to the ownership of the QAA and GDC documents. The QAA benchmarking process had representation from all dental schools in the UK. It was therefore felt to be owned by the dental schools. Ownership of the benchmark document seems to suggest that the document closely reflected what prevailed in dental schools.

Figure 7.1: Map of the Welsh Dental School, QAA and GDC Competency Statements



Sources: UWCM Dental School (2001, par. 4.3.11), QAA (2002, par. 3), GDC (2002).

Lee Elmore, who represented his school on the GDC working party and on the QAA benchmarking group, subscribed to the view of the ownership of the QAA benchmarks document by dental schools. He emphasises that,

> The QAA document had the ownership of the dental schools because each dental school had a representative on each of the working parties. ...There had been representatives from all the dental schools in the QAA document. Clearly the QAA benchmarks document was written as a sort of forward looking and aspiration document in terms of what we thought the dental course should be looking at doing (Telephone interview excerpt with Lee Elmore, member of the 2002 GDC Working Party. 25/01/2005).

Elmore seems to suggest that the QAA benchmarking reflected the most current thinking on what constituted an ideal dental course. He uses the phrase, "forward looking and aspiration document" to emphasise this point.

Elmore's view about the ownership of the QAA benchmarks document was shared by James MacDonald, who suggests that the WDS representative took the approach taken by the School in deriving their competence statements to the QAA. He points out that,

> QAA had a group working on benchmark statements for dentistry. Eliot Plummer was a representative on the QAA Working Party and he took along our competency statements and said, 'This is what Cardiff has developed.' If you look at the QAA statements and compare those with our competency statements, you will see that there are a lot of similarities there. And I think that the GDC then looked at QAA and said, 'These are good ideas here. We must incorporate those into here.' So that is how it got into the GDC. We didn't have anybody on the education committee that prepared *The First Five Years* from Cardiff (Interview excerpt with James MacDonald, Chairman of the CMG, WDS. 09/09/2004).

MacDonald attempts to explain the similarities between the WDS and the QAA and between the WDS and the GDC competence statements by the direct influence of the

representative from the WDS on the QAA benchmarking group, "he took along our competency statements and said, 'This is what Cardiff has developed.'" He backs his argument by pointing to the similarities between the QAA and the WDS competence statements. He also attempts to reconcile the similarities between the WDS and the GDC competence statements, not by the direct influence of the WDS on the GDC but indirectly through the QAA. He concedes that the WDS did not have a representative on the GDC working party, "We didn't have anybody on the education committee that prepared *The First Five Years* from Cardiff". But he goes on to suggest that the GDC competence statements were influenced by the work of the QAA.

It is difficult to say with certainty whether the similarities between the WDS, the GDC and QAA competence statements can be explained simply on the basis of the influence of individual representatives of dental schools. What is significant though is that, despite superficial differences in domains, the competence statements of the WDS, the QAA and the GDC are very similar. Appendix K.I, II and III lists competence statements of the GDC, QAA and WDS respectively. To facilitate comparisons, the statements are re-numbered consecutively.

Awareness of Personal Limitations

Competence statements are useful in acting as a roadmap and help both teachers and students to focus on the essential knowledge, skills and professional values expected on commencing independent dental practice (Hobson, Carter, Gordon et al. 2004; Ong 2002; Yip et al. 2001). The expected level of competence in the various components of the dental curriculum is specified at three levels of generality: 'being competent at', 'having knowledge of' and 'being familiar with' (General Dental Council 2002, par. 111). The competences are specified at three in order to set the limit on what can

meaningfully be transmitted in the undergraduate curriculum within the available time and resources. Brushwell Coleman points out that,

> You will notice that sometimes we say 'be competent' sometimes we say 'have knowledge'. What we are trying to do is to define three layers, because we can't expect a dental student to be competent at everything. For example in terms of oral surgery, we say, 'be familiar' with the diagnosis of oral cancer and the principles of tumour management. We don't expect a student on graduation to be competent at treating oral cancer. We want them to diagnose and send it to the person who can manage it (Interview excerpt with Brushwell Coleman, chairman of the 2002 Working Party, GDC. 21/05/2004).

Coleman emphasises the importance of stating the level of competence the student is expected to attain "because we can't expect a dental student to be competent at everything". But, as will be shown below, the three levels are also used as 'boundary markers' to delimit the boundaries between undergraduate and postgraduate education. They set out what a general dental practitioner is capable of doing, what and when to refer for specialist care.

Simply stating that students should be "competent at" does not necessarily mean that students will be capable to carry out the procedure to an acceptable level on graduation. A number of factors may prevent students from attaining the level of competence prescribed in the curriculum. These factors include the complexity of certain clinical procedures, practical exposure to clinical procedures within the limited time of the undergraduate curriculum and the availability of training material, including patients, for certain procedures such as root canal treatment (RCT) to be carried out.

When asked whether RCT was one the of those procedures in which students were expected to be competent on graduation, Joseph Smith (JS) responded that it was

unreasonable to expect students to be competent at RCT on graduation because it was a very difficulty procedure:

> *AK:* One of the emphases in the new curriculum is that it is better to have students achieve a few competencies and attain them to very high standards. Would you say that root canal is one of these few competencies?
>
> *JS:* If you mean, "Should they be competent at root canal treatment?" They should be. But I think it is unlikely that they will be. On the wish list, is it one of the important ones? Probably (..) probably (.....) I think it is very important! But then I am biased. I am an endodontist. Other people would argue that you can avoid (...) I think what I would like them to know, to be aware of, is that it is difficulty and that getting out of your depth, I mean not being aware of your limitations can cause problems. It is not like making a denture, what we tell them. It is not like making a denture. You have got the whole process of making a denture. When you fit the denture, if it doesn't work you start again from scratch. It is not the same with endo. Extractions have very definite endpoint. Even if you snap the tooth, ultimately you dig it out. You get it out. Job done, ok! With endo, it is difficult from the start. (...) I would like them to think that probably there is a lot more learning to be done outside this building and that at finals there are so many things they have to take away and learn before they can leave. Endo and molar root canal treatment probably isn't one of them. Simple principles, THEY MUST have those principles in their minds. I think that is the key (..) because I don't think they can be competent having maybe as few as four root fillings. I don't think it is practical to expect them to be competent. No! (Joseph Smith, Senior Lecturer, Restorative dentistry. 19/07/2004)

Smith identifies at least three factors that can prevent students from becoming competent at RCT during the undergraduate training. He points out that RCT is a difficulty procedure and emphasises the importance of students recognising their limitations when they graduate. He uses the metaphor, "getting out of your depth" to underscore the importance of being aware of one's limitations to avoid problems. One reason that makes RCT difficulty is the indeterminate nature of the procedure. Smith

uses a contrastive rhetoric to emphasise the indeterminate nature of RCT. He argues that unlike clinical procures such as tooth extraction and denture construction, which have definite end points, RCT is difficulty. He also points the limited number of RCTs that students carry out during their clinical training as another factor. "I don't think they can be competent having maybe as few as four root fillings". He sees his role as that of transmitting basic principles which students must build on when they graduate. He emphasises that, "THEY MUST have those principles in their minds".

Social Factors Informing the Content of the Undergraduate Curriculum

Social factors were recognised as important drivers of the dental curriculum. Among factors identified by both the GDC and WDS participants to be significant were the public's demand for increased accountability among professionals, including the dentists; patient safety; demographic changes; and changes in the profile of oral and dental diseases. Other factors were changes in the public expectations for oral care; the oral care delivery system, including national policy and trends in general dental practice; and knowledge proliferation and technological advances. These factors not only determine the content, the depth and breadth of coverage. They also have some impact on the classification strength between the contents of the dental curriculum.

Demands for increased Accountability and Effective Communication

One of the main concerns of the public is how dentist handle their patients. This concern centres on the importance of dentists to effectively communicate with their patients and on probity. Malen Davies (MD), a lay member on the GDC Working Party, dealt at length on the importance of effective patient management in dental practice. He

described effective communication and personal integrity in the dentist's behaviour towards the patients and the public as hallmarks of professional behaviour;

> AK: Could you elaborate a little bit more on the question of patient-handling.
>
> MD: Clearly it is mainly about helping people—dentists learning how to communicate. The whole idea is to try to prevent patients having wrong expectations, inflated expectations of what treatment can do, ensuring they understand what will hurt and what will not hurt, the risks attached and what the costs are. It is all about being absolutely explicit upfront at the beginning, and recognising and understanding that patients when they come to the surgery are usually in pain, they are anxious, probably not thinking and listening terribly well. You need to understand all those things when you are explaining to them what it is you are going to do (Interview excerpt with Malen Davies, of 2002 GDC Working Party lay-member. 23/05/2005).

Davies emphasises the importance of effective communication between the dentist and the patient in order "to prevent patients having wrong expectations..." He also talks of the importance of dentists being honest in their handling of patients: "It is all about being absolutely explicit upfront at the beginning." He talks of the importance of the dentist realising that patients are in pain and may not be in a state of mind to make rational judgements, hence the need for extra care when communicating with patients.

The importance of effective communication has been emphasised in the GDC curriculum framework, where it is emphasised that,

> "Students should understand the importance of *communication* between practitioner and patient. This helps to develop attitudes of *empathy and insight* in the student and provides the opportunity for discussion of contemporary ethical issues. [...]" (General Dental Council 2002, par. 65. Emphasis mine).

Like Davies, the GDC underscores the value of effective communication and have gone even further to suggest that effective communication leads to the development of empathetic feelings towards the patient and aids professional judgement (cf. Karydis, Komboli-Kodovazeniti, Hatzigeorgiou et al. 2001).

One of the consequences of continued calls for effective communication has been the enhancement of behavioural sciences, at least in principle, in the undergraduate dental curriculum at all dental schools in the UK (Pine and McGoldrick 2000). In the restructured curriculum at the WDS, behavioural sciences are taught along side clinical sciences and this has helped to elevate the value of this subject among clinical academics and the students. The value of behavioural sciences in guiding dental practice is undeniable. Davis (1981) observed that behavioural sciences were increasingly drawn in the delivery of dental care. However, McGoldrick and Pine (1999) noted that the teaching of behavioural sciences at the UK dental schools was mostly theoretical and at the pre-clinical level.

Public Expectations for Oral Care

Related to demands for increased accountability is the public expectation for high quality dental care. Malan Davies pointed to the changing values and expectation for dental care among the UK public. He contrasted the practice of dentistry in the UK and other European countries and argued that whereas in some countries dentists would not hesitate to extract teeth and replace them with implants, in the UK the public expected their teeth to be conserved at all cost;

> *MD:* [...] dentistry is not a science and there are different attitudes in different countries to the nature of what acceptable standard of care is and what inappropriate treatment is. It differs from country to country. [...]The

> expectations in this country are that a dentist will explain to the patient the nature of the problem and the treatment. But for a lot of European countries that is not the culture.
>
> *AK:* And what do you consider to be appropriate treatment?
>
> *MD:* In this country, I guess, it is treatment that is proportionate. That is to say, we don't, in this country, appear to subscribe to the school that would strive in any circumstances not to, for instance, save the tooth. I can remember dentists in front of me who believed in the school of taking all the teeth out and putting in implants everywhere simply because that was a good way of preventing fillings. That is acceptable in some parts of the European Union. It is not acceptable here (Interview excerpt with Malen Davies, of 2002 GDC Working Party lay-member. 23/05/2005).

Davies identified two public expectations: the provision of appropriate and quality dental care. He defines appropriate dental treatment as "treatment that is proportionate". He gives an example of what he considers inappropriate treatment the extraction of all teeth and replacing them with implants as a means of avoiding fillings. He goes on to contrast the UK public with other EU countries and argues that, whereas in some EU countries the replacement all the teeth with implants is acceptable practice, in the UK it is not. This may be contrasted with the practice of dentistry in the UK during the last century. Until towards the end of the 20th century, it was considered normal practice for dentists to carry out multiple tooth extractions and replace them with dentures as a means of controlling pain and eliminating infection (Dussault and Sheiham 1982).

An example in changes in the public expectation of quality dental care was given by Professor Lee Elmore in relation to orthodontic treatment. Elmore identified some factors that informed the orthodontic content of the undergraduate curriculum in the UK. They include advances in orthodontic treatment techniques, changes in the public

perception of quality orthodontic care, national policy on specialist oral care and the high demand for orthodontic care. He argues that,

> There has been a big change in this country with orthodontics. In the early 1970s most patients were treated with removable appliances and there were residual spaces. Rotations were usually not dealt with and certainly no total control. Nowadays most patients will not accept the fact that there are residual spaces and there are rotations. Now orthodontics is delivered predominantly with fixed appliances by specialists. And so expecting dental students to be competent at removable appliance therapy—removable appliances are now seen, if they are used, as the first-phase of a two phase treatment where you are doing a local tooth movement in a mixed dentition. So there was need to change that. [...] there is a perception that there isn't enough orthodontics available to the population at the level that they want it, and so should we be teaching dental students fixed appliance as well? It takes three years to train a specialist to become competent at that. There is no way in a crowded undergraduate course you could do that. We agreed that they needed to be able to make appliances safe because if someone turned up with a broken brace on your doorstep at five o'clock on a Friday, someone has to be able to do something. You can't just say, 'Oh, I am sorry, I haven't got a clue what to do'. (Telephone interview excerpt with Lee Elmore, member of the 2002 GDC Working Part. 25/01/2005).

Elmore points to trends in orthodontic treatment techniques from removable to fixed appliances. He identifies some benefits of fixed orthodontic appliances. These include refined teeth movements which leaves no residual spaces, correction of tooth rotations and greater control over the treatment resulting in predictable and better treatment outcomes (Cohen-Schotanus, Muijtjens, Scho¨nrock-Adema et al. 2008; O'Brien 1997). Fixed orthodontic therapy is perceived as the most effective form of treatment "over the whole range of malocclusions" (Cohen-Schotanus et al. 2008, p. 350). Elmore asserts the popularity of fixed orthodontic treatment and points out that, "Nowadays most patients will not accept the fact that there are residual spaces and there are rotations".

Elmore notes, however, that demand for orthodontic care far outstripping supply and raises the question of the place of fixed orthodontic therapy in the undergraduate curriculum. He observes that, "There is a perception that there isn't enough orthodontics available to the population at the level that they want it, and so should we be teaching dental students fixed appliance as well?" But he dismisses the idea of introducing fixed orthodontics in the undergraduate curriculum on the grounds that the technical skills required to carry out fixed orthodontic treatment are complex and require at least 3 years of specialist postgraduate training for a practitioner to become competent, "It takes three years to train a specialist to become competent at that".

There have been some notable changes in the GDC guidelines on the orthodontic content of the undergraduate dental curriculum from diagnosis and treatment in the 1960s and 1970s to diagnosis and referral from 2002 onwards. In the 1960s, the dental student was expected to receive "clinical instructions in the prevention and *treatment* of malocclusion of the teeth as *carried out in general dental practice"* (General Dental Council 1963, par. 19 (12), emphasis mine throughout). It is argued that the high demand for orthodontic care in the 1960s, necessitated the involvement of general dental practitioners in the provision of basic orthodontic treatment that required minimum chair-side time (O'Brien 1997). But with advances in orthodontic treatment and in public expectations of quality care, the role of the general dental practitioner has progressively been toned down to simply that of carrying out orthodontic assessment; identifying treatment needs; making safe all forms of orthodontic appliances; knowing when and how to refer for specialist advice; and recognising and managing those problems of mixed dentition requiring interceptive treatment such as space maintainers (General Dental Council 2002, par. 82). See also, General Dental Council (1990, par.

24; 1997, par. 95). That is, in the undergraduate curriculum, students are only expected to observe the delivery of fixed orthodontic treatment in order to inspire some of them to "pursue orthodontics at a postgraduate level" (Cohen-Schotanus et al. 2008, p. 350) and to render fixed orthodontic appliances safe if such help was needed by a patient.

However, Derringer (2004, p. 232) is critical of what he describes as the reduction in course hours and content, which he attributes to the GDC policy and university pressures. He therefore advocates for guideline to safeguard the clinical content and to "prevent any further changes impinging on teaching and course quality of undergraduate orthodontics in UK dental schools".

There is another dimension to the orthodontic content in the undergraduate curriculum related to power and control and economic reward. The trend towards strong boundary maintenance between general dental practice and specialist orthodontic care may be related to how dental care is organised and delivered. In the UK, orthodontists operate within what is essentially a primary care setting. But unlike general dental practitioners, orthodontists receive their patients as referrals from general dental practice. It follows, therefore, that if general dental practitioners were allowed to carry out orthodontic treatment uncontrolled, both the market niche and the reputation of orthodontists as specialists could suffer because the orthodontic care offered in general dental practice would be cheaper. Controlling the amount of orthodontic knowledge available through the undergraduate curriculum defines and secures the market territory for orthodontists.

Oral Care Delivery System and the Financial Reward

The national system of oral care delivery and financial reward are closely linked. In his account of the importance effective communication in general dental practice, Davies

identified the prevailing system of rewarding dentist under the NHS to be a potential barrier to effective communication between dentists and their patients He explained that because the NHS dentists operated on a piece-work basis, the amount of time spent communicating with patients instead of carrying out the required technical procedure translated into loss of income. He pointed out that,

> [...] dentistry, unlike medicine, has a large private element in it and also they get paid by the NHS currently on piece-work basis. That makes it difficulty to spend more time and doing more explanations. All these things: this use of more time to communicate with patients is a loss of money at the end of the day (Interview excerpt with Malen Davies, GDC Working Party member. 23/05/2005).

Malen emphasises that the piece-work approach to rewarding dentists under the NHS makes it difficulty for dentists to spend more time on communicating with patients, "...this use of more time to communicate with patients is a loss of money at the end of the day". This observation illustrates the impact of economic reward on the delivery of care and on how knowledge transmitted in the undergraduate curriculum is used in professional practice.

The impact of economic rewards is not limited to power and control over the content of the undergraduate curriculum. It may also be a factor in the disproportionate allocation of curriculum time to some subjects such as prosthodontics (see, for example, Canton 1896; Eason 1938; Lancet 1911; Shaw 1916), even when external social circumstances dictate the opposite.

In his account of the difficulties experienced in finding and recruiting patients for root canal treatment, Joseph Smith pointed out that there have been suggestions to set up

separate endodontology clinics and make endodontology a postgraduate subject. He, however, argues that making endodontology a specialist discipline would negatively impact on general dental practice;

> [...] it is suggested that we have an endo-clinic. They have a perio-clinic. [...]. I can see the attraction of having an endo-clinic. All the people together, it is me and them rather than some of my colleagues who pass on as endodontic-oriented as I am. On the other hand, our students are going to be general practitioners and to take endo out of context I think is problematical. It is part of the general practice. Some people say we shouldn't do it at all, "It is too difficulty. Make it postgraduate like orthodontics". Well, you couldn't exist in general practice without doing root fillings. It would be impossible (Joseph Smith, Senior Lecturer Restorative dentistry. 19/07/2004).

In this account, Smith points to the centrality of root canal treatment in general dental practice. He is against the suggestion of creating separate specialist endodontology clinics like periodontology or orthodontics clinic on the grounds that this would take endodontology out of context from general practice. He is also against the suggestion of making endodontology a postgraduate specialist subject, arguing that root canal treatment was an integral component of general dental practice, "...you couldn't exist in general practice without doing root fillings. It would be impossible".

There are two possible interpretations to Smith's assertion that it would be impossible to exist in general dental practice without carrying out RCT. The first is that RCT is the backbone of general dental practice because of the number of patients seeking this type of dental treatment. Therefore pushing RCT to specialist secondary care would impact negatively on access to dental care. However, earlier, Smith clarified that the problem encountered in teaching RCT in the undergraduate curriculum was twofold. It was difficulty to recruit patients and the technique was complex for students to become

competent within the limited time of the undergraduate curriculum. He went on to suggest that there were many general dental practitioners out there who were not competent at RCT. If this is true, it may suggest the provision of unnecessary and/or substandard RCT in general dental practice (cf. DHSS 1986; Jago 1984). It also follows, therefore, that RCT is considered as the backbone of general dental practice because of the economic realities of dental practice as a business (Dharamsi , Pratt and MacEntee 2007). That is, like prosthetics, RCT offers good economic rewards.

Demographic Changes: meeting the needs of an aging population

Improvements in the quality of life as well as advances in healthcare have resulted in increase in the lifespan in most Western society including the UK. But an aging population has implications on the delivery of healthcare in general and dental care in particular, which cannot be ignored. To address the oral health needs of the elderly population, there have been calls to adjust the dental curriculum (Katz 1986; WHO 2002). In the UK, the GDC responded by introducing gerodontology in the 1997 undergraduate curriculum guidelines in order to specifically address the needs of the increasing number of elderly patients. Professor Morgan Maples observes that,

> In the first edition of *The First Five Years,* one of the new sections was gerodontology, recognising that the population of this country is getting older and that older people have particular needs and requirements and therefore if one can look at that as a subject and integrate various aspects into it. This is highlighting a particular need in the country and encouraging the students to think about all aspects of older people as a consequence (Interview excerpt with Morgan Maples, former member of the GDC Working Party. 28/02/2005).

In the 2002 undergraduate curriculum framework, the GDC addresses the importance of dental students being aware of the special dental needs of the elderly patients;

> The student should be aware of the presentation of dental and oral diseases and disorders in elderly people, and the range of psychological and social factors involved in such situations. [...]Given the profound demographic changes affecting the population and the significant increase in the number of older adults with some natural teeth, the GDC would expect to see specific emphasis on this throughout the curriculum (General Dental Council 2002, par. 77)

The main challenge in meeting the dental needs of the elderly patients is that most of these patients will also have other major medical conditions (Formicola 1991; Miyatake, Kazama, Isoda et al. 2004; WHO 2002). This requires an interdisciplinary approach in the delivery of care and the strengthening of the medical content of the dental curriculum (Formicola 1991; Miyatake et al. 2004) if dentists have to function as effective members of interdisciplinary teams. But increased medical content in the dental curriculum leads to weakening in classification strength between dentistry and medicine (cf. Giddon 2006; Giddon and Assael 2004; Nash 1995; Nash 2006).

Changes in the Oral Health Status of the Public

In addressing the demographic changes, the GDC (2002, par. 77) has referred to a "significant increase in the number of older adults with some natural teeth." This is in direct reference to improvements in the oral health status of the population, as more and more individuals are retaining their teeth even in old age. Morgan Maples gave a chronological narrative of the impact of changes in the dental disease profile on the dental curriculum. He observes that,

> The most dramatic change will have been the fact that in the 1950s and 1960s there was a huge amount of dental disease to deal with once the National Health Service had come into being and to deal with the neglect that had occurred in the 1930s and 1940s during the second world-war. And so when

> the National Health Service came into being, the health of the nation was that the main accent was dealing with pain and sepsis. And so there would have been a great deal of practice involved with the extraction of teeth and the provision of dentures. And so the recommendation of the curriculum at that time were that once a new graduate qualified, that he or she—mostly he in those days—that person would be able to give general anaesthetics and has been taught how to give them and has had experience in giving them. Of course what then happened after the pain and sepsis was dealt with and the adult and child dental health started to get better, then the accent was on restoration and then subsequently the main focus was on prevention. That has occurred over the last 40 or 50 years and this has been reflected in some of the significant changes of the recommendations. [...] I think that is perhaps an example whereby big changes in oral health in the country have been reflected in the change in requirement for undergraduate education. [...]Then of course there was the need to stress the importance of prevention and of behavioural management. This subsequently came into the newer editions of the recommendations and of the two editions of *The First Five Years.* A big, big change I think! (Interview excerpt with Morgan Maples, former member of the GDC Working Party. 28/02/2005).

Maples has outlined the evolution dental care in the UK from pain relief and infection control in the 1950 and 1960s, when there was "a huge amount of dental disease to deal with". This was reflected in the curriculum by the amount of time devoted to prosthodontics and oral surgery, including the requirement for the dental students to be competent at administering and carrying out some dental procedures under general anaesthesia. Following a reduction in dental disease, the next phase was the focus on restorative dentistry and on prevention.

Prosthodontics is a specialty of dentistry with the major focus on the replacement of lost teeth by dentures. The amount of time devoted to denture construction in the undergraduate curriculum has been debatable from the close of the 19th century until today (see, for example, Canton 1896; Eason 1938; Lancet 1911; Shaw 1916).

However, recently there have been renewed debates on the place denture construction in the curriculum following a reduction in the number of people losing their teeth. MacDonald pointed out the relationship between prosthetic dentistry and the decline in dental caries. He, like many others, argues for the reduction in curriculum time devoted to denture construction,

> If you look at the epidemiological data, you can see quite clearly that the number of edentulous adults in the United Kingdom is falling very rapidly. Therefore, you have to say 'How much time should we be devoting in the curriculum to full denture prosthetics if there is not going to be that much around, and bearing in mind what is going to be happening in the wider context of dentistry with the advent of the prosthetists—PCDs who will be able to make dentures. So do undergraduates need the skill of how to make dentures? The final thing about that is we have a specialist list. There are specialists in prosthodontics who can handle difficulty cases. And as a proportion of the total edentulous population, a lot of them are going to be difficulty cases because they will have been edentulous for a long time and have flat ridges and flabby ridges and all the things that we know make dentures difficulty (Interview excerpt with James MacDonald, chairman of the CMG, WDS. 09/09/2004).

MacDonald has identified three factors that render support to a reduction in prosthodontics in the undergraduate curriculum. The decline in the number of individuals without teeth, the creation of another category of professionals complimentary to dentistry called the prosthetists; and the fact that a large proportion of those needing dentures will be difficult cases requiring specialist care by the prosthodontist. He therefore questions the logic of continuing to devote a large proportion of the curriculum time to denture construction.

A decline in oral disease, particularly dental decay, has been reported in developed economies including the UK (Nunn et al. 2000; Zarkowski et al. 2002). This has led to

demands for reduction in curriculum time devoted to the construction of dentures. Mojon et al. (2004) predict a decline in the demand for full dentures by as much as 50-60%in the next 20 years. A survey of the UK population conducted by Nunn et al. (2000) report that, on average, adults in 1998 had fewer missing teeth and more sound and untreated teeth. They further report an increase in the number of sound or untreated teeth from 13 in 1978 to 15.7 in 1998. In a related survey, Bradnock et al. (2001) report improvements in dental health attitude with more adults keen to retain their natural teeth, while Nuttal et al. (2001) reported a rise in attendance for dental check ups among adults from 43% in 1978 to 59% in 1998.

The decline in the number of people losing their tooth, improvements in the public attitudes towards oral health, the increase in the number of difficult cases of requiring dentures and the creation of a new group of PCDs called the prosthetist all present a strong case for reduction in the prosthodontics content of the undergraduate curriculum.

Knowledge Proliferation and Advances in Science and Technology

The impact of advances in science and technology and rapid knowledge proliferation on medical and dental education is widely acknowledged (Boshuizen 2003; DePaola, Howell, Baker et al. 2002; Oliver, Kersten, Vinkka-Puhakka et al. 2008). Boshuizen (2003)observes because of rapid proliferation in knowledge, by the time student graduate some of the knowledge some of the knowledge they have been socialised in will have become obsolete. This requires the production of graduates who are flexible and possess independent learning skills.

The proliferation in knowledge and technological advances offer new opportunities as well as challenges in dental education. Among some of benefits a better scientific

understanding of the disease processes and how to treat them; and the availability of improved dental instruments and materials. Joseph Smith identified two benefits of knowledge proliferation and technological advances in relation to RCT. He pointed to better understanding of the disease process and principles underlying RCT. He describes the new approach to RCT as the 'biological approach'.

> *JS:* [...]. We have a much more biological approach to root canal treatment now than the technical process that we used to have. The biological aspects are emphasised much more and the evidence-based to support that is discussed in detail and emphasised in the assessment processes. [...]
>
> *AK:* Could you just elaborate a little bit more on the 'biological approach'
>
> *JS:* I think in the past root canal treatment has been a very technical procedure—cleaning, shaping the filling. And because it is such a complicated technical procedure, that is what students had to learn and carry around with them. Pick up A, use it like this. Pick up B, use it like that, and so on and so forth—a huge list of procedural steps. But what we have known for a long time, but only now really (..) paying attention in the last five, ten years, ...paying enough attention to is that the disease is one of infection and the procedural steps that we were talking about are simply a way of eliminating the infection. And if you can eliminate the infection, then you get predictable healing and if there are issues, reasons, problems why you cannot eliminate infection, then you do not get healing, or you might not get healing. [...] The most important part is what anti-microbial irrigant you are using to disinfect the preparation that you have made. That is what I mean by biological approach, that we emphasise the microbial aetiology. We examine the evidence for that aetiology, which was known in the early 60s. It is not new. And on that basis, we have a mandate to deal with treatment in a particular way.

Smith differentiates between technical and biological approaches to RCT. He points out that in the past the approach to RCT was very technical, involving "a huge list of procedural steps" of how to clean and shape the filling. He contrasts this with the

modern biological approach in which the underlying principle is that of infection control, "...if you can eliminate the infection, then you get predictable healing".

Smith also acknowledges the introduction of rotary instruments on the dental market as a radical development in RCT. He points out that,

> [...] We have changed the shaping technique. We use nickel-titanium rotary instrumentation which, on the one hand is so simple that we try and underplay it. We just say, "This is what we are going to do and at the end of it you have got this shape" (Joseph Smith, Senior Lecturer Restorative dentistry. 19/07/2004).

Smith argues that the advent of rotary instruments in RCT has made the teaching of the shaping technique very easy to the point of being taken as simply a matter of showing students where the process begins and ends.

The rapid turnover in knowledge has implications on the volume of knowledge transmitted in the undergraduate curriculum. It also poses some challenges on the teachers who, as Bertha Fraser observes, are called upon to transmit knowledge and skills which, in some cases, did not exist when they were students:

> [...] a lot of the *technical work* that I was taught, we are not teaching students now. We need the students to have *new skills*; a broader range of skills; more *diagnostic skills* and more *technical skills* in some areas that were not even invented when I was a student. And these are challenges for us to try and teach those. I think it is important that we *put limits* on what we think we can achieve. If we try and teach too much, we teach nothing. I think we need to say, "We will teach this." Once we have taught that, that is as much as we can do. We need to constrain what we are teaching and try and teach the students basic skills very well and allow other groups, like vocational trainers and general professional training, to develop their development skills further. My view is that we are trying to *put the building blocks in place*: the building blocks of *basic technical*

> *skills*; *diagnostic skills*; *communication skills*. But also skills that I wasn't taught such as *library skills*, *audit skills* and *IT skills*, which are essential for a modern practitioner so that they can continue to develop themselves. These are things that I think we are doing and I think that these are important to make the student become a practitioner who is flexible and can develop with changes in technology and changes in dental health. I think there are changes and I don't think I was taught those skills. I was taught a technical course, which was fine, but I don't think we can do that any longer (Interview excerpt with Bertha Fraser, senior lecturer, WDS, 2004).

Fraser has drawn attention to the volume and type of knowledge transmitted in the dental curriculum. She itemises the new knowledge and skills transmitted in contemporary dental curriculum, some of which was not "invented" during her undergraduate professional socialisation. But knowledge proliferation leads to curriculum overload. She therefore sees the role of dental education as twofold. To lay the foundation in basic knowledge and skills and she uses the metaphor of "building blocks" to describe this role. The other function is that of equipping students with skills in lifelong self-directed learning (Barrows 1986; Reed 1990; Tedesco 1990), order to "make the student become a practitioner who is flexible and can develop with changes in technology and changes in dental health".

Summary

This chapter has identified and discussed factors informing the content of the undergraduate dental curriculum. These factors fall under two broad themes: the education principles and social factors. The education principle which informed both the GDC curriculum framework policy and the WDS restructured curriculum is the competent curriculum. The competence curriculum is a widely acknowledged education principle in contemporary medical and dental education (Chambers 1993, 1994; Harden 2002a; Plasschaert et al. 2002). The competence curriculum begins with some clear

definition of the competencies expected in students on graduation. These competences are derived from the professional roles and tasks carried out on graduation. This may suggest that the competence-based curriculum may also be serving the secondary function of a tool for ensuring accountability in dental education.

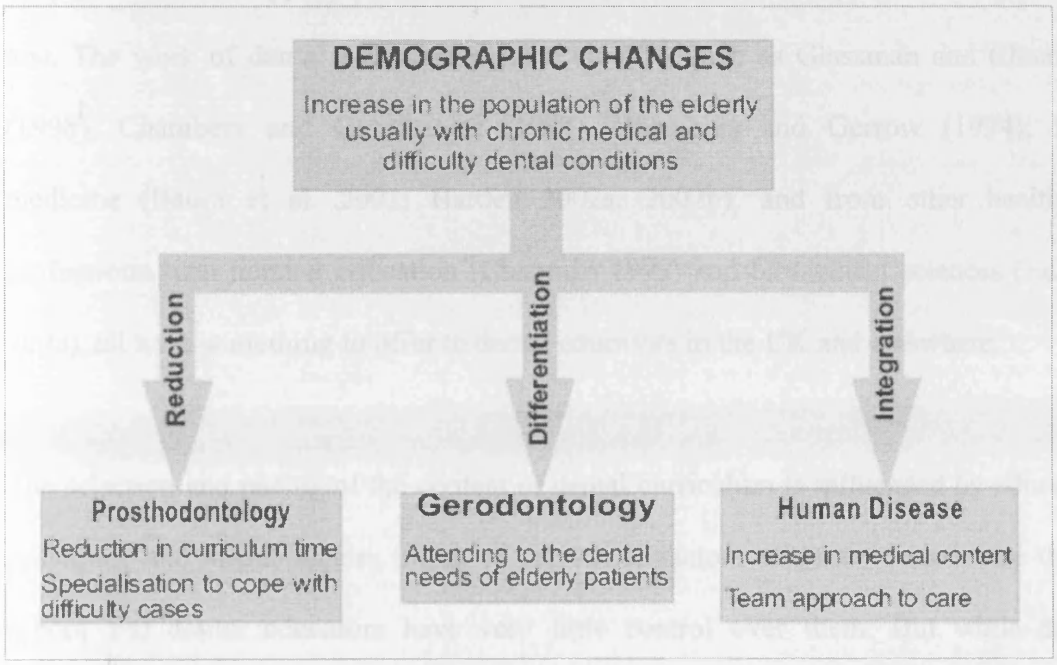
Social factors impacting on the content of the dental curriculum have been identified. They include the public demand for increased professional accountability in the delivery of care (see also Alaszewski 2002; Bristol Royal Infirmary Inquiry 2001; Rohlin, Schaub, Holbrook et al. 2002); public expectations for quality oral care (Douglass and Sheets 2000); changes in the attitude towards dental health and improvements in the oral health status of the population (Nunn et al. 2000; Zarkowski et al. 2002); demographic changes, characterised by an increase in the elderly population (Cohen Mm 2002; Miyatake et al. 2004; WHO 2002); and knowledge proliferation and advances in technology including the advent of improved rotary dental instruments and dental materials (Goldon 2004). Each of these factors may affect one several contents of the curriculum.

The two main ways in which social factors impact on the curriculum are on the degree of classification, resulting in curriculum integration or differentiation. The second is on the time allotted to content of the curriculum. This may be increased or reduced. Figure 7.2 illustrate the impact of demographic changes on three different subject areas.

An increase in the elderly population led to the creation of gerodontology as a subject to specifically address the needs of this group of dental patients. This is an example of curriculum differentiation. But the elderly patients usually have some other underlying chronic medical conditions requiring a team approach to care and an increase in the

medical content of the dental curriculum. This leads to weakening of boundary between dentistry and medicine. Improvements in dental health mean that most dental patients, including the elderly, retain their teeth for most of their life. Those requiring dentures are usually difficult cases. This has resulted in calls for reduction in curriculum time devoted to prosthodontology.

Figure 7.2: Impact of Demographic Changes on Dental Curriculum



In their interview accounts, participant extensively deployed the pragmatistic repertoire and rarely made any reference to the written literature to support their claims. On the few occasions that reference was made to the literature, participants from the WDS tended to limit themselves to the GDC and the QAA documents while participants from the GDC acknowledged the influence of the GMC (2003) and the work of the Scottish medical group (Simpson et al. 2002) in informing their education thinking on competence-based education. The exclusion of the abstractionist repertoire in participant accounts may simply be due to the fact that, the triple function of teaching,

research and clinical consultancy leaves few dental academics with time to engage with literature outside their own disciplines and research interests as already suggested in the last chapter. It is also plausible to suggest that the social positioning of the participants is a significant factor in the dominance of the pragmatistic repertoire in the interview accounts. As pointed out in chapter 4, both the GDC and the WDS participants presented themselves as experts and world leaders in dental education. As leaders, it is their experience, and not what others have theorised, that counted most. But this also simply means that opportunities to learn theory and from the experience of others are lost. The work of dental educators outside the UK, such as Glassman and Chambers (1998), Chambers and Geissberger (1997), Chambers and Gerrow (1994); from medicine (Baum et al. 2002; Harden 2002a, 2002b); and from other healthcare professions such nursing education (Chapman 1999) and biomedical sciences (Edgren 2006), all have something to offer to dental educators in the UK and elsewhere.

The selection and pacing of the content of dental curriculum is influenced by education principles and social factors. Most of the social factors originate outside the dental school and dental educators have very little control over them. But while dental educators have been quick to respond to prevailing educational theories, they are usually slow in responding to and rarely take into account social factors when planning the curriculum. However, if curriculum planning is to move from being just another additional extra on the calendars of dental school, here is need for a comprehensive approach to curriculum planning. In the next chapter factors informing how dental knowledge is transmitted are explored.

Chapter 8

The 'How' of Dental Curriculum: The Pedagogic Strategies Employed in the Transmission of Dental Knowledge

Introduction

> "...integrated codes will, at the level of the teachers, probably create homogeneity in teaching practice" (Bernstein 1977, p. 101).

In the preceding chapter, factors informing the content of the undergraduate dental curriculum were discussed. This chapter shifts the focus to the pedagogic strategies employed to transmit dental knowledge. Bernstein (1977, p. 47) defines pedagogy as "valid transmission of knowledge". In discussing the pedagogic strategies commonly employed at the Welsh Dental School (WDS), the term 'knowledge' is broken down into the three domains: cognitive or theoretical knowledge; psychomotor or procedural knowledge; and affective or professional values and attitudes. It is important to differentiate between the three knowledge domains because ordinarily, when we talk about the transmission of knowledge the focus tends to be one knowledge domain—the theoretical knowledge. When asked what pedagogic strategies they employed to transmit knowledge in the new curriculum, it became evident from the responses that most participants at the WDS had only cognitive knowledge in mind. This is not surprising because teaching is commonly associated with information transmission.

Secondly, fundamental differences between the three knowledge domains means that instructional strategies that are successful in one domain may prove ineffective in the other domain. For example, the transmission of technical other related professional clinical skills such as cavity preparations, require consistent and judicious hands-on

approach (Leach 2002), with emphasis placed on providing students with opportunities for repeated practise of the new skills and knowledge in real life settings (Crawford et al. 2007; Oliver et al. 2008; Reed 1990), while the transmission of professional judgements, values and attitudes takes place through the hidden curriculum.

A Mixed Pedagogic Approach

The educational approach employed to transmit knowledge at the WDS is described as a mixed pedagogy. Towards the end of a long thematic narrative about how the new curriculum was conceived, James MacDonald, the chairman of the curriculum management group (CMG), finally talked about the position taken on pedagogic methods in the new curriculum. He referred to this aspect of the curriculum as the 'how' of dental education:

> [...] There was a little bit about the 'HOW' as well with themes. One of the big questions in the 'how' is, "What sort of teaching styles are you going to adopt? Is it going to be lecture-based? Is it going to be small group seminar-based? Is it going to be problem-based learning, case-based learning? How is it going to be?" There was some support from people for a problem-based learning course. But there was also quite a lot of objection to that. And having talked to an awful lot of people..., I went on several PBL courses. I went to study days on PBL; I spoke at various meeting on PBL and got lots of feedback and so on and so forth. I came round with the opinion that in fact a hybrid course was the best because there are some things that are better delivered in a lecture format and there are some things that are better delivered in the PBL format and some things that are best delivered in the seminar type format. So we did not settle on a particular pedagogic approach. We said that we want to increase the amount of PBL that occurs in the course, but we did not specify which bits should be PBL. We left that down to the individual topic leaders to decide how they would actually take that forward. So we weren't specific about that (Interview excerpt with James MacDonald, member CMG, WDS. 09/09/2004).

MacDonald recognises that there is a spectrum of teaching styles. At one end of the spectrum is the strong framed, teacher-centred traditional lecture and at the other end are the weak framed approaches such as the problem-based learning (PBL), in which students exercise greater control over their learning. In between are pedagogic approaches with varying degrees of frame strength such as seminars, tutorials, case-based learning and projects. From the narrative, MacDonald seems to suggest that one of the key issues in discussions on teaching styles was whether to adopt a full PBL curriculum or not. This is insinuated in the phrase, "there was some support" for and, "there was also quite a lot of objection" to PBL. He goes on to talk about his participation in various PBL courses and meetings and getting "lots of feedback". This background information about attendance and participation at PBL conferences served to convey the fact that in deciding whether or not to adopt a PBL curriculum, MacDonald was well informed about PBL as an education strategy. It is only after driving this point home that he finally states his position, "I came round with the opinion that in fact a hybrid course was the best". Apart from stating that some things are better offered in the lecture format and others in the PBL format, no other reason is offered for rejecting a full PBL course.

In what appears to be a shift from the abstractionist to the pragmatistic repertoire, MacDonald points out that although the curriculum management group (CMG) wanted to see an increase in the amount of PBL in the programme, it was left to topic leaders decide which components of their course would be suitable for the PBL format; "We left that down to the individual topic leaders to decide how they would actually take that forward." This turn in interpretative repertoire may be seen as a strategy aimed at pacifying both the proponents and opponents of the PBL curriculum. But it also means that the term "hybrid course" was subject to various interpretations depending on the

education principles, teaching experience and education training of the topic leaders (Behar-Horenstein, Mitchell, Notzer et al. 2006; Sweet , Wilson and Pugsley 2008b).

Transmission of Cognitive Knowledge

By delegating the task of choosing appropriate pedagogic strategies to topic leaders, it is assumed that subject and theme leaders were familiar with the various instructional styles and the education principles underlying these styles for them to make informed choices. But apart from one or two exceptions, most dental academics did not have any education training nor made any attempt to familiarise themselves with prevailing education principles. Evidence from the participants' accounts suggests that most subject and theme leaders relied more on pragmatic factors rather than sound education principles in their choice of pedagogic methods. It may be plausible to suggest that because of this, the restructured curriculum at the WDS has not fully realised the benefits of a mixed pedagogic approach.

Lectures

Although the new curriculum provides for a range of pedagogic approaches, lectures remain the dominant method of transmitting knowledge at the WDS. Its popularity is attributed to being the most cost-effective method for imparting a massive body of information to large audiences (Kim and Marshall 2005). In the restructured curriculum, the method of transmitting dental public health has been changed from small-group teaching and symposia to lectures. Marty Williams, a senior lecturer, defended the move as the most cost-effective way of transmitting some dental public health topics that simply required the imparting of information to students:

> In the old curriculum, dental public health was taught mainly in small group teaching and in a series of what we call symposia, which were three hour sessions. We came to the conclusion that a lot of what we were teaching in small group was very repetitive and labour intensive teaching and didn't really need to be taught in small group teaching. So in thinking about how we were going to restructure the course, we identified those subjects that we thought could be taught in the form of a didactic lecture. That makes it seem a kind of backward step in current education thinking. But there were some subjects like, "What are the effects of smoking?" for example, and the types of epidemiological studies and how the Health Service is organised. These kinds of subjects you just teach in the form of a lecture because there isn't any...you are just imparting information to the students. You need to get them new information or collect them sources where they can do further reading. There are other subjects, however, like getting them to think about inequalities in health...or the advantages and disadvantages of different methods of organising health services, where the students can interact. They can have a discussion (interview excerpt with Marty Williams, Senior lecturer, DIWC. 23/07/2004)

Williams justifies the move from small-group teaching to lectures on the grounds that small-group teaching was repetitive, labour intensive and, by implication, a drain on curriculum time. William is, however, quick to acknowledge that the move from small group teaching to lectures appears to be in contradiction of modern education thinking. He sees his role as twofold: that of an expert conveyer of information (Fincham and Shuler 2001; McLean and Van Wyk 2006) and the identification of appropriate learning resources for students (Charlin et al. 1998). He argues that there are some topics in dental public health which are best delivered in the lecture format because, "...you are just imparting information to students". He sees his role as that of getting students new information or identifying for them "sources where they can do further reading". Williams' characterisations of his roles are in total agreement with the traditional views of the lecture as an instructional strategy.

Lectures are teacher-centred, strong framed pedagogic encounters in which the students are often cast in the role of passive recipients of knowledge. However, lectures are acknowledged as an indispensable tool in the transmission of knowledge, especially when they are used in combination with other student-centred pedagogic strategies such as the PBL (Bratt 2003; Patel et al. 2004; Stjernquist and Crang-Svalenius 2007). Williams implicitly acknowledges the use mixed pedagogy when he points out that some dental public health topics, such as inequalities in health, provide opportunities for students' interactions and discussions (cf. Fowler and Poetter 2004). Fyrenius, Bergdahl and Silén, (2005) have gone on to suggest renewed and restructured lecture formats in which student passivity is eliminated by creating opportunities for students to demonstrate comprehension and to question misconceptions.

Lectures were identified to be the only instructional method used to transmit human disease topics. The theme leader for Human Disease, Martin Johnson, pointed to the lack of control by the Dental School over human diseases teaching as the main reason for the dominance of lectures in the human disease course. He points out that;

> Human disease is delivered predominantly by the traditional lecture format. The problem we have is it is delivered by a large number of individuals from the departments of medicine, surgery, pathology, microbiology and therapeutics in the School of Medicine. The School of Medicine receives funding to deliver what is called medical for dental, which means medical teaching for dental students. That in itself is a problem because you are dealing with a large number of individuals over there [the School of Medicine] who may only be giving one or two lectures on the dental course and perhaps don't have a fuller understanding of what they have got to deliver. In that respect, I suppose, I have to act as the link between the Dental School and the Medical School to ensure that, as I have already said, the subjects we believe to be important are taught. I can say, "We need to include information on this, but we don't need to include information on that"—to be able to direct the teaching. [...]The vast majority

> consist of two blocks of teaching delivered by lectures all day on Tuesday. In an ideal world the teaching would be done differently. We would have small group teaching attachments to the wards, going into theatre, and having a wide experience of medicine and surgery. But in fact the constraints of teaching and the constraints of time within the course just don't allow that. The one area, which we must attend to, though, is the accident and emergency teaching (Interview excerpt with Martin Johnson, Theme Leader, Human Disease. 29/03/2004).

The dominance of lectures in human disease teaching points to weak external framing. Weak external framing in this case refers to reduced control by the Dental School over the instructional strategies adopted by the human disease lecturers from the Medical School (cf. Hoadley 2003). This simply means that the human disease lecturers were not obliged to be committed to the requirements of the restructured dental curriculum. Both the theme leader for human disease and the dean of the Dental School confessed that in fact they faced two challenges. The first challenge was to find lecturers at the Medical School who were willing and committed to teaching human disease topics. The second was to ensure that only relevant medical topics were delivered to dental students.

Johnson laments about the challenge of coordinating a large number of individuals "who may only be giving one or two lectures on the dental course and perhaps don't have a fuller understanding of what they have got to deliver". He goes on to suggest that, in order for the dental students to have a wide experience of medicine and surgery, in an ideal situation there would be small group teaching attachments to medical wards, surgical theatres and emergency unit clinics. He, however, points to the pressure of teaching loads and the lack of time among some of the barrier to achieving an ideal human disease course.

In an attempt to make sense of and to justify the dominance of lectures as the only instructional strategy in human disease, Johnson deploys both the pragmatistic and abstractionist repertoires. His use of the two repertoires arises from attempts to reconcile the ideal and the practical reality of human disease teaching. Johnson signals the use of the pragmatistic repertoire when he presents the prevailing practical reality—the dominance of the lecture format in the human disease course. He then shifts to the abstractionist repertoire and this is signalled by the phrase, "In an ideal world the teaching would be done differently". He then goes on to elaborate what the 'ideal world' for human disease teaching should be. That is, the dental students would have "...a wide experience of medicine and surgery". But he concludes by giving credence to the pragmatistic repertoire. He achieves this by deploying some form of CYCATYC device. That is, "...the constraints of teaching and the constraints of time within the course just don't allow that". By this final admission, Johnson seems to suggest that the use of lectures is justifiable under the prevailing conditions.

Seminars and Independent-Study

Unlike the human disease course, the paediatric dentistry course offers an example of the use multiple pedagogic approaches to transmit knowledge. In addition to the traditional lectures, Gideon Pinnacle, a subject leader for paediatric dentistry, mentioned two other teaching strategies used to transmit paediatric dentistry topics. These are seminars and what he called as a variant of the distant learning approach:

> We changed the way we are delivering some of the information. We have always had a high number of seminars. We have tried to keep those to get small group teaching rather than preaching at all times. We have also done things like taking what was a very traditional seminar-based dental trauma course and we have completely got rid of that and we are now using what is effectively like a

> distance learning module where the students have a workbook and they are given a textbook and there are basically a series of questions to work their way through dental trauma problems with some questions they have to answer when they come back to the seminar to discuss with us. Which, if you like, gives an opportunity to make for themselves their ideal set of notes without us interacting with them (Interview excerpt with Gideon Pinnacle, WDS. 16/07/2004).

Pinnacle indicated that even in the old curriculum, the paediatric dentistry course had made use of at least two pedagogic approaches—seminars and lectures. He indicates the prevalence of seminars in the old and new curriculum when he says, "We have always had a high number of seminars". He then goes on to show the value placed on seminars in contrast to lectures by disparagingly referring to lectures as "preaching at all times". He describes a newly introduced strategy in the delivery of the dental trauma course as changing from a "very traditional seminar-based dental trauma course" to a variant of a distant learning module. In the new module students worked independently through the dental trauma problems followed by seminars where they got some feedback on their work. Pinnacle identified one of the advantages of this approach to be the facilitation of independent study. This is demonstrated by the students making for themselves "ideal set of notes" and through active participation in the seminars.

The variant distant-learning dental trauma course is a relatively weak framed pedagogic encounter in which the dental students exercise some control over their learning (Bernstein 1977). It also suggests good education practice by actively engaging the students. This is implied when Pinnacle talks of giving students "an opportunity to make for themselves their ideal set of notes..." But Pinnacle goes on to add the caveat, "...without us interacting with them". When this is taken together with the fact that dental academics have to divide their time between clinical consultancy, teaching and

research, then the change from a seminar-based to the 'distant-learning' module may be interpreted as an attempt to freeing some time from teaching.

Variant PBL and Case Scenario

Another example of diversity in pedagogic approaches involving weak framing is found in the periodontology course. Patrick McAllen, (PM) the subject leader in periodontology, uses a combination of what in describes as a variant of the problem-based learning and the case scenario. His pedagogic approach is guided by two principles: creating an education environment where students are challenged and nurtured, and a cooperative approach to learning. He is very critical of the traditional 'information transmission' approach to teaching:

> There still is the philosophy here—I think the pedagogy is one of transmission—of transmitting information across. [...] "I know it, I transmit it to you." Whereas, the most important thing I have learnt is this: What is important is where the students are and how they are supported in their learning. Sometime they might need to be taught something, but not usually. It is not always that useful because they are going one way or the other. It is better when they are put in a situation where they have got to be nurtured and where they have got to be challenged and then they will come up with the goods (Interview excerpt with Patrick McAllen, WDS. 15/07/2004).

In his variant PBL and case scenario teaching styles, McAllen emphasises the principle of cooperative learning. He described his pedagogic approach and the rationale for adopting it in a narrative form as follows;

> *AK:* What is the mode of delivery? How is the teaching carried out under the new curriculum? Is it any different from the previous curriculum?

PM: I don't know if there is that much difference. I don't know. I wouldn't like to say... There is a tiny bit of classic PBL in the course. Tiny bit, which is in the first and second years. But I think it is very difficulty to... if you look at the literature on PBL, when a little bit of PBL is put with a didactic course it seems to be moved out to one side by the students in their thinking. If it is not assessed very much, then in fact it seems to be pushed to one side. They find it difficulty to see the relevance of it and things like that. I think it is difficulty with such a hybrid course, and PBL being very low percentage of what is going on. I think it is very difficulty to get that work well. What I am doing is a variant of PBL. It is not the same as PBL at all. I use a presentation technique. I give then a course booklet with the learning objectives and references. I think that is not necessarily self explanatory. I am a great believer in briefing or brain-storming. What we do is we, as a class, get through the words and I get the students to read the objectives one by one as we go round the room. In that way we cover the ground and make sure that those who are less aligned to the course and less adept can all understand. Everyone can understand what the course is about. Having done that, then we either divide the different subjects up so that a pair of students prepare it and do a presentation on it or we get the whole class to do the presentations, splitting the whole thing up a little bit and two of them will convene a power-point presentation and all the other students will give a couple of slides in to their colleagues and they do group power-point presentation. And that is a good way of learning—they all contribute. After that we have a discussion about it. On top of that we have a scenario, where I make up a case based on the topic. We go through that and we raise some questions as well on it and they go through that. I think it is rather a good system because it consolidates their learning. If they know it, if they have learnt the information, then when they go through the case scenario it will confirm that they know quite a lot and also broaden them out because they can put what they are learning in context as well. So that is my latest way of teaching, which is a hybrid of presentation learning and problem-solving or problem-based learning—something like that. I call it competence-based learning because the idea I have is that we will all... I think the students ...I say we will all go out that door and we will all pass. I will pass as a teacher and they pass as students. So we have to make sure that we all look after one another. I have a feeling that we are. Nobody moves on until everyone in the room understands where we are coming from (Interview excerpt with Patrick McAllen, WDS. 15/07/2004).

McAllen responds to my question by pointing out that his teaching style in the new curriculum is not totally different from what he has always been doing. He describes his pedagogic approach as a combination of a variant of PBL and a case scenario. In what appears to be the justification for adopting a variant of PBL rather than an authentic PBL approach, McAllen points to one of the difficulties encountered when a classic PBL is mixed with a didactic course: "When a little bit of PBL is put with a didactic course it seems to be moved out to one side by the students in their thinking." He then goes on to describe in detail his instructional approach.

There are three stages in McAllen's pedagogic approach. The first stage involves the whole group going through the objectives of the course, which are set out in the course manual. The students read out each objective and McAllen makes some clarifications as they go along. The main aim of this 'reading' exercise is to ensure that, "Everyone can understand what the course is about." The importance of making explicit the course objectives at the beginning of a programme is an important education practice. Miller, Schwartz and Loten (2000) have reported using a similar approach in their revised hybrid medical curriculum.

After the objectives of the course are clarified, the students are given topics and asked to prepare a power-point presentation. The power-point presentation is either done collectively by the whole group or the students are divided into small groups and each group is assigned a different topic to present. In the group presentations, two students lead the presentation while the other students contribute. Each presentation is followed by some discussion. The group presentations and discussions are supplemented with what McAllen describes as a case scenario; "We have a scenario, where I make up a case based on the topic." He offers two reasons for including a case scenario. The first

is to consolidate students' learning. He argues that, "If they know it, if they have learned the information, then when they go through the case scenario it will confirm that they know quite a lot..." The second is to embed what is learnt into the clinical context. McAllen argues that this broadens up the students, "...because they can put what they are learning in context."

McAllen's pedagogic approach is guided by and grounded in his education belief and philosophy of "cooperative learning" (Bahar-Ozvaris, Cetin, Turan et al. 2006). He summarises this philosophy using the metaphor of 'mutual support' between the teacher and the students, "We have to make sure that we all look after one another," and that, "Nobody moves on until everyone in the room understands where we are coming from." By actively engaging the students in the learning process and presenting knowledge in the clinical context through the use of case scenarios, McAllen's approach is consistent with the principles of the PBL (Barrows 1986; Charlin et al. 1998; Harden and Davis 1998). Crawford et al. (2007) argue that dental curriculum should be consistent with modern learning theories. Like Miller et al. (2000) and Schwartz et al. (1999), Crawford et al. (2007) point to the importance of informing students at the beginning of the course the expected learning outcomes, providing knowledge in the context in which it will be used in professional life and actively engaging the students in the learning process. Reeds (1990) also advocated for curriculum models that actively engage both students and the faculty in the learning process. He argued that the curriculum should include small group learning approaches and create opportunities for students to acquire problem solving and critical thinking skills.

McAllen's pedagogic strategy differs from the PBL in relation to the role of the teacher (Bochner, Badovinac, Howell et al. 2002; Dalrymple et al. 2007; Hitchcock and Mylona

2000). In the PBL curriculum, the teacher's role is to facilitate learning. Ideally, the teacher should be both a content and process expert (Bochner et al. 2002; Dalrymple et al. 2007). But as a process facilitator, the teacher is expected to consciously adopt a detached position during the group discussions. In contrast, McAllen sees himself as part and parcel of the students learning process. He sees the students' failures and successes as his own. His ultimate aim is the success of the whole class. He points out that, "...we will all go out that door and we will all pass. I will pass as a teacher and they pass as students."

Unlike most other informants, McAllen was able to draw on both the pragmatistic and abstractionist repertoires in his discussions of the dental curriculum in general and in presenting his 'variant of PBL' pedagogic approach in particular. His ability to simultaneously deploy the two repertoires can be attributed to his vast personal experience as an academic both at the WDS and abroad, his keen interest in developments in higher education and his familiarity with education principles (cf. Hargreaves 1981, 1984). When I specifically asked for his advice on what, as new comers to dental education, we should avoid when planning our curriculum, he began by first pointing to the importance of being familiar with prevailing education theories. He cautioned against being insular, but to seek help from academics in higher education in order to avoid re-inventing the wheel. But, like other participants, he also recognised the importance of identifying and paying attention to social factors that impinge on dental education. He identified political support, funding, available education and clinical facilities, student recruitment, staffing and the presence or absence of a robust system of staff development among factors that can have long term implications on the sustainability of a dental programme.

Projects

The use of projects to transmit dental knowledge is celebrated as one of the innovations in the restructured curriculum at the WDS. The projects were prepared by an interdisciplinary group—the Projects Committee. They covered a wide range of topics including basic sciences, library, human disease and clinical dentistry and were distributed throughout the undergraduate programme (UWCM Dental School 2001a). The projects are organised at increasing levels of complexity from group poster presentations in the first year to a dissertation in the final year as shown in Table 8 below.

Jackson Gerard described the range and types of projects as follows:

> We have introduced projects every year. And in fact those projects are uniformly driven and they always have a clinical bias. For example, in the first year there are three projects that students have to do. One is a group project and they have to produce a poster which is based upon some element that has been done in the foundation course which touches upon the clinical work they have been doing. [...]The other one is an essay project which they do individually. The students have quite some time. Again it touches...they have to have a clinical bias to that kind of thing. And the third one they do is again a poster project, but they do it individually and not as a team. So it starts of as a team, they do an essay project individually and then another poster project, but again individually and that one is always electronically presented. They have to present their poster as an electronic package which we then review and look at and discuss. In year two a somewhat similar pattern exists. But when you go beyond that certainly they now have to do very advanced projects: library projects; research projects in the final year with a dissertation, and so on. Those stages... all those analytical and critical skills that we expect them to have developed because of their increasing maturity and knowledge base, we expect them to bring that on board (Interview excerpt with Jackson Gerard, Foundation Theme, Cardiff University. 27/01/2004).

Table 8: Types, distribution and aims of the Projects at the WDS

Project Type	Presentation Schedule	Project Aims
Group Poster: (A) (B) (C)	Year 1: December Year 1: April Year 2: December	• Encourage application of Knowledge • Develop skills in searching scientific literature • Develop skills in team-working • Develop communication skills
Essay	Year 2: March/April	• Demonstrate in-depth understanding of one major oral disease • Gain experience in summarising and collating information from different sources • Develop literacy, writing and communication skills • Develop computer literacy skills
Library	Year 3: March/April	• Foster library skills • Gain experience in extracting information from scientific literature • Develop critical appraisal and analytical skills • Enhance ability to apply knowledge and transfer learning to unfamiliar problems
Clinical Case Report: • Human Disease • Dental	Year 3: January Year 4: March	• Gain experience in documenting a case • Gain understanding of a complex case requiring multi-disciplinary management • Enhance skills in scientific literature search
Family Study	Year 4: Sept/October	• Develop understanding of influence of social environment on child's development • Relate the likely impact of the child's social environment on oral health and dental care
Dissertation	Year 5: April	• Refine skills developed in other projects: e.g. communication skills, library skills, analytical skills, etc. • Display skills of reporting in detail on a clinical subject of interest • Demonstrate skills of disciplinary enquiry

Source: UWCM Dental School (2001a): Appendix 10

The projects are organised from simple to more complex to reflect the expected academic progression and increase in the knowledge base of students. Gerard uses the metaphor of 'growth' to describe the anticipated progression on a trajectory from the novice to the competent stage at the end of the undergraduate education. He argues that;

> We can't expect them to run, start to do a lot of projects...a lot of projects in year one, or doing a lot of analytical and critical work in year one. They should be doing that as they grow (Jackson Gerard, Foundation Theme, Cardiff University. 27/01/2004).

Although Gerard does not make any reference to education principles, it is evident that the NEC trajectory was one of the guiding principles in organising the project topics. In the first year group poster project, for example, one of the aims is to encourage the practical application of knowledge from formal teaching and to develop skills in team-working (UWCM Dental School 2001a, par. 2.1). In the final year dissertation project, because the students were considered 'academically mature', they were expected to carry out more challenging tasks such as analysing and critiquing published literature. According to Gerard, by the time the students' are assigned the dissertation project, they have an expanded knowledge base and they are academically more mature and this should be reflected in the originality and quality of their work, "...all those analytical and critical skills that we expect them to have developed because of their increasing maturity and knowledge base, we expect them to bring that on board." The argument here is that, the level of complexity of the projects should closely match the stage the students' have reached on NEC trajectory. Gerard, however, noted that the expected students' educational 'growth' did not always match performance, especially in projects requiring the use of difficulty skills such analytical skills.

When asked to comment on what he considered to be the major accomplishment in the new curriculum, Gerard was quick to single out the integrated approach to teaching and projects as major accomplishments. He then went on to point out the impact of curriculum 'continuity' and 'discontinuity' (Hargreaves et al. 2001) between high school and university education on the students' performance in the projects:

> *AK:* Apart from what you have already intimated on, what do you consider to be the greatest achievement so far in the new curriculum?
>
> *JG:* Well, the greatest achievement is definitely bringing the anatomists, the physiologists, the biochemists together—to integrate under themes and topics their material. [...]. And also I think that it is an achievement that we've introduced projects. That is something the students do really well. And, I suspect that, that relates to the way in which they are schooled these days. If your tests are all knowledge-based, and it is important that a lot of tests are knowledge-based, I don't want to decry learning. All we need is the students to have a knowledge base. They do... they certainly do a lot better when things are also presentation-based. So if you ask them to work in groups, you ask them to do a poster presentation, certainly they will come up with the most incredible things and show a lot of enthusiasm for it. But that is part of the educational process they went through in school. It obviously shines itself well there. What they have got to do now obviously is to have the more difficult aspects of retaining knowledge, being critical and analytical about it. That is a little bit more difficulty. We find that in all subjects (Interview excerpt with Jackson Gerard, Foundation Theme, Cardiff University. 27/01/2004).

Gerard notes that students performed exceptionally well in group poster presentations and attributes this to the students' prior education experience: "...that is part of the educational process they went through in school. It obviously shines itself well there." He contrasts this to the students' performance in projects requiring the use of what he terms as the more difficulty abilities of knowledge retention, analytical and critical skills. He laments the lack of these skills among students and concludes resignedly,

"That is a little bit more difficulty. We find that in all subjects." Gerard insinuates in this statement the failure of general education to adequately equip students with these more demanding skills. Both Grace (1995) and Walford (1994) have pointed to curriculum discontinuity between high school, on the one hand, and university education and the world of work, on the other hand. They point out that the pressure for grades in high school means that students are subjected to a strong classified and framed curriculum. But in higher education and the world of work they are expected to operate in a relatively weak framed environment.

The more advance individual projects are seen as an opportunity for gifted students to show their creativity. In his 'cooperative learning' philosophy, McAllen talks passionately about the need for all students to move together. But he also recognises individual differences in students' academic abilities and talks of the need not to tie down 'highfliers'. He sees projects as one way through which gifted students can be challenged and nurtured:

> Nobody moves on until everyone in the room understands where we are coming from. And those who are high fliers and want to take things further obviously now and again will go off on a tangent. And then we have projects which allow people who are really very bright, very enthused, very enthusiastic, to really put a lot of effort and a lot of their creativity into a project so they won't feel confined by competence-based. It is not mediocre. I mean, it would be nice if everyone excels. But I think there is that feeling of ensuring, through the group, that everyone gets through. That is a very useful atmosphere to prevail first (Interview excerpt with Patrick McAllen, CD Theme, WDS. 15/07/2004).

As an education strategy, projects are premised on two education principles. They actively engage students in the construction of knowledge (Crawford et al. 2007; Reed 1990) and the sequencing of projects from simple to more complex ones is based on the

principles of the spiral curriculum (Bruner 1977; Harden and Stamper 1999). Projects also facilitate the development of various skills including IT, communication and team-working skills. In addition, the family study project has potential for interdisciplinary collaboration and team-working outside the traditional dental team.

The Family Study

The family study is a community-based project under the dentistry in the wider community (DIWC) theme, in which students are assigned a child below the age of five. They visit the family at least once from the first to the third academic years to observe and monitor the child's growth and development (UWCM Dental School 2001a, par. 7). In the fourth year they prepare and present a report. Kelvin Holmes (KH), the theme leader for DIWC outlined the aims, structure and some challenges encountered in the family study as follows:

> *KH:* One of the things we have tried to do and which is called 'Family Study' where they [students] get attached to a family with a child under the age of five. They follow the child's physiological growth and psychological development. But they also have to look at the environment that that child is growing up in and really see how it is different from their own.
>
> *AK:* That sounds to be a very interesting concept. How have you gone about recruiting families?
>
> *KH:* Well, we have asked health visitors and doctors to give us access to families to recruit to the study. But in fact it has proved to be very difficulty to get families to take part.
>
> *AK:* And the problem of few families?

> *KH:* We have just not had enough families. The problem is, the students are actually enjoying it and are clearly learning a lot from it, and we just need to get some more families and so we are just looking at different ways of recruiting families. But it just may not be possible (Interview excerpt with Kelvin Holmes, DIWC. 18/02/2004).

Holmes notes that the family study is well received by students. He, however, finds the problem of recruiting sufficient numbers of families to be a threat to the future of the project. The failure to attract sufficient families to the study may be attributed to cultural factors beyond the control of the dental school. These may include the general attitude of the public towards intrusion on their privacy and the apprehension by families to allow outsiders' access to a young child. The problem may be compounded further because families may not see the relevance and benefit of the study to them and the young child. At the stage of less than five years, it may be difficulty for most parents to appreciate the relationship between the child's growth and development and oral health. But the problem may also be a reflection of some shortcomings in the way the study is organisation. Unlike the other projects, the family study has potential for inter-professional collaborations. Currently, this appears to be found only at the level of the dental school. Holmes pointed out that when recruiting families, the dental school liaises with other healthcare professions engaged in the delivery of child health services. The study can benefit from improved collaboration with other healthcare providers such as community nurses. Instead of the dental students visiting children on their own, they could plan joint visits with the community nurses who are traditionally more established and accepted in the community.

The importance of an active presence of the dental team in the planning and delivery of primary healthcare in the community has been stressed by Gordon (2007). In a study of the oral status of children attending a malnutrition clinic in South Africa, Gordon

(2007) reports that a combination of dietary habits, social practices of parents and malnutrition increased the risk for dental diseases in children. He argues that health promotion, prevention and therapeutic oral care can be further enhanced by the participation of the dental team in interdisciplinary primary healthcare activities.

Exposure to community-oriented learning approaches such as the family study offer students social and education advantages. Participating in more broadly defined interdisciplinary primary healthcare teams can lead to the development of teaming-working skills and increase awareness of inequalities in access to healthcare. Other advantages include the graduation of dentists who are more culturally sensitive and community-oriented (Crawford et al. 2007; Henzi, Davis, Jasinevicius et al. 2007, p. 1017). The community presence of the dental students can also enhance the public visibility and image of the dental school and the dental profession. This can have some impact in correcting the negative public image of the dentists and the dental profession (Dederich, Lloyd, Dixon-Farmer et al. 2004).

The family study is an example of a weak framed learning approach in which students exercise relative control over the construction of knowledge. The students are free to visit families during scheduled or in their own free time and they have up to the fourth year to present their reports. But students are also actively engage in knowledge construction when they observe and compare the child's physical, psychological and social environment to their own. The study is also an example of weak classification. In studying the child's physical growth, psychological development and social environment, the students have to draw on and integrate knowledge from different disciplines including basic sciences and behavioural sciences and social sciences.

Transmission of Procedural Knowledge

The transmission of complex procedural skills is an important aspect of professional education. The acquisition of professional skills begins in the shelter of the dental laboratory where students operate in a context-free environment before they are finally allowed to practice on the real patients in the clinics. A number of pedagogic strategies are employed to transmit procedural knowledge. They include demonstrations and simulations, hands-on clinical practice and briefing and debriefing sessions.

Laboratory-based Technical Skills Training and Simulations

Technical skills training help students to acquire basic technical skills in a context-free and protected shelter of the dental skills laboratory. It marks the transition between the pre-clinical textbook- and classroom-based theory and clinical practice. The students need to be familiar with basic skills, such as how to conduct physical oral examination using indirect vision of dental mirror and how to drill a hole in a tooth, in preparation for actual patient care (Gallagher , Clarke and Wilson 2008). Central to skills training is the use of simulations to replicate as closely as possible the real-life clinical environment. Smith, a clinical tutor in endodontology, remarks how easy it is to simulating root canal treatment (RCT) in the pre-clinical laboratory;

> We can simulate root canal treatment in the pre-clinic environment better than many of these simulations because clearly once you start root canal treatment you can eliminate the pulp and there is no quest—you don't need this vital response you get if you want to see the effects of your cavity preparation on the pulp. You don't need to worry about that. [...] It is not real, but I think you need to practice it so you can work out what you thought you knew from the text-books, from the teaching and try and apply it ... (Interview excerpt with Joseph Smith, WDS. 19/07/2004).

Smith attributes the ease with which RCT can be replicated in the skills laboratory to the nature of the clinical procedure. In RCT the need to monitor the tooth's vital response is eliminated because the procedure involves the removal of the pulp through which the tooth gets its nervous and blood supply. But Smith is also quick to admit that the laboratory-based RCT simulation is not the real thing, but an essential step in putting theory into practice; "It is not real, but I think you need to practice it so you can work out what you thought you knew from the text-books..."

Smith describes it as a huge bonus the fact that most of the technical procedures in dentistry can be replicated in the skills-laboratory using real teeth,

> We have relative amount of freedom in the pre-clinic skills laboratory and we are luck in dentistry that we can simulate a lot of what we do and also, at the moment we can simulate on real teeth. That is a huge bonus. I would be very unhappy if, for whatever reason, we couldn't use natural teeth. Working in the area of high decay, so we have got plenty of diseased teeth and WELL that is great! (Interview excerpt with Joseph Smith, WDS. 19/07/2004).

Smith talks of the "relative amount of freedom" in apparent reference to the context-free and relatively weak framed environment of the skills laboratory. In the skills laboratory students can afford to experiment with and even make mistakes without any serious consequence to anyone. In contrast, the clinic is a relatively strong framed environment. Students are closely monitored in order to ensure that all safety procedures are followed and to protect patients from any harm.

Demonstrations and Hands-on Clinical Practice

Chair-side clinical education is predominantly a hands-on practical experience (Clancy, Lindquist, Palik et al. 2002a). Students acquire complex technical and professional

skills and values by practicing on real patients. Prof. Patty Carter identified three stages in the students' acquisition of procedural clinical knowledge: learning by seeing, learning by doing and knowledge consolidation through repeated performance of clinical tasks,

> In the practical sessions, essentially the students participate in small group teaching under a supervising member of staff. It is effectively "see-one-do-one" teach-on position. That is what they get. First of all they start by assisting and then they undertake the procedures themselves. And then they will go through gaining confidence. Perhaps not to expert, but certainly to a confident level by the time they graduate. (Prof. Patty Carter, Oral Surgery, WDS. 2004).

However, one of the obstacles to effective dental clinical demonstrations is the limited field of view for most students observing the procedure (Sweet , Pugsley and Wilson 2008a). Smith laments the difficulty of demonstrating a procedure to students because only a few can see what is actually going on;

> My view is it is very difficult, if not impossible, to teach clinical dentistry. [...] I could sit down and demonstrate a procedure on someone, but only one person could see what is going on realistically. We have got fantastic IT equipment but it is not (.) What you need to learn is what it looks like to the dentist. Not what it looks like to an observer—literally the perspective you have on that patient. The dentists sits in one position and anyone else who is watching is not actually seeing what is going on. It is not the same (Interview excerpt with Joseph Smith, WDS. 19/07/2004).

Smith emphasises that because the mouth is such a confined space, there is very limited line of vision for students to observe demonstrations. He points to the value of the different instructional media such as the three dimension computer simulations (Aragon and Zibrowski 2008) and video demonstrations (Wierinck , Puttemans and van Steenberghe 2006) in complimenting physical demonstrations. The use of instructional

media to compliment tutor instructions is an "effective tool in improving knowledge" (Teasdale and Shaikh 2006, p. 1368). In a study in which one group of students received only a video taped demonstration of a procedure and the other a live demonstration, Packer, Rogers, Coward et al. (2001) report that both groups developed similar levels of understanding of the principles behind the procedure. However, students preferred live to video taped demonstrations. This suggests the irreplaceability of the tutor. But it also point to the value of combining instructional strategies.

The first patient contact is considered a milestone in the students' clinical experience (General Dental Council 2002). But to fully benefit from their clinical training, students must actively be engaged in the hands-on provision of care from the first day they are allowed to practice on patients. Smith observes that,

> [...]In a clinical situation my feeling is that the teaching is very difficulty. The student is here to learn, and you emphasise that, and if they are not engaging and taking part then they are only able to learn a small part of the course. They can read a book, read a text-book, but it is very difficulty to get a real understanding until you try and do it. So my teaching, if you can call it that, I do a hands-off approach, so much so that in the early stages we sit there in silence until hopefully they realise that they have to do the work. And in doing the work they prepares for seminars. In doing the work they are learning. My job, as I said, in the clinic—most of our staff will be in clinical dentistry, clinical teaching—you watch very closely what goes on away from the unit to make sure that the appropriate safety procedure is being adopted and thereafter when they encounter difficulties, when they encounter problems, when they encounter something that they are not sure of, then they call you over and you try and help them. But I don't really see the advantage in me doing (..). I only take over if I have to take over—if the patient is having problems, or the student is having problems and wants me to take over or if they are running out of time and the nurses have to close the clinic. Other than that it is a free enterprise (Interview excerpt with Joseph Smith, WDS. 19/07/2004).

Smith puts emphasis on the 'doing' aspect of this stage of clinical socialisation. He argues that students may possess extensive theoretical knowledge through reading of textbooks, but this is of little use to them until they actually put it to practice, "...it is very difficulty to get a real understanding until you try and do it". Smith describes his approach to clinical teaching as the "hands-off" approach. As a clinical tutor, he sees his role as that of closely monitoring the students, but from a distance, in order to ensure that all safety procedures are followed and to ensure the safety of the patients. He, however, describes three occasions when he may take over the treatment of a patient from a student: when the patient develops some problem; if the student is experiencing some difficulties or when the clinic is about close.

Students consolidate their procedural knowledge by repeatedly performing clinical tasks under supervision. One of the aims of clinical education is the provision of sufficient clinical material for students to practice on. In the old curriculum, students' mastery of clinical skills was gauged by the number of procedures completed. Each discipline specified the number procedures to be completed for a student to be deemed competent in the procedure. However, the quota system was criticised for failing to take into account individual differences in the learning ability of students. Secondly, the pressure to reach set targets shifted the focus from quality to quantity. Daniel Calma clarifies the reason for abandoning the quota system in preference to the competency approach. He points out that,

> We nolonger have a quota system where they were required to do 50 amalgams or 40 composites or 10 crowns for them to qualify. They still have to do them, but we don't set limits as such. We set targets and set for them competency exercises. Some people will be very good after practising four or five times while some people will need 10 or 15. Once the competency assessments are passed, it doesn't mean they stop doing it, they still have to do. Once they get a

> pass mark in plastic filling material, it doesn't mean they stop doing it. They still have to do them. They still have to do the crowns. It is more intensive and rigorous for the students and the fact that they know exactly what is expected of them (Interview excerpt: Daniel Calma, Senior lecturer in restorative dentistry, CD Theme, WDS. 10/08/2004).

Calma contrasts the quota system in the old curriculum and the competency approach in the restructured curriculum. The fundamental difference between the two is that, whereas in the former the focus was on quantity, in the latter it is on the quality of care. Under the competency approach, student performance is no longer measured in terms of number of tasks completed but in terms of the attainment of competency levels. Calma observes that, "Some people will be very good after practising four or five times while some people will need 10 or 15". Implicit in this observation is the recognition of individual differences in the pace of learning. There is also an assumption that the expected level of competency in a given procedure is clearly defined for all students to know if and when they have attained the required level. The attainment of an acceptable level of competency is confirmed by passing a competency assessment.

The successful implementation of both the quota system and the competency-based clinical training depend on two important social factors: demographic changes and the profile of oral and dental diseases in the community. For students to attain the required level of competency there should a constant supply of suitable material to practice on. But, as argued in the next chapter, some of the challenges in the dental hospital-based clinical training are the type of patients, a decline in the levels of dental disease and some shortcomings in the patients' appointment system.

Briefing and Debriefing Sessions

Two related innovations associated with the transmission of procedural knowledge are pre-clinical session briefings and post-clinical debriefings. Pre-clinical session briefings give students' and tutors an overview of the tasks that will be carried out during the clinical sessions, while the post-clinical debriefings offer an opportunity to reflect on interesting cases encountered during the day. Smith outlined the main purpose of briefings and debriefings as follows;

> We have briefing sessions at the start for the staff to familiarise themselves with the procedures to be done and to make sure that the students have got the right idea: they have come prepared. And we have a debrief session at the end were we sort of gather the thoughts, for example some people may not have had a patient. The patient may not have turned up or cancelled [the appointment] and they sat there and they may not have a chance. But someone else had a very interesting experience and rather that be lost and when that person takes it away with him, we get that person to sort of elaborate on it (Interview excerpt with Joseph Smith, WDS. 19/07/2004).

Smith identifies at least two advantages of debriefings. They allow students and staff to share their interesting clinical experiences with the rest of the group. This is particularly beneficial for students who, for various reasons, may not have had an opportunity to attend to any patient. Secondly, by reflecting and 'elaborating' on the interesting case, this leads to deep learning.

David Jackson described debriefing sessions as an educational activity at the close of the clinical session during which students are given an opportunity to reflect on and share some interesting cases they encountered during the day:

> The final-year students come here in groups of about ten once a week. They spend the whole day here. They treat patients and we teach them at the chair-

> side. At the end of the morning session they have a formal seminar on some aspect of primary care. At the end of the afternoon they have a structured debriefing session. We talk about interesting things that may have happened during the day, if a particular student had a problem with a patient then, if it is of benefit to everybody, we will talk about it so that everybody learns from whatever that problem was. If there is an interesting case that they have seen during the day, we will talk about that. In my experience everybody, even qualified dentists can still learn by talking through a problem or whatever happened. And that is carried out at the end of the afternoon. So they spend most of their morning treating patients, seminar, afternoon mostly treating patients and then a debriefing session at the end. (Interview excerpt with David Jackson, Part-time clinical tutor, St Davids Primary Dental Care Unit. 22/07/2004)

Jackson describes three educational activities carried out at the St Davids PDCU, namely, chair-side teaching, seminars and debriefing sessions. He describes his role as that of chair-side teaching, "They treat patients and we teach them at the chair-side". In contrast, Sweet, Wilson and Pugsley (2008b) observe that some part-time dental clinicians see their role as that of supervision and not teaching. Jackson argues that debriefing sessions offer an opportunity to both students and dentists to learn something by going over an interesting clinical encounter, "...everybody, even qualified dentists can still learn by talking through a problem or whatever happened."

Debriefing sessions are acknowledged in the literature as an important after-action learning activity. They help students to reflect on and to self-critique their performance, two essential attributes to becoming a competent practitioner (Dreyfus and Dreyfus 1980, par. 45). Although debriefing sessions are a relatively new innovation at the WDS (Sweet et al. 2008a), they are a common pedagogic practice in the training of pilots. In their study of Air force pilots, Ron et al. (2006, p. 1069) have extensively discussed the importance of post-flight debriefing sessions. They argue that "after-action" reviews offer an important opportunity for learning by allowing learners to critically reflect upon

their experiences. In recognition of the education value to both students and teachers, Hendricson and Kleffner (1998), advice that some protected time should be set aside for clinical debriefing sessions. They argue that debriefings provide students an opportunity to reflect on and share their experiences with others. As an instructional strategy, debriefings facilitate reflection and, as Leach (2002) observes, the development of competence is nurtured by reflection on experiences.

Transmission of Professional Values

The inculcation of appropriate professional attitudes and values in students is considered one of the hallmarks of professional education. Patty Carter identified two knowledge areas that he considered vital in the professional socialisation of the dental students—a sound knowledge of the scientific basis of professional practice and the development of ethical and moral responsibility;

> [...] what we always have, I think you will agree on this. The main thing...it may be different in other parts of the world, but in the UK it certainly is to recognise what are the key things that are required. In the UK, the key area in the course is for students to have a good scientific understanding of the knowledge which underpins what they do in practice. We want the students to have that. We want them to be good professionals who are ethically and morally responsible. We also recognise that certain things of the core skills they must be able to do. And those core skills could vary according to each country of the UK and also in terms of the local requirements. But those other two things are fundamental; to understand the science behind what is done and then the moral and ethical things are important (Prof. Patty Carter, Oral Surgery Consultant, WDS. 2004).

Carter stresses that possession of sound knowledge of the scientific basis of professional practice and the development of ethical and moral responsibility are two key areas in the undergraduate dental curriculum in the UK. Ethical and moral responsibility includes

personal integrity in dealing with patients and colleagues, effective communication with patients (General Dental Council 2002); sensitivity and responsiveness to social inequalities in oral care (Benn 2003; Dharamsi et al. 2007; Garetto and Yoder 2006; Werhane 2006), including willingness to serve socially deprived and remote communities (Bazen, Kruger, Dyson et al. 2007; Henzi et al. 2007); and sensitivity towards patients from different socio-economic, ethnic and cultural backgrounds (Rubin 2004; Rubin, Rustveld, Weyant et al. 2008). However, one of the challenges in the transmission of professional values is how to assess them.

After a length narrative about the importance of defining the key principles underpinning the curriculum, Brushwell Coleman, outlined the three main knowledge areas transmitted in dental education. That is, cognitive, psychomotor and affective. He acknowledged that whereas it was relatively straightforward to transmit and evaluate student knowledge in the cognitive and psychomotor domains, the affective domain presented some challenges. He pointed out that;

> I think you will agree that in terms of skills the dental graduate must be able to obtain and record a comprehensive history; perform an appropriate physical examination; interpret the findings and organise appropriate further investigations. That is reasonable. [..] But when you have the attitudes: "respect for patients and colleagues that encompasses without prejudice diverse of background and opportunity, language and culture", that is reasonable. "The dental graduate must have integrity, honest, trustworthiness". We think that is true. But how do you test it? Not as easy. Do I put a £10 note in the clinic and wait for the first student to come and tell me where it is? You can't. So some of these things, although they are easy to write down, and nobody would disagree that a dentist or doctor or nurse should have integrity and be honest and trustworthy, if you then say, "How do you test that?" It is much more difficulty and I think what I would say is students learn that from their teachers. The jargon is 'modelling'. How do your teachers model? Are they honest and trustworthy? Do they turn up? Do they treat you correctly? Do they treat

> patients correctly? [...] It is easy to write but much more difficulty to actually come out with a box at the end that says this person is honest and trustworthy and I can prove it. It is much difficulty (interview excerpt with Brushwell Coleman, chairman, GDC Working Party. 04/2004).

Coleman stresses that it is indisputable to expect all dental graduates to possess unquestionable character, but laments the difficulty of ascertaining the presence of these virtues in students. He admits that one of the problems is that professional values are transmitted mainly through the hidden curriculum through role modelling. He notes that how the teachers conduct themselves towards patients and colleagues will have profound impact on the professional development of students. That is, students acquire professional values and attitudes through day-to-day in and "out-of-class" (Masella 2006, p. 282) interactions with their teachers. Masella (2007, p. 282) observes that "students learn at least as much from what faculty do as from what they say".

The role of faculty in shaping the students' professional values is unquestionable and the most potent avenue through which these values are transmitted is through role modelling. Therefore, social and professional interactions in which student are exposed to examples of best practice will enhance the development of professionalism. Educational experiences such as early clinical contact and community outreach programmes (Rubin 2004; Rubin et al. 2008), mentoring and shadowing in which students have an opportunity to observe exemplars in professional practice (Masella 2007), offer opportunities for the development of professional values.

Discussion

The WDS curriculum supports a mixed pedagogic approach and, as evident from the findings, a wide variety of instructional strategies are employed. The WDS is not alone

in its celebration of mixed pedagogy. Patel et al (2004), Bratt (2003) and Doig and Werner (2000) all argue for mixed pedagogic approaches in which the traditional weak framed teacher-centred instructional approaches such as lectures are combined with the strong framed student-centred methods such as the PBL.

Support for Mixed Pedagogy

Empirical evident from medical, dental and general education supports mixed pedagogy. In a study of the relationship between small group learning and lectures in medical education, Patel et al. (2004) point to the value of combining lectures and small group discussions. They note that when a topic is introduced to students in a lecture format, followed by small group discussions, lectures provide the theoretical foundation upon which small group discussions are grounded, while small group discussions help students to embed theory from lectures into the practical situations. They conclude that combining lectures and small group learning offer students "the most appropriate means of learning" (2004, p. 1078). In dental education, Wierinck et al. (2006) conducted a study in which first year dental students with no prior experience of dental cavity preparations took part in a preclinical cavity preparation virtual reality simulator training (VRST). One group of students received only VRST while the other received additional tutorial input from lecturers. They report that students who received both VRST and tutorial input exhibited optimum long-term learning compared to students who only had VRST. They conclude that tutorial-enriched VRST is more beneficial for long-term skills acquisition, knowledge retention and transfer of learning.

In a study of the students' performance in mathematics education, Fowler and Poetter (2004) have attributed the French students success in mathematics to two factors: a

mixed pedagogic approach and the embedding of mathematics lessons in the everyday social reality of the students' lives. They report that French teachers presented mathematics lessons as problem situations drawn from the children's experiences (cf. Cooper 1998; cf. Cooper and Dunne 1998). This was followed by class exercises in which the children freely interacted with each other and with the teacher in an "extended series of activities related to the 'problem situation,'" (Fowler and Poetter 2004, p. 310). They argue that a mixed pedagogic approach provided students with an "intellectually challenging mathematical content". Morais (2001b, p. 568) also supports "mixed pedagogic practice of weak and strong classification and framing" as the most logical and practical approach to teaching and learning.

The WDS curriculum does not provide guidelines on how arrive at the most appropriate instructional methods. This partially explains the lack of homogeneity in pedagogic practice at the WDS. In an integrated curriculum teachers are expected to adopt common pedagogic practices (Bernstein 1977). However, a careful evaluation of factors related to the type of knowledge transmitted; the profile of students; and the institutional context, can help to inform the choice of appropriate instructional methods.

Type of Knowledge Transmitted

I have presented the pedagogic methods employed at the WDS under the three knowledge domains—theoretical knowledge, procedural knowledge and professional values. Under each domain, a wide range of instructional approaches are available (see Appendix I—the education approaches branch). Fundamental differences in emphasis in the three knowledge domains, means that instructional strategies that may prove effective under one domain may not be appropriate under another domain. To illustrate

this point, although lectures are widely used (Fyrenius et al. 2005), they are most suitable for information transmission. The transmission of procedural knowledge, on the other hand, requires students to engage in extensive hand-on experiential learning (Sweet et al. 2008a; Williams and Klamen 2006). Smith describes his approach to chair-side teaching in restorative dentistry as the 'hands-off' approach to emphasise that students have to engage in the treatment of patients with minimal help from him. This is an essential condition if students have to fully benefit from their clinical experience. Similarly, although professional values and attitudes can easily be presented to students in the form of a lecture or a small group discussion, the most potent route through which values and attitudes are ultimately transmitted is through the social interactions between the faculty and the students, in and out-of-class (Masella 2006). Prof. Brushwell Coleman stressed that students learn professional values from their teachers through role modelling. But an awareness of the range of options of instructional strategies in each of the three knowledge domains may not be sufficient in arriving at the most suitable instructional method. Two other variables—the profile of students; and institutional and faculty related factors—should be taken into account.

Profile of Students

The guiding principle in the choice of instructional methods should be the enhancement of the education experience of the students (Crawford et al. 2007). But students entering higher education come from diverse education and social backgrounds (Dooley 2004) and may exhibit variations in learning skills, academic and intellectual ability to engage in active learning approaches. They will also have different education needs at the different stages of their professional socialisation. There are at least four factors related to the profile of student that may be useful in informing the most appropriate

instructional methods. These are the socio-cultural background; prior education experience; individual differences in learning skills and academic ability; and the academic level within the programme.

With more open admission policies at most higher education institutions, the students' socio-economic status (Hennequin, Tubert, Devillers et al. 2002; Morris 1992), ethnic and cultural background (Lalloo , Ayo-Yusuf and Yengopal 2008; Mayya , Rao and Ramnarayan 2002; Thind , Atchison and Andersen 2005), and even the rural-urban divide (Marino, Morgan, Winning et al. 2006) have become important factors when considering the choice of instructional approaches. Inequalities in access to education and educational resources between social groups mean that entry to professional programmes such as dentistry is skewed in favour of student from middle and upper social classes (Hennequin et al. 2002; Vigild and Schwarz 2001). But it also means that students from socially disadvantaged groups who enter professional programmes are at a comparative disadvantage in learning skills. Doig and Werner (2000) have reported the introduction of a hybrid dental curriculum at Michigan State University in which focus in the first year is on transmitting essential basic science concepts and principles using strong framed instructional approaches such as lectures. This is followed by PBL in subsequent years. They argue that a mixed pedagogic approach takes into account the broad range of student ability and background.

The possible influence of culture on learning approaches is acknowledged. There are two ways in which culture can impact on the curriculum. It has some influence on the students approach to learning (Hussain, Mamat, Salleh et al. 2007), and it may impact negatively on the curriculum innovations which appear to threaten the authority of the teachers (Jippes and Majoor 2008). In a study comparing the learning approaches and

difficulties between Nepali and Indian students, Mayya, Rao and Ramnarayan (2002) found significant differences between the two ethnic groups and attributed these to differences in academic, social and cultural backgrounds. In a related study of the appropriateness of the PBL curriculum in Asian universities, Hussain et al. (2007) report that the PBL small group discussions functioned more as a forums for students to report back independent inquiries. They attribute the lack of critical engagement during group discussions to the cultural inappropriateness of challenging peers and tutors.

Culture may exert some direct influence on the success or failure of curriculum innovations especially the weak framed pedagogic varieties such as the PBL. Jippes and Majoor (2008, p. 283) observe that in countries where "power-distance" is an important dimension of culture and in countries where the national culture shows strong "uncertainty avoidance" the integrated curricula are not likely to succeed. They advise that before adopting integrated or PBL curricula in these countries strategies must be found to reduce the impact of these dimensions of culture.

As noted in chapter 6, there may be curriculum discontinuity (Hargreaves et al. 2001) between general education and higher education (Dooley 2004; Grace 1995; Walford 1994), and between the pre-clinical and the clinical components of the curriculum (Armstrong 1980). The strong classified and framed curriculum in secondary education, with its main focus on passing externally set examinations (Grace 1995; Walford 1994), means that students entering higher education are ill-equipped for the challenges of the relatively weak classified and framed student-centred pedagogic approaches in higher education. This can lead to initial poor performance even by the most academically adept novice students. Gerard has noted exceptional performance in projects involving poster and power-point presentations but moans about the poor performance in projects

requiring the use of higher order analytical skills because, ostensibly, general education does not impart these skills in students. To bridge the gap between secondary and higher education, it may be helpful to introduce foundation programmes and/or the use of strong framed pedagogic approaches earlier in the programme before more academically demanding student-centred learning approaches are introduced (Crawford et al. 2007; Reed 1990). Doig and Werner (2000) advise that educators should take into account the prior education experience of students before introducing challenging learning approaches such as the PBL.

The hierarchical structuring of projects at the WDS from those requiring the use of basic skills, in the first year, to more complex ones requiring possession of analytical and critical skills, in senior years, is premised on the educational logic that as students progress on the NEC trajectory they acquire appropriate learning skills and accumulated a broad knowledge-base (Chambers 1994; Chambers and Glassman 1997). This enables them to intellectually engage with theoretical and procedural knowledge in solving complex tasks (Fealy 2002). Charlin, Mann and Hansen (1998) observe that early in the PBL programme students need help in identifying and accessing learning resources, but later this help becomes redundant. A study by Stjernquist and Crang-Svalenius (2007), in which they compared the students' satisfaction with two active learning approaches—the PBL and the case study, they observe that medical students rated the PBL highly during the pre-clinical stage. But rated case studies highly during clerkship years and scored lectures neutrally throughout. They, therefore, support mixed pedagogic approaches arguing that the demands of the different stages of medical education require different pedagogic approaches. In addition, hybrid pedagogic approaches help to carter for individual differences in learning styles and intellectual ability of students (ADEA Commission on Change and Innovation in Dental Education

et al. 2006b; Hendricson and Kleffner 2002). MacAllen pointed to the value of creating a supportive environment for both the intellectually gifted and the average student. Crawford et al. (2007) argue that to accommodate different styles of student learning, there must be flexibility and variety in pedagogic approaches.

Institutional and Faculty-Related Factors

An important variable in the success of any curriculum innovation are the teachers (Bruner 1977; Kelly 2004; Kirk and MacDonald 2001; Schwartz 2006). The epistemological beliefs and assumptions about the nature of knowledge, and commitment to education principles will have some significance influence on the teachers' pedagogic approaches (Williams and Klamen 2006) and may be the most significant factor in the success or failure of new instructional approaches.

Bernstein (1977) argued that in an integrated curriculum there is likely to be homogeneity in pedagogic approaches. The assumption is that, in integrated curricula, teachers share common values and beliefs about the nature of knowledge and approaches to the transmission of knowledge. But the beliefs, commitment to education principles, teaching experience and disciplinary loyalties can have lasting impact on the teachers. But as Behar-Horenstein et al. (2006) have observed, teaching styles tend to be ingrained after many years of practice and can be difficulty to change. This may also explain why senior academics tend to be resistant to new education innovations (Kabara 1972; Sweet et al. 2008b). This highlights the value of establishing vigorous programmes of professional development as an integral part of curriculum innovations. Behar-Horenstein, Mitchell and Dolan (2005) argue that professional development must form part of the change process.

Professional Development

The value of faculty development in higher education was recognised and recommended as early as the 1960s (University Grants Committee 1964, chap. XI). In recent years there has been renewed attention in medical and dental education in recent years, particularly with the popularisation of the PBL curriculum (Dolmans, Gijselaers, Moust et al. 2002; Fincham and Shuler 2001; Saunders and Dejbakhsh 2007). Faculty development is an essential element in converting from the traditional strong classified and framed to the weak classified and framed curricula varieties (McLean 2004).

In the PBL curriculum, a vigorous programme of staff development is advocated in order to convert the tutors from their traditional role of expert conveyers of information to that of facilitators of learning (Dalrymple et al. 2007; Fincham and Shuler 2001; Hendricson, Anderson, Andrieu et al. 2007; McLean and Van Wyk 2006). But the importance of staff development programmes need not be limited to PBL curricula. Sweet et al. (2008b) recommend vigorous professional development programmes that are targeted at developing and enhancing the teaching skills of the different categories of clinical teachers, while Gerzina McLean and Fairley (2005) recommend faculty development in clinical teaching in order to promote evidence based teaching and the development of empathic skills in teachers. All these recommendations underscore the need for education training to be an integral and ongoing component of faculty development programme in dental education.

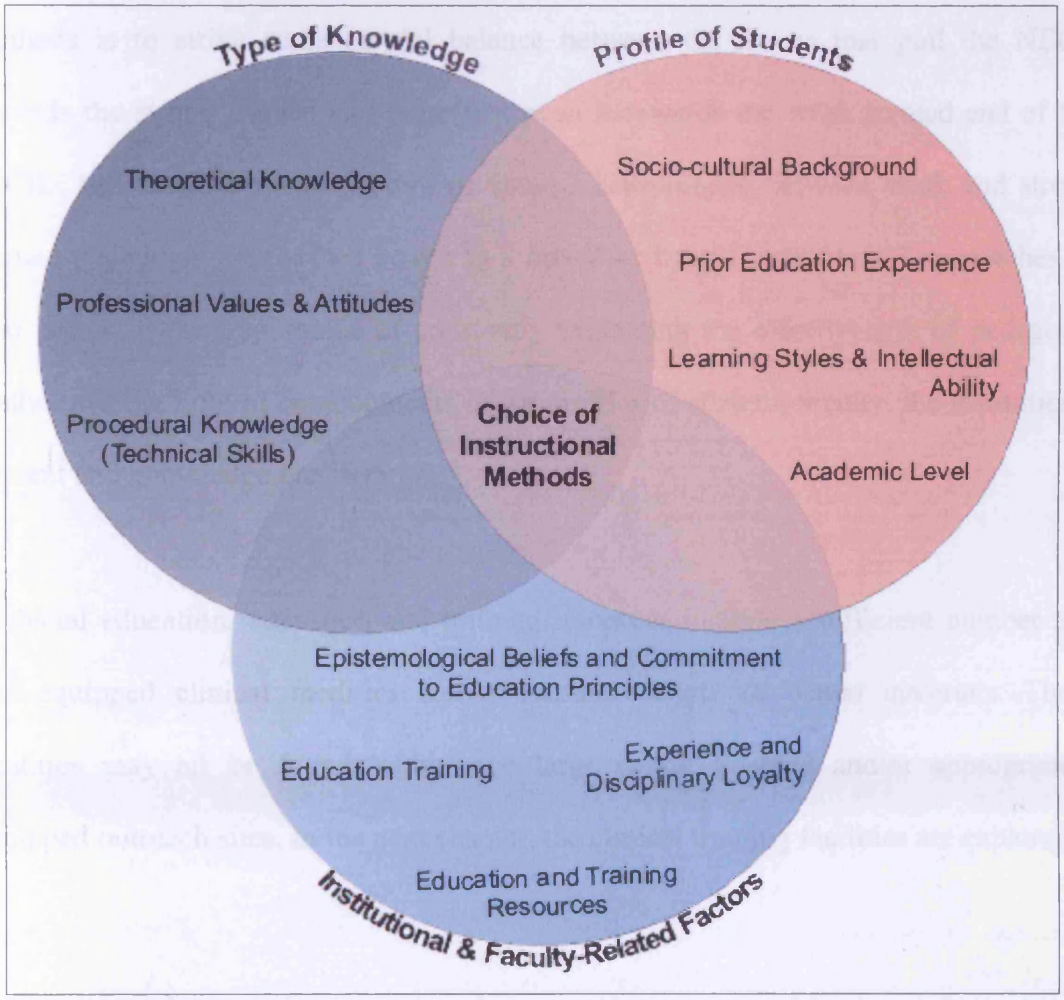
Education Resources and Facilities

An equally important element in the successful implementation of curriculum innovations is the availability learning resources such as well-stocked libraries, IT equipment and sufficient space including seminar rooms (Carrera et al. 2003; Fincham and Shuler 2001; Tosteson et al. 1994). The availability of education resources such as well stocked libraries is critical factor in the weak framed curricula such as the PBL because, as Fincham and Shuler (2001) have observed, students make far much greater demands on library resources and physical space than their traditional peers.

Implications for Curriculum Planning

Figure 9 presents the choice of the most appropriate pedagogic method as an intersection of three variables—the type of knowledge transmitted, the profile of students and institutional and faculty related factors. In chapter 5, I introduced the concept of a diagonal collection-integrated landscape (DICIL). In the reconceptualised DICIL, the curriculum is defined by the location of the novice expert continuum trajectory (NECT). I have argued that the NECT is not static, but can drift upwards towards the weaker classified and framed or downwards towards the traditional stronger classified and framed ends of the landscape. The NECT may drift in response to the interaction of social forces arising from the total education and socio-cultural environment (TESE). The factors presented in figure 8 can be grouped into two. Those that will tend to push the NECT towards the weaker framed and those that pull it towards the stronger framed end of the DICIL.

Figure 8: Factors Informing the Choice of Pedagogic Methods



Among factors that may push the NECT towards the weak framed end of the DICIL are faculty commitment to and unwavering support for active learning approaches such as the PBL, and education training in modern teaching methods. Rapid knowledge proliferation has been an important factor in equipping students with independent learning skills. In clinical dentistry, the need to facilitate the transition to independent professional practice requires a weak framed clinical environment, but concerns about patient safety and quality assurance will tend to pull the trajectory towards strong

framing. Other factors that may pull the NECT towards strong framing include faculty resistance to change, deeply entrenched disciplinary loyalties, student social background and curriculum discontinuity between secondary and university education. This would suggest that the most practical and realistic approach in the choice of pedagogic methods is to strike some careful balance between the forces that pull the NECT towards the strong framed and those that push it towards the weak framed end of the DICIL. But, from a practical point of view, a compromise between weak and strong framed pedagogic approaches points to a mixed or hybrid instructional approaches. It also points to the importance of constantly evaluating the effectiveness of pedagogic methods in the light of developments in the profiles of student, faculty, the institutional context and knowledge proliferation.

In dental education, education and training resources include a sufficient number and well-equipped clinical facilities and a constant supply of dental materials. These facilities may all be found within one large dental hospital and/or appropriately equipped outreach sites. In the next chapter, the clinical training facilities are explored.

Chapter 9

Facilitating the Transition from the Novice to the Competent Stage: The Clinical Education and Training Environment

Introduction

An essential component of dental education is the transmission of knowledge, professional values and technical skills essential for carrying out total patient care in general dental practice (Jones 1987). The transmission of procedural knowledge takes place in the hierarchically structured education and training environments of the technical skills laboratory; the university dental hospital specialist clinics; and the community outreach clinics. Each subsequent environment builds on and consolidates the learning that has gone on earlier.

Students begin the process of acquiring technical skills in the sheltered and context-free environment of the pre-clinical phantom head laboratory. They learn basic physical tasks such as how to hold a dental mirror and how to handle and control hand-pieces when cutting a hole in a tooth. These basic skills need to be understood and mastered prior to patient treatment (Clancy, Lindquist, Palik et al. 2002b). The dental hospital specialist clinics give students an opportunity to apply their procedural knowledge on real patients. But the university dental hospital is discontinuous with general dental practice in the structuring and organisation of care and in the type of patients seen. Whereas general dental practice operates on the principle of integrated or 'whole patient' approach to the delivery of care, the delivery of care at the university dental hospital is compartmentalised into the different specialties and sub-specialties of dentistry. To facilitate the transition to general dental practice and to consolidate their learning, students are exposed to an extended clinical environment in the dental schools'

poly-clinics and in the community outreach dental education (CODE) clinics during the final year of their undergraduate education.

Technical Skills Laboratories

The pre-clinical technical skills-training is an essential part in the education and training of dental students. It helps to prepare students for actual patient care by transmitting procedural knowledge and skills essential for the delivery of care in the different disciplines of dentistry. These skills are acquired in a context-free and idealised environment of the phantom head laboratory. Daniel Calma, a senior lecturer in restorative dentistry, described the function of the technical skills course as that of imparting the 'basic rudiments' of clinical dentistry. He uses a contrastive rhetoric to describe differences in the structure and duration of the technical skills course between the old and new curriculum. He argues that,

> [...] Their phantom-head year—simple fillings, periodontology, endodontics, crowns, in-lays—they got all of the basic rudiments taught within one year. So they could have anything when they came to the clinics. Now it is much more structured and we try to lead them in a more structured way. We start off with simple procedures and move to more complex rather than potentially going into very complex procedures on the first day (Interview excerpt with Daniel Calma, Senior Lecturer in restorative dentistry, WDS. 10/08/2004).

Calma insinuates curriculum overload when he points out that all the 'basic rudiments' of the various disciplines of dentistry were taught in one year, leading to students who were ill-prepared for clinical training. In contrast, the new curriculum is said to be "much more structured". In addition, Calma hints at the concept of the spiral curriculum as the underlying principle in the structuring of the technical skills courses (See, Harden

and Stamper 1999; Kabara 1972). He point out that the students are now led in "a more structured way" from simple to more complex procedures.

As novices, students operated in a 'context-free' (Benner 1984, 2004; Dreyfus 2004; Dreyfus and Dreyfus 1980) preclinical laboratory environment. But the artificial laboratory environment does not fully prepare students for the 'real life' of the dental clinic. Joseph Smith, a senior lecturer in restorative dentistry, described the dental students just commencing clinical practice as possessing over-technical view dentistry and to facilitate their transition to the clinical environment, the morning sessions of the first term were utilised to reorient the students to the practical realities of the clinic:

> [...] Year-three term one is an opportunity in the mornings in the pre-clinic environment to look back at what they have learned in terms of technical skills, and my impression is...what we find is that they have an over technical view of what this is about. Because of being fundamentally away from patients, away from vital pulp, away from a whole range of real issues, we have to sort of refocus their minds and say that, "The hand piece is this and the bur is this. It does that. But if you do it on the real tooth a whole lot of bad stuff can happen and you have got to do it in such a way." (Joseph Smith, Senior Lecturer Restorative dentistry. 19/07/2004).

Smith points to the importance of going over what the students did in the pre-clinical laboratory sessions in order to refocus their thinking on the patients. The main aim of the morning pre-clinical sessions was to draw the attention of students to the realities of clinical practice and the dangers that may result from indiscriminate application of their newly gained but largely untested technical skills, "Because of being fundamentally away from [...] a whole range of real issues".

The University Dental Hospital Clinics

In the UK and the USA, the clinical phase of the undergraduate medical and dental curricula have historically been hospital-based (Bloom 1989). As noted in chapter 2, the establishment of dental schools in the UK was always preceded by the presence of dental hospitals (Campbell 1981; Cooke 1997; Murry et al. 1995; Smith and Cottell 1997). But unlike today's university dental hospitals, these were voluntary hospitals rendering primary health care services to the poor. Because these dental hospitals were located in the poor areas with very high levels of dental disease, the dental students always had a large patient-pool to practice on their clinical skills. The modern dental hospital has since evolved into a highly specialised superstructure offering secondary and tertiary care to a different type of dental patient—the referrals from general dental practice. This has implications on the range of patients seen.

Limitations of Dental Hospital-Based Clinical Training

Functionally, dental hospitals are established to offer tertiary and secondary dental care. They recruit their patients as referrals from general dental practice and community dental service clinics. In his discussion of the value of setting up an outreach primary care dental unit at St Davids, Matthews pointed to two problems associated with the hospital-based dental training: a diminishing patient-pool and what he describes as a 'biased' sample of patients:

> We had been keen for more than a decade for outreaching our students and because if you have a central institution like this [dental hospital], after a while you start to run out of patients. But before that you find that you have a very biased sample of patients which students treat which does not represent real life outside. To represent real life outside is important and to do that they need to go where the community has caries and other dental diseases. So that was the

concept of outreach (Interview excerpt with Prof. Kenneth Matthews, Dean, WDS. 20/09/2004).

Matthews refers to patients attending university dental hospital as not a true representation of "real life outside" to underline that these patients were not attending the dental hospital for the first time with active dental disease but were referrals who have received dental attention at the general dental practice on several occasions. In medical education, Atkinson (1997, p. 95) describes these type of patients as "already socialised" into the medical situation, while Armstrong's (1980, p. 88) describes them as "trained" medical patients, who having had their history taken innumerable times by doctors before they are finally seen by a medical student, learn what to present to the student. Although these patients are 'ready material' for students to practice on, they do not reflect the true picture in general practice.

Joseph Smith, a subject head, drew attention to the challenge of recruiting the right type of patients for root canal treatment (RCT). He identified two problems. All potential RCT patients are first screened in the restorative clinics before they are passing on for RCT. But after they are screened and given appointments for RCT, some patients fail to turn up for the appointment. As a result, some students do not have sufficient clinical exposure to RCT;

> We work in a model of total patient care. Theoretically, it is not likely particularly around here. We have got all this disease, but theoretically they [students] could spend their time and not come across a patient who needs root canal treatment. Now they wouldn't know that they have to do root canal treatment. They have to modify their clinic, pass some patients over and get new patients in. But if those new patients don't turn up, we have got finite time and that is how some students end up doing two or three root canal treatments. That

> is something very difficulty to control (Joseph Smith, Senior Lecturer Restorative dentistry. 19/07/2004).

Smith talks of a "model of total patient care" in apparent reference to adult clinical dentistry or restorative dentistry. He specifically points to the difficulty faced by students in identifying patients who need RCT. He emphasises that students could spend a long time on the clinics without coming across a candidate for RCT. Consequently, some students are only able to carry out 2 or 3 RCTs which is not enough exposure for students to confidently carry out RCT on graduation.

The aim of the undergraduate dental education is to produce a dentist who is capable of assuming professional responsibility for the effective and safe care of dental patients and who is able to take full responsibility for her/his own professional development (Chambers 1993; General Dental Council 2002). This means that at the end of the undergraduate dental education the student can be expected to have reached the competent stage on the novice-expert continuum. But as noted above, the dental hospital does not offer an ideal environment for preparing students for general dental practice (General Dental Council 2002; Jones 1987; Nuffield Foundation 1980). To prepare students for 'independent' general practice, an extended clinical environment where students are exposed to a cross section of patients with diverse dental conditions, is recommended (General Dental Council 2002). There are two types of extended clinical environments. The poly-clinics established within the dental hospital, which provides mainly emergence care (Jones 1987), and the CODE teaching sites.

Dental Hospital Poly-Clinics

The problem of compartmentalisation clinical dental education and care at university dental hospitals is minimised by establishing primary care units or poly-clinic where students operate in an environment similar to general dental practice (Jones 1987). Unlike the specialist clinics in conservative dentistry and oral surgery, patients attending the poly-clinics come as emergence cases and not referrals. They, therefore present with a range of oral conditions close to those found in general dental practice. In these clinics, students are challenged to draw on knowledge and skills learnt from the different disciplines in an integrated manner in order to carry holistic care.

Supervision of students in the poly-clinic is done by staff drawn from two or three specialist disciplines of dentistry on a rotating basis. Each tutor, however, is responsible for her/his specialist subject. This model of integration is an illustration of the 'teachers-based' across-subjects variety (Bernstein 1977, p. 93). This is in contrast to the 'teacher-based' integrated code found in community outreach dental clinics where one tutor from general dental practice is responsible for two or more students each carrying out a different clinical procedure. This type of supervision cuts across disciplinary boundaries and reflects the approach to care in general dental practice.

Community Outreach Dental Education

There is general agreement that the dental hospital-based model of dental education does not adequately prepare students for "independent and unsupervised practice which is permitted on primary qualification" (General Dental Council 1990, par. 4; 2002, par. 45). It is also acknowledged that the transition from the shelter of the dental school to general dental practice can be difficulty for students (General Dental Council 2002; Thomson, Önkal, Avcioğlu et al. 2004). In order to "broaden the base of available

clinical material and enhance the educational experience" of dental students (General Dental Council 2002, par. 45), the CODE model is advocated and continues to gain popularity among dental educators around the world (Ayers , Abrams and Robinson 2001; Crawford et al. 2007; Eaton et al. 2006; Elkind 2002). As an education and training environment, students have opportunities to enhance both their knowledge and clinical skills.

At the WDS, coordination of the CODE activities falls under dentistry in the wider community (DIWC) theme. The theme leader for DIWC, Professor Kelvin Holmes, described the functions of DIWC as that of exposing dental students to dentistry outside the dental school and offering subjects that linked dentistry to people and the communities;

> What my area does is to take the students and give them experience of dentistry outside the Dental School and also to give them the teaching subjects that link into people and communities. Subjects like psychology, sociology, epidemiology, community prevention, and ethics. We are doing the clinical placements. We arrange a number of visits outside the Dental School for students to experience real life dentistry. That is, to general dental practitioners, to the community service both here in South Wales and North Wales as well, to district hospitals and to our primary care outreach centre at St. David's (Interview excerpt with Kelvin Holmes, Theme Leader, DIWC. 18/02/2004).

Holmes uses the metaphor of 'real life' dentistry to contrast general practice dentistry with dentistry practised in the specialist clinics of the university dental hospital. He then goes on to identify some outreach teaching sites where students at the WDS consolidate their clinical training. These are the general dental practice, community dental service, primary dental care unit (PDCU), and the general district hospitals. Each of these sites

offers students an opportunity to experience some aspect of dentistry that may not readily be found in a university dental hospital.

Types of Community Outreach Teaching Sites

The General Dental Council (2002, par. 45) identifies six sites where outreach dental education may take place. These are:

- General practice units established by the dental school
- Community dental service clinics
- Personal dental services
- Other teaching hospitals in the United Kingdom and abroad
- All systems for the delivery of primary dental care
- Other secondary care dental services such as those in regional hospital units

In their survey of undergraduate outreach teaching at United States and Canadian dental schools, Ayers et al. (2001) have identified four types of outreach sites: hospital dental clinics; public health clinics; schools and day care centres; and private dental offices. Elkind (2002), on the other hand, has grouped outreach teaching sites into two—community dental clinics and community-based attachments. The names and variety of outreach settings may differ from one country to another. This reflects, in part, differences in healthcare delivery systems. For example, what is called general dental practice in the UK is referred to as a private dental office in the USA (cf. Ayers et al. 2001; Lennon, Ireland, Tappin et al. 2004). Similarly, the range of educational experience offered to dental students also differs from one outreach setting to another. However, the primary aim of outreach dental education remains the same. That is, the

enhancement of the educational experience of students (Elkind, Potter, Watts et al. 2005; Smith, Lennon, Brook et al. 2006a).

The types of CODE attachments may be grouped into two main categories: attachments where students only observe care being delivered. Examples include attachments to specialist dental units at hospitals and attachments at participating general dental practice units. In the second type of attachment, students are involved in hands-on experience. They carry out a wide range of clinical procedures on patients under supervision. Examples include attachments at community dental service clinics and primary care dental units.

General Hospital-Based Dental Units and General Dental Practice

During attachments at general dental practices and hospital-based specialist dental units, students are limited only to observing the delivery of care at these setting. At the hospital-based dental units, students observe the range of secondary dental care carried out outside the university dental hospital (General Dental Council 2002), while at general dental practices students are exposed to the delivery of dentistry in the setting in which they practice when they qualify (Smith et al. 2006a). Although students are not engaged in any hands-on-practice, exposure to these two types of outreach settings facilitates the development of communication and interpersonal skills (Lennon et al. 2004; Thomson et al. 2004) and, patient and practice management skills (Ayers et al. 2001). This is in addition to exposing students to the range of procedures and type of patients accessing this type of dental care.

Community Dental Service Clinics

Unlike the hospital-based and general dental practice units, community dental service (CDS) clinics offer students hands-on practice. Students attend to a diverse patient-pool and carry out a wide range of dental procedures unlike in the university dental hospital. Kenneth Matthews pointed out that community clinics offered a rich training environment in terms of the range of patients and the support students received from supervising staff. He points out that;

> ...they [students] have gone in ones and twos to small clinics and have very good ratio—student teacher ratios—may be one to two, one to three, very, very good, very intensive teaching. They see far more patients because they don't have to queue up and wait for teachers to have a look. We don't have all the administration bureaucracy out in outreach, so that is good (Interview excerpt with Kenneth Matthews. Dean, WDS. 20/09/2004).

Matthews emphasises the easy access to supervisors, a benefit not readily available at the dental school clinics were students have to queue for tutors to observe what they have done (cf. Sweet et al. 2008a). However, one draw back with CDSs is that the provision of care is limited mainly to orthodontics, paediatric and special needs dentistry (Elkind 2002; Hunter et al. 2007). This limits the range of patients seen to children and young adults.

Primary Care Dental Units

The primary care dental unit (PCDU) is a relatively new innovation in outreach dental education at the WDS. The School has a well equipped and modern PCDU at St Davids Hospital in Cardiff City. The advantage of PCDU and CDS clinics is that, like the historical voluntary dental hospitals (see also chapter 2), they are usually located in areas of dental need and offer dental students an opportunity to come in contact with

'real world patients' (Eaton et al. 2006). David Jackson identified one of the advantages of PCDU over CDS to be the range of patients attending this setting. He points out that,

> [...] We also do some outreach visits to community surgeries or community clinics which we have done for many years. But obviously the type of patients they see there are mainly children ... some adults, but mainly children. Here [at St Davids PCDU] they are seeing more of the full range of ages and patients that they would see in real life (Interview excerpt with David Jackson, Part-time clinical tutor, St Davids Primary Dental Care Unit. 22/07/2004)

Like Homes, Jackson uses the metaphor of 'real life' to contrast the range of patients attending CDS clinics with those attending the PCDU. In contrast to the CDS and the university dental hospital, the PCDU exposes dental students to a range of patients and dental conditions similar to those found in general dental practice.

Advantages of Community Outreach Dental Education

The CODE as a model of dental education has attracted the attention of dental educators (Crawford et al. 2007; Eaton et al. 2006). It offers a number of advantages such as broadening the patient-base and diversity of dental conditions and procedures carried out by students (Bean, Rowland, Soller et al. 2007; Mascarenhas, Freilich, Henshaw et al. 2007; Thikkurissy, Rowland, Bean et al. 2008); developing team-working skills (DeCastro, Matheson, Panagakos et al. 2003); facilitating the transition to general dental practice and vocational education by exposing students to the practice conditions found in general dental practice (DeCastro et al. 2003); broadening access to dental care for underserved communities (Thikkurissy et al. 2008); and developing a sense of social responsibility in the students (Davidson, Carreon, Baumeister et al. 2007; Rubin 2004; Rubin et al. 2008). However, the CODE also presents some challenges. These include how to monitor and maintain quality assurance; loss of access to the dental school

facilities during outreach attachments; and the question of credentials of part-time tutors responsible for the supervision of students.

The range of educational and social advantages associated with community outreach education has led both policy makers and dental educators alike to see the CODE as the future for dental education and training (Department of Health 2002; Elkind 2002). It was evident from the interviews that the WDS and GDC participants' were no exception to this general view.

Range of Patients and Dental Conditions

Asked about the benefits of training dental student at the primary care dental unit such as the St Davids, David Jackson a clinical tutor at St Davids PCDU, pointed not only to the range of patients but also to the presence of active dental disease in these patient. He observes that,

> They [students] get a greater range of patients. They see patients in some cases that have not had dental treatment for many years, whereas in the dental hospital they are seeing patients who come back year after year, after year. It is a different type of patients (Interview excerpt with David Jackson, Part-time clinical tutor, St Davids Primary Dental Care Unit. 22/07/2004)

Jackson contrasts the patient-types attending the PCDU at St Davids with those attending the university dental hospital. He talks of patients with active dental disease who had not received any dental treatment in many years. He contrasts this type of patient to the dental hospital patients who comes back year after year and, implicitly, does not offer students any new and varied clinical experience.

Joseph Smith, a senior lecturer in restorative dentistry, also identified the quantity and diversity of patients seen at outreach settings as a positive aspect of these settings. When asked where else the dental students received practical experience in root canal treatment apart from the university dental hospital restorative clinics, Smith readily mentioned the St Davids PCDU and went on to discuss the benefits of attaching final year dental students at St Davids:

> *AK:* In terms of exposure to root canal treatment, which other place do they [student] practice it?
>
> *JS:* St Davids. They see a lot of patients, A LOT of patients in St Davids as part of their final year general practice rotation. They see FAR MORE patients in St Davids than they will see here because of the way they work. They approach practice differently in St Davids. It is far more based on general practice reacting to people coming in with a problem and dealing with it. People are counselled about the other diseases that they may have in their mouth, whereas here in this building we have got this very extensive history, examination, treatment planning idea, sequential treatment. The two philosophies are sort of slightly different (Joseph Smith, Senior Lecturer Restorative dentistry. 19/07/2004).

Smith emphasises the quantity of patients seen by students at St Davids PCDU. He talks of students seeing "a lot of patients" and "far more patient" at St Davids than at the dental hospital. He identifies two fundamental differences between the two institutions: the type of care delivered and the philosophy underlying patient care. Whereas the dental hospital delivers mainly specialist secondary and tertiary care, St Davids PCDU delivers primary care. Smith clarifies this point when he says that the practice at St Davids is based on "general practice reacting to people coming with a problem and dealing with it". He also talks of differences in philosophy underlying care. At St Davids, practitioners practise a "whole-mouth" (Jones 1987, p.612) or holistic approach to dental care, "People are counselled about the other diseases that

they may have in their mouth". This is contrasted with what he terms as the "sequential treatment" approach at the dental hospital, where history taking, examination and treatment planning take the primary focus.

The GDC fully supports the CODE for two main reasons. Exposure to these settings helps to increase the patient-pool and enhances the education experience of students. It is argued that, "An extended clinical environment and outreach teaching can potentially broaden the base of available clinical material and enhance the educational experience" (General Dental Council 2002, par. 45). In the literature, the important role played by the CODE in enhancing the education and clinical experience of students is widely acknowledged (DeCastro et al. 2003; Mascarenhas et al. 2007; Thikkurissy et al. 2008). Studies comparing students exposed to the CODE and those following a traditional curriculum suggest that CODE students see far more patients and carry out more dental procedures to high technical quality than those exposed to the dental school alone (Bean et al. 2007; Crawford et al. 2007; DeCastro et al. 2003; Thikkurissy et al. 2008). This makes the CODE students more confident in tackling normal clinical situations (DeCastro et al. 2003; Smith, Lennon, Brook et al. 2006c). But confident students were also better prepared for independent general dental practice and to function as members of the primary care team.

Facilitating the Transition to General Dental Practice and Vocational Training

Another argument in support of the CODE model is the that outreach education provides a more positive and realistic clinical environment similar to that prevailing in general dental practice (DeCastro et al. 2003). When I asked David Jackson, a part-time tutor at St Davids PCDU, how he got involved with the dental school, he responded with a chronological narrative in which he outlined his contributions in facilitating the

dental students' transition to independent practice and vocational education. He began with a brief account of when he qualified as a dentist and his role as a part-time tutor:

> *AK:* Can we begin by you giving me your personal professional background and how you are involved with the Dental School.
>
> *DJ:* I actually qualified from Cardiff in 1973 and I went straight into general practice. About 12 years ago I started part-time teaching. I was teaching a day a week and four days in practice. After a number of years I was given some responsibility for the teaching of general practice element of the course, which was very limited. The students just had a few seminars and they were told general practice existed and that was it, but not much more. So we tried to expand on that and enhance that. I realised that perhaps there was a better way of doing it. We had already moved in the UK to vocation training and I was conscious that there was somewhat a big gap between the academic education and when they went into vocational training after they qualified. [...]

He went on to talk about the impact of the structure of the university dental hospital on the organisation and delivery of care and the importance of setting up a teaching unit separate from the dental school whose main function should be the easing of the students "from the Dental School into the deep." He argues that;

> [...] One of the problems of the dental hospital is that you do different things depending upon the floor you are on. One floor might do conservation, one floor might do children, or whatever. But you are still in the same building and it is a large building. It is very much a hospital environment. Here we are much smaller. It is more individualistic. So when the students come here, they do more of what they would be doing in actual practice. I think it is more realistic (Interview excerpt with David Jackson, Part-time clinical tutor, St Davids Primary Care Unit. 22/07/2004).

Jackson begins his narrative by voicing his dissatisfaction with his earlier teaching experience of the general dental practice course. He points both to the duration and the

content of the course as being very limited in focus and scope. He expresses this by pointing out that, "The students just had a few seminars and they were told general practice existed and that was it". He then goes on to talk about his earlier attempts to improve the course by expanding and enhancing it. Efforts to reform the general dental practice course were further spurred by the need to adequately prepare the graduating dentists for vocational training (See, Jones 1987; Nuffield Foundation 1980). Jackson points to the "big gap between the academic education and when they [students] went into vocational training after they qualified". He then goes on to use the contrastive rhetoric to argue that the St Davids' PCDU offered a more superior clinical education environment than the dental hospital. Like Lee Elmore in chapter 6, he points to the structure of the dental hospital as one of the impediments to a holistic approach to care. He observes that at the dental hospital, "you do different things depending upon the floor you are on." He contrasts this with the "more realistic" environment found at St Davids PDCU where students "do more of what they will do in general practice."

An extended clinical environment such as that at St Davids PCDU is an important step in the education and training of dental students. It facilitates the transition to general dental practice and postgraduate training by offering students a "broader and more intense clinical experience" (Bertolami 2001, p. 733). In their survey of traditional curriculum and CODE alumni, DeCastrol et al. (2003) report that CODE alumni were better prepared for general dental practice and postgraduate education than their counterparts from a traditional curriculum. The difference between the two groups may be explained in terms of the range patients and the quality and quantity of procedures carried out (Mascarenhas et al. 2007; Thikkurissy et al. 2008). The advantages of the CODE environment are not limited to patient-related factors alone. They also include

such factors as good student-to-tutor ratios, access to and opportunities to work with PCDs leading to the development of team-working and communication skills.

Team-working

A feature of the CODE sites which further enhance their reputation in providing a more conducive education and clinical training environment is that, unlike in the dental hospital, students may have direct access to dental nurses. This is addition to receiving support from tutors with very strong background in general dental practice. They also have an opportunity to practise team-working with PCDs including dental hygienists, dental therapists and dental technicians. Jackson pointed to having access to a dental nurse as one practice experiences which students do not normally get at the dental school. He pointed out that,

> [...] Staff wise we have a dedicated nurse per student. So we have a qualified nurse per student which they don't get in the Dental School. So this is something new to them. We also try to practice a lot of team work. We get involved with hygiene and therapy students. They work in the unit as well. The net result, I think, is that we do make this transition much easier for them. We have had two full years go through now and the feed back has been pretty good from everybody in the sense that we are seen to be getting the management right. But I have got no intention that we will now rest on our roles. I want us to keep on improving and to improve our teaching. (Interview excerpt with David Jackson, Part-time clinical tutor, St Davids Primary Dental Care Unit. 22/07/2004)

Jackson draws attention to the importance of the dental student working as a member of the dental team. He points out that, "We also try to practice a lot of team work." He then goes on to define the composition of the dental team at St Davids, namely, the dental nurse, the dental hygienist and the dental therapist. Conspicuously absent on this team is the dental technician. This is because, although the dental technician is an important

member of the dental team, the provision of removable prosthetics is not considered part of the primary oral care. Jackson then signals the conclusion of his narrative by pointing out how successful the outreach programme at St Davids had been since its inception. He supports this claim by referring to the feedback from the alumni, who had passed through the unit during the first two years of its inception. He attributes the success to the collective efforts of the staff and management at St Davids. He concludes with a promise of continuing with efforts aimed at improving the quality of care and teaching, "But I have got no intention that we will now rest on our roles".

On graduation the dental student is expected to possess knowledge and skills that enable her/him to function effectively as the leader of a dental team comprising dental hygienists, dental nurses, dental technicians and dental therapists. The GDC recognises the important role played by PCDs in the provision of oral care and emphasises the need for opportunities within the dental curriculum for dental students to experience working with other members of the dental team. It is argued that,

> "With increasing emphasis being placed on PCDs, there is the need for the undergraduate to have experience of working as an integral part of the greater dental team. All the members of the team benefit by becoming aware early on of the contribution each can make in the provision of oral healthcare. This also assists in the development of a team approach." (General Dental Council 2002, par. 36)

The potential role of PCDs in increasing access to oral care for whole communities is widely acknowledged (Behar-Horenstein et al. 2006; Haden , Morr and Valachovic 2001; Monajem 2006; Neumann 2004; Noonan and Evans 2003; Samarawickrama et al. 1998). With very low and/or declining numbers of dentist in most countries, PCDs are considered an important "dental workforce reserve productive capacity" (Haden et al.

2001, p. 490) who should be mobilised in order to improve access to primary oral health care. But role of PCDs is usually hampered by the restrictive and monopolistic practices of dentists. Exposing dental students to dental teams is, therefore, seen as one way of producing dentists who appreciate and are more willing to work with PCDs (Benn 2003). In their comparative study of CODE and traditional curriculum alumni, DeCastrol et al. (2003) report that CODE students were more prepared to work with and delegate procedures to PCDs. It can therefore be argued that possession of knowledge and skills in team-working is directly linked to broadening access to oral care by producing dentists who are more willing to work with and more supportive of the work of PCDs.

Broadening Access to Dental Care

CODE programmes generally target deprived communities and vulnerable groups (Crawford et al. 2007). Consequently, they are seen as playing an important role of increasing access to oral. Kenneth Matthews talked very enthusiastically about the impact of PCDUs in dental education. He observes that PCDUs were particularly popular among politicians because they made it possible to deliver care to whole communities:

> These units [PCDUs] are very popular for a number of reasons: They are popular with politicians because they train members of the dental team in areas where there is a dental need, usually a shortage of dentists. Dental students treat patients to dental health not like any other health care area. They actually make whole populations fit dentally. So that is very attractive to a politician. (Interview excerpt with Kenneth Matthews. Dean, WDS. 20/09/2004).

Matthews links the political support for CODE to their potential to increase access to oral care. He argues that PCDUs are popular with politicians because they are usually

located in areas of dental need. They offer students valuable clinical experience by exposing them to diverse oral conditions, while members of the community receives essential oral care that would not normally be accessible in the absence of the CODE facilities. This leads to a win-win-win situation: the students win by practising in an enhanced clinical environment (DeCastro et al. 2003), the dental schools win by increasing their visibility and image in the community (Crawford et al. 2007; DeCastro et al. 2003), the community wins through increased access to oral care (Rubin 2004; Rubin et al. 2008; Thikkurissy et al. 2008), and the politicians win by making some political mileage out of the programme. The basic principle behind the operations of the CODE programmes is similar to the historical dental hospital (cf. British Dental Association 1979; Campbell 1958, 1981; Murry et al. 1995; cf. Smith and Cottell 1997. See also chapter 2), the students gain professional experience through rendering service to vulnerable communities.

In the UK, the outreach dental education has received the full blessing of the Department of Health (2002) and the GDC (2002). The GDC (2002, par. 45) sees the CODE programmes as one of the ways in which the education experience of dental students can be enhanced by broadening the "base of available clinical material". The Department of Health uses the rhetoric of 'improving the quality of care' to legitimate its support for the CODE. It argues that;

> "Education should be focused on developing professionals who are best suited to providing appropriate, high quality patient care. The need to ensure that education and training is designed to develop dental professionals who are best suited to working in practice argues for an increased use of primary care outreach schemes throughout training" (Department of Health 2002, p. 50, par. 3.4).

The problem of disparities in access to oral care has attracted the attention of dental educators around the world (Behar-Horenstein et al. 2006; Crawford et al. 2007; Haden, Catalanotto, Alexander et al. 2003; Henzi et al. 2007; Hobdell 1995; Hobdell et al. 1995b; Odlum 1995a; Tuisuva 1995). In countries, such as the USA, with a very strong private-sector driven dental healthcare delivery system and where there are wide disparities in access to dental care among minority communities, the CODE has assumed a moral dimension (Dharamsi et al. 2007; Haden et al. 2003; Werhane 2006). The CODE programmes have been developed as one of the ways of reaching out to underserved groups such as rural and low-income populations (Crawford et al. 2007). CODE programmes are also considered to be effective in raising students' awareness of critical access problems. Dharamsi et al. (2007) argues that students who experience the plight of vulnerable populations and social inequalities in healthcare are more likely to want to address these disparities when they qualify.

Central to serving vulnerable and culturally diverse groups is the development of cultural competency. Students on outreach attachments come in contact with patients from diverse ethnic and cultural backgrounds. This gives them an opportunity to develop attitudes, beliefs and values which are essential in working with and serving populations from diverse cultural backgrounds (Crawford et al. 2007; Davidson et al. 2007; Rubin 2004; Rubin et al. 2008). In a survey of participants of a CODE programme, Rubin et al. (2008) report improvements in the cultural competency and an increase in the sense of social responsibility among participating students, while Davis et al. (Henzi et al. 2007) have argued that participation in CODE produces a more socially aware, culturally sensitive, and community-oriented dental practitioners. It follows, therefore that while serving as a means of broadening of access to care, CODE

programmes also facilitate the development of a sense of social responsibility among future dental practitioners.

There are two assumptions related to the viability of the CODE programmes. The first is related to the number and range of patients accessing these facilities. When Mathews talks about training "members of the dental team in areas where there is a dental need" it is insinuated that these areas have a sufficient pool of patients to warrant setting up CODE sites. The second is related to the availability of sufficient dental facilities to support a reasonable number of dental students and the permanent staff. At the WDS, the smallest CODE sites have one dental unit each and the largest, at the St Davids PCDU, has 14 dental units (see appendix L). But all the community dental surgeries with one to two units are located within easy reach of the WDS in the Cardiff City area. All the sites outside Cardiff City have from three to seven dental units. This makes sending students to these sites cost effective and practical.

Cost-Effectiveness

Matthews also drew attention to the high cost of running dental hospitals and used this as further justification for his support for CODE programmes. He argued that PCDUs offered good value for money;

> [...] It [PCDU] is good value for money. Running a dental hospital is very expensive—very, very expensive. And I suspect that it [PCDU] is probably the future. If I was developing undergraduate education from scratch now, I would probably have a much smaller core building providing for basic dental education and I would do a lot of the training in St. Davids' type units (Interview excerpt with Kenneth Matthews. Dean, WDS. 20/09/2004).

Matthews uses a contrastive rhetoric to justify his support for PCDUs. He portrays the cost of running dental hospitals very negatively: It is, "very expensive—very, very expensive". This is contrasted with PCDUs, which he suspects is probably the future of dental education. He stresses his strong support for the CODE by pointing out that if he was asked to set up a new dental school, instead of setting up an expensive dental hospital, he would utilise PCDUs. However, Matthews does not explain why PCDUs are cheaper to run than dental hospitals. Neither does he make any reference to the cost of setting up CODE facilities, nor does he make any mention of the cost of transporting students to and from and accessibility of CODE sites, which may present a major obstacle to the effective implementation of CODE programmes in remote locations.

Future Career Plans and Practice Location of Graduating Dentists

One of the missions of dental schools is to promote oral health and the provision of care by meeting the workforce requirements for oral health (General Dental Council 2002; Henzi et al. 2007; Jones 1987). An important element in this function is the production of dentists who are willingness to work in underserved and remote communities on graduation. Lee Elmore pointed out another reason why CODE programmes were popular among politicians. They assumed that exposing students to underserved and/or deprived communities during outreach would make them more willing to serve these communities on graduation. Elmore was, however, quick to dismiss this type of thinking as a fallacy. He went on to points out that;

> [...] There is no doubt about it that the GDC was responding to the government's perception that it was very difficult to get dentists to work outside very large conurbations. Particularly in the Midwest Region there is a huge recruitment problem away from the Cornfield-Raspberry axis [the two major cities in Midwest]. And government was very keen to get students out working in those areas in the hope that they will eventually encourage them to set up

> practices or working in practices out there once they qualify. It hasn't worked and they are looking at other ways of doing it. As I said to them, "slavery was abolished a long time ago in this country." [...]The government was trying to do some social engineering for understandable reasons. They have got a problem. I am not sure that they took the best approach (Telephone interview with Lee Elmore, Head of Department, Midwest Dental School and former member of the 2002 GDC Working Party. 25/01/2005).

In this excerpt, Elmore begins by stating where the influence on the GDC policy on outreach education was coming from: the Government was keen on increasing the number of dentists in underserved areas. He then goes on to affirm that access to oral care was a big problem for vast areas of the Midwest Region and acknowledges that the Government has responsibility to address the problem of disparities in oral care manpower distribution. However, he is sceptical about the approach taken, "They have got a problem. I am not sure that they took the best approach."

Elmore's scepticism about the impact of the CODE programmes in influencing the students' future practice locations in underserved areas has some empirical support. In the literature, it has been reported that students exposed to community outreach programmes are more socially sensitive to disparities in oral health and are more likely to do something about it compare to students who do not have such exposure (Davidson et al. 2007; Rubin 2004; Rubin et al. 2008). However, it is argued that community outreach exposure is not the only determinant of future career plans and practice locations of students on graduation (Davidson et al. 2007; DeCastro et al. 2003). It is argued that ill planned CODE programmes may even influence some students away from rural practice locations (Orpin and Gabriel 2005). Several factors that are significant in influencing the career and practice plans of students have been identified (Davidson et al. 2007).

Evidence from programmes aimed at increasing the rural medical workforce in Australia, suggests that several factors influence the future practice plans of doctors. Dalton, Routley and Peek (2008), Dunbabin and Levitt (2003), and Veitch, Underhill and Hays (2006) all agree that although participation in rural placements during medical education was important in influencing the doctors career path and practice locations, it was not the only factor. The other factors include students' personal characteristics such as family attachment in the rural areas, financial aid obligations, including student debt; and expressed interest to work in rural areas prior to entering the medical school (Dunbabin and Levitt 2003; Wilkinson 2003). In the UK, students' perceptions about the NHS dentistry (Gallagher et al. 2008) may be an important determinant of future practice plans. Other factors such as uncertainties about future career prospects (Sofola , Uti and Akpene 2008), student debt (Karibe, Suzuki, Sekimoto et al. 2007; Lalloo et al. 2008) and the quest for prestige and financial stability (Karibe et al. 2007; Kuusela, Honkala, Hausen et al. 1993; Lalloo et al. 2008) may all play a role in informing the future career plans of dentists. But, as Bazen (2007) has observed, the CODE programmes may be a valuable tool in augmenting access to oral care for all sectors of society.

Both Matthews and Elmore identified the political context as a significant factor in informing decisions about the CODE programmes in the GDC dental curriculum framework policy. But unlike Matthews and other participants from the WDS, who were very passionate, Elmore was generally cynical about the policy outcome of the CODE programme. Differences in perception of the effectiveness of the CODE programmes between Elmore and participants from the WDS may point to differences in the social environment between the WDS and the Midwest dental school. Whereas the WDS has a modern PDCU and outreach sites which are relatively within easy reach,

the Midwest dental school does not seem to possess well established CODE infrastructure. This further renders support to the fact that differences in the local social context between dental schools can lead to different responses to the dental education framework policy even within the same country.

Challenges and Barriers to the CODE

The implementation of the CODE model is not without its challenges. Social factors such as the density and distribution of the population; physical and electronic accessibility of outreach sites can some impact on the cost-effectiveness of the CODE programmes. Education factors such as monitoring of student performance and quality assurance mechanisms and the qualification and experience of tutors supervising students during outreach attachments can have implications on the quality of the education experience of students.

Cost of Running CODE Programmes

In a long narrative, Lee Elmore identified three barriers to CODE programmes, which are all related to the cost of running CODE programmes. He points out that,

> One of the tenets of modern education is that people learn best, or the most appropriate learning environment is the environment in which the learned skill, or whatever it is, is going to be applied. The problem is when you try and do that with outreach you lose the economics of scale that you get with the dental school. It is actually much cheaper to have one member of staff supervising eight or ten students on a poly-clinic than it is to have one practitioner looking after four students in outreach.

This section of Elmore's narrative offers an example of the simultaneous use of the abstractionist and pragmatistic repertoires to make sense of and to resolve potential

contradictions between theory, on the one hand, and the practical reality of the CODE environment on the other. He begins by acknowledging the education principle that learning is more effective when knowledge is transmitted in an environment similar to that in which it will be used in professional practice (Crawford et al. 2007; Oliver et al. 2008). But he questions the applicability of this principle to outreach education and uses the metaphor of 'loss of economics of scale' to justify his opposition to CODE at the Midwest dental School. This also signals a shift from the abstractionist to the pragmatistic interpretative repertoire. From this point onwards, Elmore focuses on barriers to the CODE and he makes no attempt to offer any suggestions on how these barriers may be resolved.

By loss of 'economics of scale', Elmore is comparing the cost of supervising students at the dental hospital and at outreach clinics. He argues that because in outreach clinics one tutor supervises one to three students while at the dental hospital one tutor may be responsible for more than 8 students, this makes supervising students at the dental hospital cost-effective. In contrast, in the earlier section on CDS clinics, Matthews argued that the low tutor-to-student ratio in outreach clinics had education benefits for the students. The student did not have to queue for the tutors (cf. Sweet et al. 2008a).

Elmore went on to identify other barriers to outreach education. These include the logistical problem arising from a relative low population density in the Midwest region and how this may negatively impact on the viability of setting up a twelve unit PDCU. Taking the example of the population of Stockdale, the city where the Midwest Dental School is located, he points out that,

> We have a problem with outreach in that there is a population of 240 000 in the Stockdale area. If you take the area of Stockdale to within 30 miles before you

> encroach on Cornfield and Raspberry territories, you are looking at a population of probably only half a million. And again for outreach, we don't have centres with a population where you can put in twelve chair poly-clinics. There just isn't the population-base to support those and our students have to go much further for outreach. They are going up to Stressdale, which is a 100 miles away; they are going to Leach Stock which is 75 miles away. They are going to the Greenbelt Islands, which is a ferry-trip away. But even in those centres we are still looking at only six-chair units. So outreach is going to be a very expensive way of delivering that sort of education because you loose the economies of scale and you fail to meet this output.

Elmore is concerned about two logistical issues: the lack of centres in the Midwest region with a population density that would support the setting up of a 12 chair PDCU such as that at St Davids in Cardiff. He is also concerned about the geographical location of the outreach sites. He argues that in some cases students have to travel between 75 and 100 miles to reach outreach sites. This adds to the cost of outreach education, loss of contact with the dental school and loss of valuable curricular time.

The problem of loss of contact with the dental school is made worse by the relative physical and electronic inaccessibility of some outreach sites. For example, to get to Greenbelt Islands, students have to depend on the ferry as the only means of travel. This exposes students to some risks such as storms. In addition, some areas are electronically isolated from the rest of the world. That is, some outreach centres do not have computerised information systems and electronic links. Elmore specifically identifies the absence of distributed learning infrastructure in outreach sites to facilitate learning and communication with students. He laments that,

> There should be in place an infrastructure for distributed learning. An electronic learning environment, which means that I can keep in touch with the students when they are away because, clearly if someone is in Stressdale they can't

> participate in the seminars that we have. We need to be able to have electronic links into these places so that they can take part. There is no way you can have a student in Stressdale for a week and bring them back for a Wednesday morning seminar and send them back up to Stressdale for the rest of the week. So there are structural issues like that (Telephone interview with Lee Elmore, Head of Department, Midwest Dental School and former member of the 2002 GDC Working Party. 25/01/2005).

Elmore points to the need for some electronic links between the dental school and outreach sites in order to facilitate contact between the students the dental school. Such links would enable the students' access to electronic education resources and to the blackboard virtual learning environment. Students could also participate in education activities such as seminars via video links. Cinotti, Saporito, Feldman et al. (1999) argue that community-based dental education can be boosted through computerised information systems and electronic links. But to develop such links requires funding, which most dental schools cannot easily find.

Barriers to the CODE programmes are not limited to geographical and demographic factors. They also include the cost related to setting up the physical infrastructure and the running costs associated with a bloated workforce. Jackson elaborated on the cost of setting up and running a PCDU like St Davids:

> AK: Based on your experiences here, what would you recommend as the basic infrastructure for a dental school wishing to run a community training facility such as this one here?
>
> DJ: The first thing one has to say is that you have got to have the space and you have got to have the money. If you are short of either then you are not going to achieve what you want to achieve. At the moment we are running twelve operatives, so obviously we have got to have the relevant equipment to run twelve operatives. We have the policy, as I said earlier, of one nurse per student.

> We have got enough nursing staff. Teaching staff wise, we always work on a ratio of a maximum of six to one. So on any one day if there are ten or twelve students, we have got two members of staff. You have also got to put into the infrastructure the background people. There is the receptionist, there is the person who looks after the sterilising of instruments and we have got secretarial support for half a week. You have got to have an adequate amount of managerial side—I time-table myself for teaching for probably half to two thirds of a week and the rest of my time is managerial. That is not necessarily within the unit. I have to attend a lot of meetings in the Dental School. I attend meetings on the new curriculum. So to teach twelve students does require a lot of resource both in money, manpower and equipment. It is more than you would need for twelve surgeries in a general practice (Interview excerpt with David Jackson, Part-time clinical tutor, St Davids Primary Dental Care Unit. 22/07/2004).

Jackson looks at the cost of PCDUs in terms the cost of setting up the infrastructure and running costs associated with teaching. He points to the importance of finding the space. The right 'space' has both physical and social attributes. It must be physically adequate to accommodate the equipment, staff and dental students. But it must also meet the social criterion of being located in an area of social need. Jackson went on to discuss running costs associated with the teaching of students at the PDCU. These include the equipment—twelve operatives; and the manpower—the tutors, a nurse for each student, clinical and administrative supportive staff. He compares the cost of running the PCDU with that of running a general dental practice and concludes, "...to teach twelve students does require a lot of resource both in money, manpower and equipment. It is more than you would need for twelve surgeries in a general practice".

Monitoring and Quality Assurance

An important aspect of clinical education and training is the supervision and monitoring of students (Sweet et al. 2008a; Sweet et al. 2008b). This serves two functions, the protection of patients from injury and to ensure that the patient received reasonable

quality of care. One of the concerns in outreach education is how to ensure that the quality of dental care delivered by students during the CODE was consistent with that delivered in dental schools. The GDC draws attention to this concern and advises all dental schools to clearly define the objectives of outreach activities and to effectively co-ordinate "quality assurance mechanisms" (General Dental Council 2002, par. 45). Jackson Smith drew attention to the challenge of monitoring the quality of root canal treatment (RCT) carried out during outreach attachments. He points out that,

JS: I have very little control over individual students' experience of clinical practice (.....) both in terms of, they may see very few, but equally they may actually be in a different place to this and see lots of people and do lots of root canal treatment. But it may not be root canal treatment as I would expect and as the endodontists would expect to be practised. And so outside, they could be doing a lot. But if they are not doing it right then that cannot ( ). It is very difficulty. [...]We have an outreach programme where they visit community clinics for a fortnight in North Wales or South Wales and some of the South Coast Naval Bases and they can do root canal treatment there. Now, I wouldn't necessary know that. There are gaps you know.

AK: And how do you propose to close those gaps?

JS: Well, this logbook idea (....) I will ask all the students, as part of the revised curriculum—and they are getting practice now in case-reporting because that is how we develop...to record what we have done. We have slightly a different style of recording. They will have to submit all the root canal treatment that they have done in the form of a logbook as I said. And that way we will get numbers. We will get an idea of quality from the radiographic images. At the same time as I see the radiographic images I can look at the root canal treatment. I can also look at the images themselves and see how good they are. So if there is a problem with a radiograph we can, as part of endo, then we can look at that. And on the basis of that documentation—I mean we are asking the students to tell us the truth by not hiding anything. If I am concerned, I can sample some of those case reports, go to the computer server, dial up the student number or dial the patient number and all the radiographs that have been taken for that patient

> will be on the computer. You cannot erase them. If there is a discrepancy between what the student told me had happened, then I can check back. [...]But the onus is on the students. I will check a sample of them to see that they are not omitting information. Once I know what their experience has been, I can at least reassure myself, and perhaps some external body. We have a tangible record. (Joseph Smith, Senior Lecturer Restorative dentistry. 19/07/2004).

Smith acknowledges the challenge he faces in monitoring both the quantity and quality of RCTs carried out by students during community attachments. He talks of the introduction of the logbook and the use of radiographs as important aids in monitoring students' work: "They will have to submit all the root canal treatment that they have done in the form of a logbook". But the logbook can only show the number of procedure done and not necessarily the quality. To have some idea about the quality, radiographs taken as a routine part of RCT may be examined.

The monitoring of the quality of RCTs is facilitated by the use of modern technology. Smith specifically referred to the use of electronic patient records (EPR) to assess the quality of RCTs. He points out that if there were any doubts about the performance of a student, this could be checked out by examining the EPR, "I can sample some of those case reports, go to the computer server, dial up the student number or dial the patient number and all the radiographs that have been taken for that patient will be on the computer". The use of EPR is acknowledged as an important tool is assessing the quality of care in dentistry and dental education (Atkinson et al. 2002; Langabeer, Walji, Taylor et al. 2008; Shelley , Johnson and BeGole 2007). They are also an important tool for research (Atkinson et al. 2002) and have the potential of improving the education experience of students (Langabeer et al. 2008). The use of IT in clinical dentistry is not limited to patient information storage and retrieval. The use of virtual reality simulators as a pedagogic tool in developing manual dexterity of students has been reported by

Wierinck, Puttemans and van Steenberghe (2006). But since IT and EPR may not be available in some CODE centres, logbooks and X-rays may be the only means of monitoring and evaluating student performance during community attachments.

Part-time Clinical Tutors in Dental Education

The role played by part-time clinical tutors in the training of dental students is acknowledged by the General Dental Council (2002, par. 33), "The contribution of part-time clinical teachers, who work in general practice and hold appropriate qualifications, is highly advantageous." There are two benefits offered by part-time tutors. They help to enrich the educational experience of students by bringing a truly "general practice atmosphere" (O'Neil 1994, p. 350) to clinical training. And, with the challenge facing many dental schools of failure to attract sufficient numbers of full-time academic staff (Treasure 2004), they are a ready source for teaching staff.

Lee Elmore discussed at length the challenges facing dental schools in recruiting sufficient numbers of full-time academic staff and the burden this placed on the few staff. He observes that,

> Actually recruiting people into academia at the moment is hugely difficulty. I think we are going to face a long time recruitment problem and I think we then have to look at what are the core things the academic should be doing and that is going to be leadership. Our biggest problem is that dental schools are getting top heavy. You need senior lecturers to lead the subjects departments. But we don't have enough staff at the junior level, underneath, to do the work that frees up the time for the senior academics to be doing what senior academics should be doing. ...That situation is really impossible to sustain long term. I think that what we are going to have to do is to bring in more general practitioners as tutors. We will probably have a smaller core of true academics and greater number of part-time tutors whose basic predominant earnings is probably going

> to come from practice (Telephone interview with Lee Elmore, Head of Department at Midwest Dental School and former member of the 2002 GDC Working Party. 25/01/2005).

In the face of difficulties in attracting new staff into the academia, Elmore sees part of the solution to lie with the recruitment of part-time tutors from general dental practice. But the participation of part-time tutors presents three potential problems. Most of them do not possess appropriate professional and academic qualifications. They do not have any teaching experience. And there may be some discontinuity in the depth and breadth of what is taught in the dental schools and what is practised in general dental practice (Clark et al. 2001; Solomon et al. 2006). The lack of teaching qualifications and a lack of appreciation of modern learning and teaching principles may apply to other academic staff including full-time clinical tutors (Sweet et al. 2008b). But the impact may be more pronounced on outreach tutors because of the lack of peers support and immediate access to the dental school resources.

Professional and Academic Qualifications

Most of general dental practitioners do not possess higher academic and professional qualifications required by universities from all teaching staff. Elmore speculates that this problem is likely to be overcome in the long term as more dentists from general dental practice acquire specialist professional qualifications. He notes that,

> [...] what we are going to have to do is to bring in more general practitioners as tutors. We will probably have a smaller core of true academics and a great number of part-time tutors whose predominant earnings is probably going to come from practice. But I think with the increase in specialisation, we will be able to get teachers with particular specialist expertise from practice and I think that is going to be the change at the moment. Most of the practitioner-tutors that we have don't have any higher qualifications, either clinical or academic and I

> think that will change. What we will see is more part-time teachers rather than full time academics and many of these will have higher qualifications of one form or another, particularly clinical ones. (Telephone interview with Lee Elmore, head of Department at Midwest Dental School and member of the 2002 GDC Working Party. 25/01/2005).

Closely associated with the possession of the right professional and academic qualifications is the need for clinical tutors to have some educational training.

Education Training and Teaching Experience

Elmore pointed to the value of education training and faculty development programmes aimed at helping tutors to become more effective teachers. He argues that being an expert in a subject does not necessarily make one an effective teacher,

> [...] But there is also, I think, the issue of "Just because you know about the subject doesn't necessarily mean you can teach it." We will start to get much more proactive about ensuring that they [part-time tutors] get the same adequate training in terms of the educational side (Telephone interview with Lee Elmore, head of Department at Midwest Dental School and former member of the 2002 GDC Working Party. 25/01/2005).

Earlier, Elmore pointed to the increasing interest in education principles, particularly among junior academic staff at the Midwest Dental School. He attributes the surge in interest in education to "the realisation that dental education is not something that just happens and that because you are a dentist you can go out and teach". This observation renders further support for faculty development programmes in education training.

Discontinuity between the Dental Schools and General Dental Practice

David Jackson saw the main challenge in working with part-time tutors was how to ensure a coordinated approach to and consistence in teaching. He argues that this is a serious area of concern because of differences in approach to care among general dental practitioners;

> I think one of the challenges is not so much teaching the students, but teaching the part-time staff how to teach students. I would have imagined that probably quite a number of your teaching staff will be part-time. ...We have a lot of part-time staff, and I guess you probably will as well. And it is really ensuring that part-time staff are teaching in the way that you want them to, not sort of going off and doing their own thing. Hence this meeting tonight where we are going to be talking to all our part-time staff and going over certain things with them to try and get them do the same thing (Interview excerpt with David Jackson, Part-time clinical tutor, St Davids Primary Care Dental Unit. 22/07/2004).

Jackson emphasises the importance of coordinating and monitoring part-time tutors in order to ensure that they did not go off "doing their own thing". He holds regular meetings and seminars with them aimed at "going over certain things with them to try and get them do the same thing". Jackson's concern about the teaching ability of part-time clinical tutors is shared by Sweets et al (2008b, p. 568) who have observed that because most of part-time tutors do not possess insufficient training, they may unwittingly be "straying from taught procedures, which may confuse students".

Sweet et al. (2008b, p. 568) have referred to the possibility of general practitioner-tutors "straying from taught procedures", while Jackson draws attention to the importance of getting them "do the same thing". Both underscore the importance of adhering to the university taught clinical procedures during clinical supervisions. They also implicitly point to the existence of some discontinuity between the dental school and general dental practice. Indeed, studies on trends in general dental practice have

reported disparities and discontinuities in some clinical procedures between what is taught in the dental schools and what is applied in general dental practice (Clark et al. 2001; Silversin et al. 1975; Silversin et al. 1978; Solomon et al. 2006). To harmonise this disparity, Solomon et al. (2006) suggest constant monitoring of trends in general dental practice in order for dental schools to produce programmes that reflect the real needs of general dental practice.

Discussion

The three environments in which the professional skills are transmitted in dental education are the phantom head laboratory, the discipline-based dental hospital clinics and the CODE sites. The technical skills laboratory, facilitate the acquisition of essential basic skills such as how to handle and control hand-pieces when cutting a hole in a tooth. These basic skills form the foundation for more complex procedures and must be understood and mastered by students before they are allowed to practice on patients (Clancy et al. 2002b). The dental hospital-based specialist clinics give students an opportunity to apply the knowledge skills acquired from the phantom laboratory on real patients. While the CODE environment facilitates the students' transition to general dental practice by exposing them to a wide range of patients and dental conditions similar to those found in general dental practice (Bean et al. 2007; Crawford et al. 2007; DeCastro et al. 2003; Thikkurissy et al. 2008). This helps students to develop more confident in tackling normal clinical situations (DeCastro et al. 2003; Smith et al. 2006c), carry out dental procedures to a relatively high technical quality (Bean et al. 2007; Crawford et al. 2007; DeCastro et al. 2003; Thikkurissy et al. 2008) and be better prepared for independent professional practice on graduation.

The CODE, as a model of dental education, continues to attract the attention of dental educators around the world (Eaton et al. 2006; Elkind 2002; Elkind, Blinkhorn, Watts et al. 2003; Smith et al. 2006a; Smith, Lennon, Brook et al. 2006b). It offers a range of possibilities for the future of dental education (Elkind 2002). Changes in social environment such as a diminishing dental hospital patient pool, political support for outreach education (Department of Health 2002), the cost of running dental hospitals in the face of declining funding (Kerosuo et al. 2001; Murry 2002), and the social responsibility of the dental profession to broaden access to oral care for all sectors of society (Rubin 2004; Rubin et al. 2008; Thikkurissy et al. 2008) have all contributed towards the popularity of the CODE a model of dental education. Some challenges which need to be taken into account when planning the CODE include the cost of setting up and running CODE programmes, logistical factors such as the population density and accessibility of outreach sites; the importance of having in place monitoring and quality assurance mechanisms to ensure that the quality of education students are exposed to during outreach is consistent with that provided at the dental school.

The three education environments suggest a hierarchical progression in the education and training of dental students from knowledge acquisition, to knowledge application and, finally, to knowledge integration and consolidation respectively. At the WDS, the first and second years are devoted to preparing students for clinical practice by equipping them with the requisite foundation and procedural knowledge. The phantom head skills laboratory plays some crucial role in developing technical skills and manual dexterity essential for carrying out complex dental procedures on patient. The third and fourth years are devoted to socialising students in the various disciplines and sub-disciplines of dentistry. The students are allowed to put into practice the theoretical and procedural knowledge acquired through lectures, independent study and from the

technical skills laboratory. The fifth year gives students are an opportunity to integrate and consolidate their clinical experience in an extended clinical environment in the university dental hospital poly-clinics and community outreach sites.

From the theoretical perspective of a diagonal collection-integrated landscape (DICIL) and the novice-expert continuum, the three environments also point to hierarchical progression from the strong classified and framed phantom head technical skills laboratory, to the strong classified but relatively weak framed dental hospital specialist clinics and, finally, to the relatively weak classified and framed CODE setting. The students learn technical skills in the sheltered and context-free environment of the pre-clinical phantom head laboratory. This environment is relatively strong classified. However, in the restructured curriculum at the WDS there have been trends towards weak classification. Examples weak of classification include the integrated fixed and removable prosthodontics (FARP) and the integrated paediatric and restorative dentistry phantom courses. In addition, the fact that students are not practicing on real patients may lead to a relatively more relaxed environment than would be the case if real patients were involved. But a context free (Dreyfus and Dreyfus 1986; Dreyfus and Dreyfus 1980) and a relatively strong classified environment (cf. Chambers 1994) offers an ideal learning environment for novices.

The transition from the technical skills laboratory to the dental hospital-based specialist clinics marks progression from a relatively strong classified and framed environment to a strong classified but relatively weak framed environment. The university dental hospital is compartmentalised into the discipline-base specialist clinics, suggesting strong classification in the learning environment. For students to fully benefit from their clinical experience they must actively engage in hands-on learning from the moment

they are introduced to patient care. As pointed by Smith in the previous chapter, tutors may adopt a hands-off approach in the transmission clinical skills. This suggests weak framing. But concerns for patient safety and quality of care will tend to lean towards a strong framed environment.

The dental hospital poly-clinics and the CODE are relatively weak classified and framed environments. The students see a wide range of patients and carry out a variety of clinical procedures to meet the patient's needs. To achieve a holistic approach to care required in a poly clinic, student have to apply and integrate knowledge from the different disciplines of dentistry. In addition, at this stage of professional socialisation, the student possesses some professional judgement and values and is capable of carrying out a range dental procedures presented by most patients in general dental practice (Chambers 1994; Chambers and Glassman 1997). However, concerns about patient safety and the fact that at this stage the student lacks speed and flexibility (Chambers and Geissberger 1997; Hendricson and Kleffner 1998) will tend to pull the NECT towards strong framing.

Based on the structural organisation and the power and control social relationships between the students and tutors, the three learning environments can be mapped on to the DICIL. The phantom head laboratory would map on to the collection side of the landscape. The dental hospital would map on to the collection-integrated interface, while the CODE can be mapped on to the integrated side of the DICIL.

In the next chapter, the education and socio-cultural factors presented in Appendix I will be discussed in relation to Zambia. The chapter begins by first presenting a model, which aids a systematic identification of the relevant elements of the TESE in Zambia.

Chapter 10

Contextualising the Education and Socio-cultural Environment of Zambian: pragmatic implications for curriculum planning

Introduction

In the introduction, I have pointed out that one of the motivations for undertaking this study was in order to develop a theoretically and empirically informed comprehensive curriculum model for Zambia. In chapter 5, I have developed a theoretical framework for guiding curriculum analysis. I have argued that while what determines what curriculum innovation is adopted may be based on education principle, the successes of the innovation will depend on the wider socio-cultural factors and I have introduced the term the 'total education and practice environment' (TEPE) to describe these factors.

This chapter identifies and sketches into a model the social factors that are relevant to Zambia. Borrowing from Kelly's (2004, p. 4) concept of the "total curriculum", I have called this model the 'total education and practice environment' (TEPE) of Zambia. The model helps to draw attention to the fact that dental curriculum is a product of complex interaction of social forces. In general education, Kelly (2004, p. 4) has argued for the need to move beyond a simplistic approach to curriculum planning, which only focus on the knowledge-content transmitted. He suggests a more comprehensive approach to curriculum planning that takes into account the wider societal concerns.

The centrality of the curriculum in the production of dentists, who are not only scientifically informed and technically competent but socially responsive, is widely

acknowledged in the dental profession (Enwonwu 1988; Hobdell 1995; Hobdell and Sheiham 1981; Robbins 1972; Thorpe 2006). Because social factors differ from one country to another, the planning of the dental curriculum should start with a "realistic appraisal of the social and economic situations as well as patterns of dental pathology" (Robbins 1972, p. 34). But as Kelly (2004) has observed in general education, the challenge is in finding a suitable model for guiding a comprehensive approach to curriculum planning. Such a model should simultaneously address two issues. It should inspire and engage the 'curriculum *users'*, the teachers and the 'curriculum *receivers*', the students (Schwartz 2006, p. 450). At the same time, it should be sensitive to the socio-cultural context in which it is situated. The TEPE offers such a comprehensive scheme. It offers a holistic and systematic approach to curriculum planning by drawing attention to the wider social environment.

The Total Education and Socio-cultural Environment

In deriving the curriculum model for Zambia, I have looked at the dental education environment broadly as product of 'composite and complex' interaction of 'intellectual and social forces' (Hobdell 2002, p. 19). The concept of TESE serves as an integrating concept that brings together all the different social factors impinging on dental education. The overall aim is to move dental curriculum planning from a passive and unplanned response to changes in the external social environment to a project which begins with the identification of and understanding all factors affecting dental education with the view of exploiting them to achieve specific educational ends (Hobdell 2002).

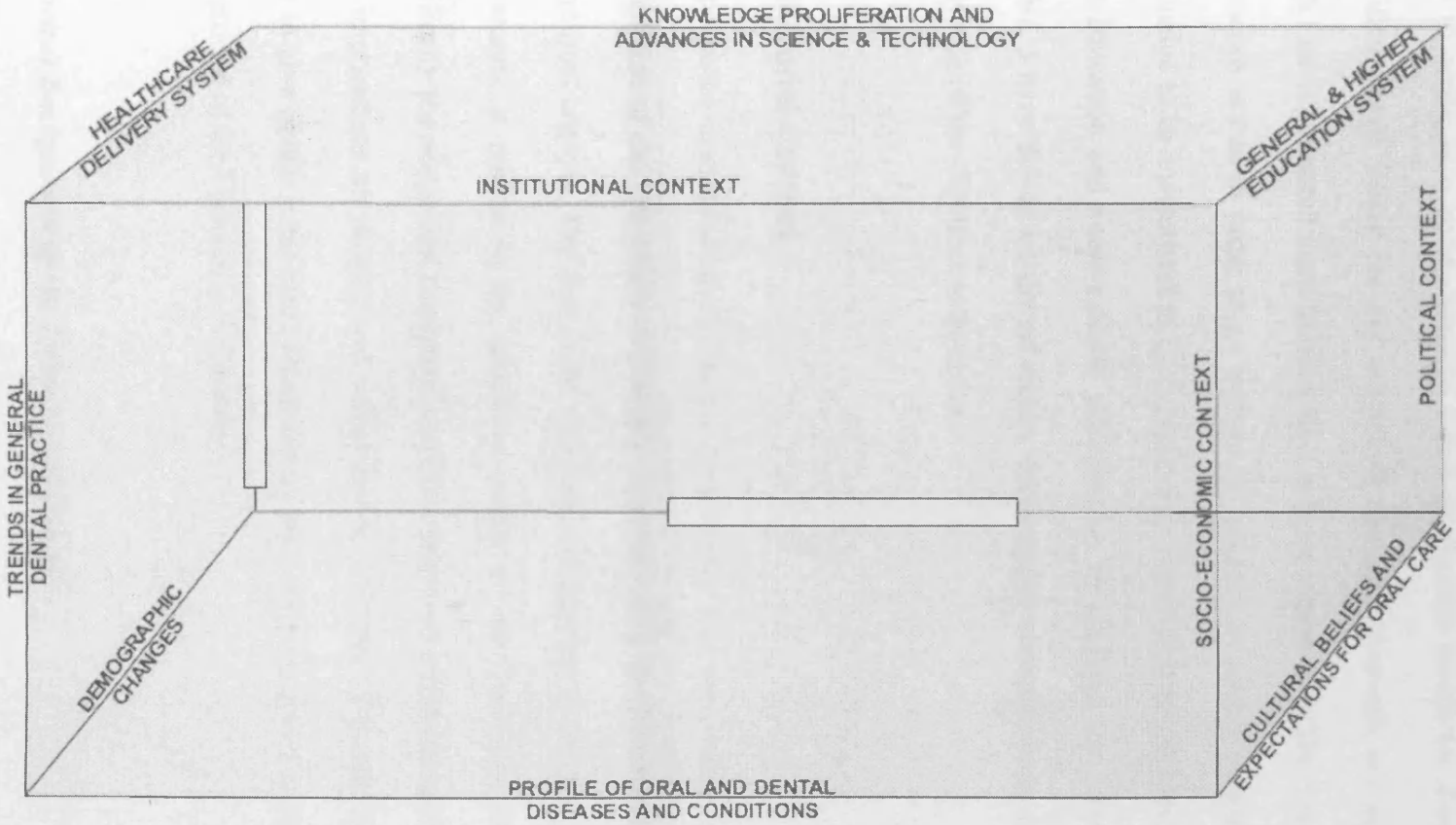
There are two caveats in my use of the concept TESE. The first is that oral health circumstances differ from one country to another and for different sections of the community within the same country (Hobdell 1995; Myburgh 2002). Therefore the

number of elements constituting the TEPE and their impact on the on the curriculum will also differ from one dental school to another. The second caveat is that dental education should be directed at meeting oral health needs of individuals and the community which the dental school serves (Fonseca 1995; Myburgh 2002).

Figure 10.1 is a diagrammatic presentation of elements of the TESE. The number and impact of the elements constituting the TESE will vary from one country to another. To illustrate how the TESE can be used as a conceptual aid to holistic approach to dental curriculum planning in Zambia, ten elements are identified and discussed. These are the institutional context, education system, cultural context, health care delivery system, general dental practice, demographic changes, oral disease profile, scientific and technological advances, socio-economic context and political context.

The impact of the TESE will vary from one institution to another depending on the local social context. For example, the climate has some curricular significance in Canada (Odlum 1995a) while national and regional accreditations requirements, for example in the USA and the European Union (American Dental Education Association 2006; Chambers 1996; Plasschaert et al. 2004; Scott 1990) are important drivers of the dental curriculum. In countries such as the USA, Canada and Japan it is mandatory for dental graduates to pass state licensing examinations before they are permitted to practice dentistry, (American Association of Dental Schools (AADS) 1997; American Dental Education Association 2004, 2005, 2006; Boyd et al. 1996; Heo et al. 2004; Japan Dental Association). In the UK the GDC's (2002) curriculum framework guidelines and the QAA (2002) benchmarking are all important factors in informing the undergraduate dental curriculum.

Figure 10.1: The Total (Dental) Education and Socio-cultural Environment



The dental curriculum is a product of complex interaction of multiple education and socio-cultural factors which have been termed as the 'total education and socio-cultural environment' (TESE). The number and impact of elements of the TESE on the curriculum will differ from one institution to another. The planning and implementation of innovations in dental curriculum should therefore start with a systematic identification and evaluation of the relevant elements of the TESE and their potential impact on the curriculum.

The Relevant TESE Elements in Zambia

Ten elements of the TESE, which are relevant and need to be taken into account in order to arrive at a comprehensive dental curriculum model for Zambia, have been identified above. These are not necessarily the only elements, nor does the order in which I have presented them indicate their relative importance. The main point I wish to underscore is that in order to go beyond the practice of simply itemising the body of knowledge to be transmitted in curriculum, it is importance to contextualise curriculum in its education and socio-cultural environment. In applying the concept of TESE to Zambia, I have drawn on the secondary documentary data and from my own personal experience of the Zambia environment.

Institutional Context

The proposed undergraduate dental programme will be a department under the School of Medicine of the University of Zambia. There are two significant issues related to the institutional context. The first is the structure and staffing of the School of Medicine. The second is related to the admission policy of the University of Zambia; more specifically the admission requirements of the School of Medicine and their likely long term implications on professional values and the delivery of dental care. However, in order to give reader some clear perspective, I will begin by giving some brief historical background of the University of Zambia.

Historical Background of the University of Zambia

There are two universities in Zambia: the University of Zambia and the Copperbelt University. The University of Zambia was officially opened two years after Zambia's independence, in 1966 with only three Schools: the Schools of Education, Humanities

and Social Sciences, and Natural Sciences. As the university expanded more schools were established: the School of Law in 1967, Engineering in 1969 and Medicine in 1970. Other schools to follow were Agriculture in 1971, Mines in 1973, Business Studies in 1978, Environmental Studies in 1981 and Veterinary Medicine in 1983. The Schools of Business Studies and Environmental Studies were located at the Ndola campus on the Copperbelt Province. However, in 1987 the Ndola campus was transformed into a separate university and renamed the Copperbelt University.

Although the School of Medicine was officially opened in 1970, the first cohort of medical students commenced their pre-clinical studies in 1968. The School granted its first joint Bachelor of Medicine and Bachelor of Surgery in 1973. The School has since graduated over 1200 doctors (University of Zambia School of Medicine). In addition to the MBChB programme, the School offers postgraduate degrees in medicine and surgery and is responsible for undergraduate Bachelor of Science programmes in Nursing, Biomedical Science, Physiotherapy and Pharmacy. Two additional programmes are planned for establishment in Bachelor of Science in Environmental Health and Bachelor of Dental Surgery (BDS).

Academic Staffing

Like all public institutions in Zambia, the greatest challenge faced by the School of Medicine is the problem of recruiting and retaining academic staff. Although this is a general problem even in developed economies such as the UK (cf. Treasure, 2004), it is more critical in developing countries. Low funding to the University and general deterioration in the conditions of service for all staff means that the University is not able to offer competitive conditions of service. This has led to mass exodus of staff to the private sector and abroad. This has resulted into all schools and departments of the

University operating far below established staff levels (University of Zambia 2000). The logical response under such an environment should be to maximise the use of available manpower. One way in which this can be done is to identify common competencies between dentistry and the other already established health care profession programmes with the aim of developing a collaborative approach in the teaching of common topics. Some of the programmes with which the BDS programme could forge collaborative links include medicine, nursing, pharmacy, biomedical sciences and veterinary medicine. In a study by Spielman et al. (2005) in which they compared the core competencies between nursing, dental and medical programmes at New York University College of Dentistry, they found an overlap of 38% between the dental and nursing and 25.4% between the dental and medical programmes. They therefore argue for increased interdisciplinary collaboration not only between dentistry and medicine but also between dentistry and nursing. They argue that collaboration between dentistry and other health care programmes would help to foster interdisciplinary and comprehensive primary care.

The Advantages of adopting an interdisciplinary model of teaching with other health care academics are twofold. The first is that this leaves the teaching of dental topics in the hands of dental academics and non-dental topics to others with content expertise in those subjects. Allowing academics to focus on topics in which they posses expertise enhances the achievement of 'teachers-based' (Bernstein 1977) integration. In education, Hargreaves et al (2001) and Kysilka (1998) pointed out that one of the impediments to integration was that teachers were socialised in very narrow disciplines. But in an integrated curriculum they were expected to work together. They argue that this left them feeling incompetent and exposed (Hargreaves et al. 2001; Kysilka 1998). In order to minimise this feeling incompetence and exposure in front of their classes,

Hargreaves et al suggest that teachers should not be "drawn so far beyond their knowledge base of familiar subject content" (Hargreaves et al. 2001, p. 106).

The teaching of dental topics to non-dental students will not be a new practice. Dental consultants based at the University Teaching Hospital in Lusaka are appointed as honorary lecturers by the University of Zambia to teach medical students basic dental topics. The establishment of the undergraduate dental programme will simply open up the opportunity to teach dental related topics to other healthcare students including nursing, pharmacy, and biomedical science students.

The other advantage of interdisciplinary teaching is that by combining dental students with other health care students, this will foster interdisciplinary team-working among students at an early stage in their professional socialisation. At the same time, this will help to broaden the concept of team-working from the current narrowly conceived dental team comprising the dentist and professionals complimentary to dentistry (PCDs) to a more comprehensive interdisciplinary primary care team (Spielman et al. 2005) comprising other members of health care professionals. Interdisciplinary teaching would also help to prepare future dentists to take up leadership role in primary care settings at urban health centres or rural district hospitals where they may find themselves to be the only or most senior member of the health care team.

Education System and Future Participation in Dental Education

The standard of education in Zambia has disparities in participation in secondary education between rural and urban areas and the general deterioration in the education. The largest proportion of secondary school going age group (14 – 18 years) is found in rural areas where participation rates in secondary education is also lowest in comparison

to urban areas (Central Statistical Office [Zambia] and ORC Macro 2003). In addition, there has been a progressive deterioration in the general standard of education in all public secondary schools, with rural schools being the worst affected (University of Zambia 2000). This means that students attending school in rural Zambia are more likely to drop out of school earlier and, if they manage to complete secondary education, they are less likely to obtain higher grades than their counterparts in urban areas.

A combination of unfavourable education environment and the cost of university education mean that students from rural areas are at a comparative disadvantage when competing for places in higher education. This has resulted into the unintended consequence that recruitment to the various schools of the University of Zambia has tended to be elitist (University of Zambia 2000): favouring mainly students from middle and upper social class families from urban areas. This feature is likely to be even more pronounced for dental students. In developed countries where access to higher education is relatively high for all social groups, studies indicates that recruitment to dentistry tends to favour students from middle and upper social classes (Hennequin et al. 2002; Vigild and Schwarz 2001). An elite dominated dental profession is likely to have some negative consequences on the delivery of dental care. Empirical evidence seems to suggest that the future career aspirations and practice locations of dental students are influenced partly by their social background (Karibe et al. 2007; Khami, Murtomaa, Jafarian et al. 2008; Kuusela et al. 1993; Lalloo et al. 2008). This implies that students from socio-economically advantaged backgrounds are less likely to take up public appointments in rural areas leading to widening rather than narrowing the disparity in access to dental care between the poor and the rich and between rural and urban areas.

Admission Policy and Curriculum Continuity

The minimum entry requirements to the various schools of the University of Zambia are five credits in the general certificate of education, at the ordinary level, in approved subjects. Possession of five credits, however, does not automatically guarantee one a place at the university because of very high competition for the few places. In addition, admission to the School of Medicine is not direct. Would be medical students are first admitted for two years for foundations courses in the School of Natural Sciences. The first year foundation courses are common for all students from the Schools of Medicine, Natural Sciences, Agriculture, Education, Engineering, Mines and Veterinary Medicine. To finally secure a place in the School of Medicine, a student must pass the competitive first- and second-year foundation courses with an average B grade or better. Under the university quota system, students admitted to first year under the other schools, for example the Schools of Education or Natural Sciences, can transfer to medicine as long as they meet requirements set by the School of Medicine. This practice is similar to France where medical, dental and midwifery students sit for common competitive selection examinations at the end of the first year before admission into the three programmes (Jover , Doudoux and Deveaux 2006; Roger-Leroi 2006). Because the selection procedure gives first priority to medicine followed by dentistry, this may lead to competition for students between medicine and dentistry and may have some implications on the perception of dentistry, especially by students who choose dentistry as an alternative to medicine (Jover et al. 2006; Sofola et al. 2008).

After completing two years at the School of Natural Sciences, successful students finally move to the School of Medicine, which is located at the University Teaching Hospital some 5 miles from the main University campus, where they commence pre-clinical studies in basic sciences. Since the admission requirements for the proposed

dental programme will be the same as for medicine, under the quota system, students will be free move between dentistry and medicine. One of the challenges for dentistry will be similar to that expressed by dental educators in the UK over 40 years ago: the difficulties of attracting the best students in competition with medicine (See, for example, General Dental Council 1972; Inter-Departmental Committee on Dentistry 1946). One way to alleviate this problem would be to introduce programmes such as open days for school leavers (Fenesy and DeCastro 2008) and early clinical contact (Sofola et al. 2008). Open days at which pre-dental students are exposed to real life in dentistry have been reported to be "an effective means of developing well-informed dental school applicants" (Fenesy and DeCastro 2008, p. 599). Apart from identifying with the dental profession, early clinic contact helps to improve the perception and acceptability of dentistry among students who may not have come in contact with dentistry before entering the dental school.

Unlike the experience of some dental schools in developed countries, the problem of failing to attract sufficient numbers of high calibre students to dentistry will not be a critical issue because in Zambia demand for places for all professional fields and at all levels of tertiary education far outstrips available places (University of Zambia 2000). Hobdell (1995, p. 29) observes that in developed countries where education opportunities are open to all, professional education, although desirable, attracts relatively fewer applicants than in developing countries. He goes on to suggest that, "Those trapped in ghettos of poverty and deprivation look to education, particularly professional courses, as a means of escape." Unlike in developed countries were education is compulsory, at least up to the age of 16, in developing countries students are subjected to highly competitive eliminations examinations for them to progress from primary to secondary and from junior to senior secondary. Consequently, the education

route is sealed off very early in lives of most students. The lucky few, who complete secondary education, only a small fraction get admitted to university.

A highly competitive education system has other unintended consequences on the curriculum. The highly competitive external examinations that characterise primary and secondary education place immense pressure on both students and teachers. The curriculum in primary and secondary education is very strongly classified and framed and the teachers' performance is usually judged by the number of students that secure a place at the next level of the education system. This creates pressure to adopt very strong framed teacher-centred strategies in order to maximise the number of students passing. But this leads to curriculum discontinuity (Hargreaves et al. 2001) between general education and the relatively weak framed university education, where students are expected to be more independent learners (cf. Grace 1995; Walford 1994).

Curriculum discontinuity between general and university education requires dental educators take into account the students' prior education experience during secondary education and the foundations years at the School of Natural Sciences when deciding whether to adopt an integrated, hybrid or traditional curriculum. Overambitious curriculum innovations involving only the dental programme can be a recipe for failure.

Cost of Education

Although in principle, participation in higher education is open to all Zambians, there are several barriers especially for students from socio-economically disadvantaged families. The introduction of tuition fees and the general deterioration in the standards of education, with institutions in poor urban and rural areas being the worst affected, are among the main barriers to participation in education. From independence in 1964 to

1991, education in Zambia was free from primary to the university level. However, following years of economic stagnation and growing international debt in the 1970s and 1980s, the government that came into power in 1991 introduced wide ranging World Bank sponsored structural adjustment programmes. The new policy for funding higher education was based on the principle of cost-sharing between the government, the institution and the end users, the students. That is, from 1992, higher education institutions were allowed to charge 'economic' tuition fees. The introduction of user fees and the general funding strangle on higher education is not unique to Zambia but is a common practice for all higher education institutions in Africa (Reddy 2002).

The University of Zambia charges three types of fees: tuition, accommodation and other sundry fees which include registration, examination, medical, caution and recreation as shown in Table 10.1. These fees are payable per semester. Tuition fees are divided into three bands: Category A—Humanities and Social Sciences-, Category B—Science- and Category C—Medicine-Based fees. During the 2006/2007 academic year, a first year medical student doing foundation courses under the School of Natural Sciences paid the equivalent of US$1,990 per year in tuition fees (this increased to US$2,380 per year if accommodation and sundry fees were added). Tuition fees increased to US$2,030 per year from second to four year and then reduced to US$1,010 per year during the clinical years from fifth to seventh year. When compared to fees changed by universities in the developed countries, the fees charged by the University of Zambia may appear reasonable. But it must be borne in mind that over 83% of Zambians live at less than $1 per day (World Bank 2006, see also Appendix N: Table IV: Socio-economic indicators) and most of those in active employment earn less than US$100 per month. This simply means that an average Zambian family cannot afford the cost of university education.

Table 10.1: Fees Charged by the University of Zambia: Academic Year 2006/2007

Year:	Tuition				Accommodation	
	Category B-Science Based		Category C- Medicine Based			
	(ZMK)	(US$)*	(ZMK)	(US$)*	(ZMK)	(US$)*
1	3,685,500	995			565,500	150
2	3,685,500	995	3,750,000	1,015	565,500	150
3	3,125,000	845	3,750,000	1,015	435,500	115
4	3,125,000	845	3,750,000	1,015	365,000	100
5	1,562,500	420	1,875,000	505	250,000	65
6			1,875,000	505	250,000	65
7			1,875,000	505	250,000	65

Sundry fees include registration (ZMK 15,000), Examinations (ZMK 30,000), Medical (ZMK 22,500), Caution (ZMK 87,000) and recreation (ZMK 22,500) giving a total of ZMK 177,000. This is equivalent to about US$ 45 per semester.

*The US$ equivalent has been calculated at the rate of ZMK 3,700 to US$1 and figures have been rounded off to the nearest $5. The exchange rate is not fixed but fluctuates depending on market forces. In recent years the rate has remained relatively stable around ZMK 3,800 to US$1.

Source: University of Zambia website: Academic Fees, at http://www.unza.zm

The cost of education is likely to have some implications not only on participation but also on career aspirations and the willingness of the dental graduates to take up appointments in the public sector especially in the underserved rural areas. Evidence from the literature seems to suggest that the cost of education is an important factor

influencing the future career aspirations and practice plans of dental students (Karibe et al. 2007; Lalloo et al. 2008). Other factors include the initial motives for choosing dentistry as a career.

Career Motivations of Students

A number of surveys to determine the students' motivations for a career in dentistry indicate that the most common reasons for choosing dentistry are economic reward and financial security, marketability of dentistry including ready availability of work both locally and abroad, and social status and prestige (Al-Bitar , Sonbol and Al-Omari 2008; Brand and Chikte 1992; Brand , Chikte and Thomas 1996; Gallagher et al. 2008; Hallissey , Hannigan and Ray 2000; Morris 1992; Vigild and Schwarz 2001). Other reasons include control over and flexibility of work (Bernabe , Icaza and Delgado-Angulo 2006; Brand et al. 1996; Whittaker 1984) and altruistic reasons (Bernabe et al. 2006; Hallissey et al. 2000; Morris 1992; Vigild and Schwarz 2001; Zadik , Gilad and Peretz 1997). The only exception appears to be the British (Whittaker 1984) and Peruvian dental students (Bernabe et al. 2006) who did not consider material reward to be a very important factor, while Australian dental students (Brand et al. 1996) did not rate social status and prestige highly among reasons for choosing dentistry. In a related study, Zadik et al. (1997) conducted a survey among first and third year dental students at the Hebrew University-Hadassah Faculty of Dental Medicine and found that third year students scored financial security higher than first year students. This led them to suggest that both the ambience of the dental school and the practical reality of dental practice may be significant factors in promoting the observed difference in values between first year and third year dental students.

The motivations for a career in dentistry are not very different for students in the sub-Sahara Africa. In a study to determine the socio-demographic characteristics and career motivations of dental students at four dental schools in Nigeria, Orenuga and da Costa (2006) found that prestige, good employment opportunity abroad and a prestigious and financially lucrative profession similar to medicine were among the main reasons for choosing dentistry. Based on the prevailing economic and social conditions in Zambia, it is plausible to speculate that both economic reward and social status will be significant factors, if not the strongest attractions to a career in dentistry. But both economic reward and social prestige are least likely to be met in the public healthcare institutions for which the programme will be targeting. This may lead newly qualified dentists to seek employment in the private sector and abroad as has been the case with doctors and nurses. Brand et al. (1992, p. 512) observe that, "Most students appear to be influenced by the idea that dentistry conducted in a private practice setting offers the best possibility of fulfilling personal needs of living a satisfying professional life."

The tension between the quest for economic reward and prestige on the one hand, and social responsibility to the community on the other, has been noted. In a survey conducted by Sofola, Uti and Akpene (2008) on the career aspirations of students, they observe that despite the high demand for dentists in Nigeria, because of uncertainties in career prospects, a large number of students indicated they would seek employment opportunities outside the country. In another study in which the future career plans of Tanzanian and Finish dental students were compared, Kuusela, Honkala, Hausen et al. (1993) reported that whereas Finish dental students planned for a career in general dental practice in community service, the Tanzanian students looked forward to an academic career. They suggested that differences in career intentions between the two groups probably arose from differences in job opportunities for graduating dentists in

the two countries. This observation seems to be supported by the findings of other comparative cross-cultural studies of career aspirations of dental students. A survey by Lalloo, Ayo-Yusuf and Yengopal (2008) to determine the future career intentions of students at the four dental schools in South Africa also report differences in career aspirations black African, White and Asian students. They note that although most students planned to enter general dental practice, nearly all White students expressed this intention compared to only 35% of Black Africans. They also point out that the White students were expected to earn considerably higher incomes as dentists than the Black African and Asians. They further point out that the Black African students, who are also the most economically disadvantaged, were more concerned about the levels of personal debt related to the cost dental education than the White and Asian students.

In a similar survey of the career plans of Japanese, Canadian and Thai dental students, Karibe, Suzuki, Sekimoto, et al. (2007) report that whereas Japanese and Canadian dental students planned to go into general dental practice, Thai students looked forward to specialisation. They point to cultural practices and economic factors as the major determinants of future career choices. In Japan children are normally expected to take over family businesses and most of these students were from families with general dental practices. Student debt, on the other hand, forced Canadian students to go into general dental practice immediately on graduation, while Thai students opted for specialisation because of an oversaturated general dental practice in urban areas and the belief that specialists enjoy more financial stability than general dental practitioners.

One of the challenges for Zambia will be to develop a curriculum in which a balance is strake between the high technology-dependent and private sector type of dentistry and primary care dentistry that is directed at meeting the basic needs of the wider

community. It will be about the choice between a curriculum that implicitly or explicitly promotes 'materialistic and utilitarian' (Zadik et al. 1997) professional values or, a humanistic curriculum in which social values that put the patient and the wider good of the community come first in the delivery of care (Shanley and Nattestad 2002). However, Hobdell and Sheinham (1981) observed that the pull towards the Western type of high technology dentistry may become stronger as the number of dentists increase. although high technology dentistry may promise 'high quality' dental care and enhances the chances of graduates employability outside the country (cf. Sofola et al. 2008; Vigild and Schwarz 2001), it fails to address the problem of equity and access to dental care for the majority of the community (Hobdell 1995; Hobdell et al. 1995b). One of the key tasks will be to create opportunities in the curriculum for students to develop social and professional values that are compatible with a comprehensive and holistic approach to oral care of the individual and the community and equality of access for all sectors of the Zambia community and not only those who are socio-economically capable of meeting the cost of care.

Healthcare Delivery System and Access to Oral Care

The main provider of health care in Zambia is the government. From independence in 1964 until the early 1990s, the government provided all social services, including health care, free to all Zambians. The policy of free social services was sustainable from independence until the mid 1970s when a combination of the worldwide economic depression and falling copper prices on the world market, led to Zambia's economic recession. Zambia is a mono-economy country based on copper mining. In order to sustain the policy of free social services, the government turned to external borrowing. By the 1980s, Zambia had become one of the poorest and was among the most highly indebted countries in the world.

Following change of government in 1991, the new government embarked on health reforms in 1992. These reforms included the creation of the Central Board of Health (CBoH). In 1995 management of public health care institutions in Zambia was devolved from the Ministry of Health (MOH) to the CBoH and Health Management Boards. The MOH only retained the functions of policy formulation and monitoring. In addition, the government also introduced user fees as a mechanism of mobilizing additional resources for public health institutions.

Organization and Distribution of Health Care Facilities in Zambia

There are two main providers of health care in Zambia: the government and the private sector. The Government is the main provider with health facilities distributed throughout the country. There are two types of private health care providers. These are the for-profit mining and private providers and charitable missionaries. The mining companies' health care facilities are located mainly in the copper mining region of Zambia—the Copperbelt Province—and offer services only to mine employees and private patients who have the means pay the full fees charged. In recent years, for-profit private hospitals and clinics, including private dental surgeries, have mushroomed in many urban towns, especially in the Capital City, Lusaka. These are targeted mainly at the affluent. Mission health care facilities, in contrast, are found in less accessible and deprived rural areas. They provide free health care services to the poor (Berman, Nwuke, Rannan-Eliya et al. 1995). Table 10.2 shows the number of health care facilities by provider and level. Berman et al. (1995) have also given a detailed account of the distribution of health care facilities in Zambia by provider.

Table 10.2: Number and Type of Health Care Facilities in Zambia

Facility Type		*Number of Facilities by Owner*			
		Government	*Private*	*Mission*	*Total*
3rd Level (Central Hospital)		*5*			*5*
2nd Level (General Hospital)		*12*		*6*	*18*
1st Level (District Hospital)		*36*	*17*	*21*	*74*
Health Centres	*Rural*	*889*	*23*	*61*	*973*
	Urban	*163*	*74*		*237*
Health Posts		*19*	*1*		*20*
Total		*1,124*	*115*	*88*	*1,327*

Source: Central Board of Health (2002)

Health care facilities in Zambia are organized at four levels, the health post, the health centre, the first referral or district hospital, second referral or general hospital and the third referral or central hospital. The health posts function as first aid centers for the local community. Health centers are designed to be the first point of contact for patients. They provide basic preventive and primary care to the community. Zambia is administratively divided into nine provinces and each province comprises districts. There are a total of 58 districts. Each province has one general hospital located in the provincial capital. There are 36 districts hospitals. Dental facilities are found at all level-three and level-two hospitals. Some level-one hospitals and a few urban health centers also offer some limited dental services.

Healthcare Workforce

Zambia has a critical shortage of all types of health care personnel. The shortage has been attributed to a number of factors including the low capacity of medical and nursing schools; emigration of health personnel to neighbouring countries and abroad in search of better conditions of service; and the impact of HIV/AIDS on the workforce (International Insulin Foundation 2004; Kaboru, Falkenberg, Ndubani et al. 2006). The situation, however, is worse for all types oral care personnel, especially dentists (Noar 1990). Although Zambia ranks slightly higher than most Southern African countries in the healthcare workforce, she has the lowest number of dentists in the region. Table 10.3 shows the density of doctors, dentists, pharmacists and nurses per 1000 population in some select Southern African countries. At only 44 dentists for the whole population, Zambia has the lowest density of dentists.

Oral Health Care Workforce

There are three types of oral care personnel in Zambia—dentists, dental therapists and technicians. Out of the 44 dentists, only 21 work in for the Government. Government employed dentists are found mainly at third level, a few at provincial capital general hospitals and none at the district hospitals and health centers. There are about 260 dental therapists and 40 dental technicians. Dental therapist and technicians are mainly employed by Government. Dental therapists are found at all levels three and two hospitals, at most level-one hospitals and at some urban health centers. They carry out mainly curative dental care involving emergence dental extractions and some limited restorations on both children and adult teeth. Government employed dental technicians are found at level three hospitals, the Dental training School, and at three other level two hospitals. The mines and military hospitals have modern prosthetic laboratory facilities and employ some dental technicians.

Table 10.3: Health Manpower in Select Southern African Countries

Country		Botswana	Lesotho	South Africa	Swaziland	Zambia	Zimbabwe
Year		2004	2003	2004	2004	2004	2004
Population (000)		1, 765	1,795	47, 432	1,032	11,668	13,010
Physicians	Number	715	89	34,829	171	1264	2086
	Density (Per 1000)	0.04	0.05	0.77	0.16	0.12	0.16
Dentists	Number	38	16	5,995	32	44[a]	310
	Density (Per 1000)	0.02	0.01	0.13	0.03	0.004	0.02
Pharmacists	Number	333	62	12,521	70	1039	883
	Density (Per 1000)	0.19	0.03	0.28	0.06	0.10	0.07
Nurses	Number	4753	1,123	184,459	4,590	19014	9357
	Density (Per 1000)	2.65	0.62	4.08	4.24	1.74	0.72

Source: WHO World Health Statistics 2007, at http://www.who.int/whosis/whostat2007.pdf
[a] Ministry of Health, Zambia

Note: WHO documents puts the number of Zambian dentists at 491. This is a gross error.

As already noted, in Zambia the oral care facilities and workforce are disproportionately distributed in favour of urban areas. Paradoxically the rural areas, which have the least developed oral healthcare infrastructure, are where the age groups below 10 years and above 60 years, who have a high demand for oral care lives. The challenge for Zambia is how to equitably distribute the oral care resources and the need to develope an appropriate mix of qualified oral care workforce (Benn 2003), who can deliver oral care at all levels of the health care system and to all sectors of society. Appropriately 'qualified' refers not only to the possession of requisite technical skills, but also the possession of high professional values such as a sense of social responsibility (Dharamsi et al. 2007; Garetto and Yoder 2006; Rubin 2004) that transcends personal ambitions and aspirations for material gain.

Curricular Implications

Although the dental curriculum cannot be expected to address all the problems arising from the structure and social organisation of the education and healthcare delivery systems in Zambia, there are some steps that can taken to mitigate their impact. Practical steps such as a strong community outreach dental education (CODE) component in the curriculum and admission policies that deliberately encourages student diversity in terms of rural/urban divide (Marino et al. 2006), can go a long way in promoting a socially sensitive dental profession in Zambia.

As noted in chapter 9, a strong CODE component in the dental curriculum has educational and social advantages. It enhances the education experience of students by exposing them to a wide range of patients and dental conditions (Bean et al. 2007; Crawford et al. 2007; Mascarenhas et al. 2007; Thikkurissy et al. 2008). It is also an important tool in developing a socially responsive dental profession (DeCastro et al.

2003; Dharamsi et al. 2007). Although exposure to the CODE may not necessarily result in participants' willingness to work in underserved areas on graduation (Davidson et al. 2007; DeCastro et al. 2003), evidence from programmes aimed at increasing the rural medical workforce in Australia suggest that rural placements during undergraduate and postgraduate medical education is an important factors in increasing the probability of students' setting up practice locations in underserved rural areas (Dalton et al. 2008; Dunbabin and Levitt 2003; Veitch et al. 2006). Other significant factors include students' personal characteristics, financial aid obligations, an expressed interest to practise in underserved areas prior to entering the medical school (Dunbabin and Levitt 2003; Wilkinson 2003).

In Zambia, student characteristics such as rural background, family attachments and work experience as PCDs will need paying attention to when recruiting dental students. Gaengler et al (2002) observe that a well planned student selection and recruitment system plays a vital role in the successful outcome of dental education. It is essential to put in place a robust admission policy that deliberately discriminate in favour of students from rural areas and serving PCDs (cf. Noonan and Evans 2003). The advantage of including PCDs among the dental student-pool is that most of them possess the basic entry requirements to the UNZA. Many will have family commitments in rural areas prior to commencing their undergraduate studies and will be more willing than any other group to take rural appointments on graduation. Since most PCDs already work in rural or deprived urban areas, under the current Government rural retention scheme, they will have the added advantage of having access to both the Ministries of Health and Education scholarships to support their studies. In contrast, the traditional student-pool entering the UNZA directly from secondary schools has very high but unrealistic aspirations, which may not be met by the public sector dentistry and

has lead to frustrations and the search for greener pastures abroad (cf. Kaboru et al. 2006; Sofola et al. 2008). In a survey of career motivations of Iranian dental students, Khami, Murtomaa, Jafarian et al. (2008) report that students from a dental hygiene background were less likely to pursue postgraduate studies but to go directly into general dental practice in the public and private sectors. Matsumoto, Inoue and Kajii (2008), Dunbabin and Levitt (2003), Wilkinson (2003) and Dalton et al (2008) all report that rural origin, family commitments and rural outreach exposure during training are important factors in influencing the practice location of doctors on graduation. This has led Marino et al. (2006) to suggest the diversification of the undergraduate dental student pool, not only on ethnic lines, but in terms of the urban/rural divide.

Dental Practice and Professional Values

The aim of the undergraduate dental curriculum in Zambian will be to produce dentists with requisite knowledge, skills and professional values and, who on graduation, will be willing to practice in deprived urban and rural areas. But a combination of social factors such as the students expectations for economic and social returns for investing in dental education and the poor remuneration and general conditions of service in the public sector may be an obstacle to achieving the altruistic aims of the dental curriculum of putting the interests of the patient at the centre of all professional activities (Berthold and Lopez 1995; Hobdell, Sinkford, Alexander et al. 2002).

In developed economies, one of the challenges has been how to make dental care accessible to all sectors of society including the socio-economically disadvantaged groups (Dharamsi et al. 2007; Henzi et al. 2007) and how to change the image of dentistry from a closed elite profession (Dederich et al. 2004) to a profession that operates in primary care setting. International efforts such as the proceedings of the

International Collaborations in Dental Education (Berthold and Lopez 1995) and the Global Congress in Dental Education (See, Shanley and Nattestad 2002, for an introduction), and the working paper by Hobdell et al. (2002) all point to the centrality of the dental curriculum in achieving equitable access to oral care for all sectors of society. Although the dental curriculum is recognized as an important agent for social change (Hobdell et al. 1995b; Hobdell et al. 2002), attempts at changing the curriculum without paying attention to the wider social environment may have very little impact. The challenge for dental educators is to come up with curricula that produce dentists with the requisite technical skills and professional values and who are responsive to "psychosocial imperatives of health care" (Shanley and Nattestad 2002, p. 6) and are able to adapt to the rapid scientific and technological changes.

Shanley and Natted (2002, p. 6) have summarized the role of dental educators as that of identifying and focusing on those needs that enable dental graduates to perform optimally, encourage life-long self-development through active learning, and carrying out their professional duties in an ethical manner and, at the same time, being accountable to the community they serve. Dharamsi et al. (2007) have gone further to suggested that in an increasing materialistic society, dental educators have to find creative and relevant ways to develop and nurture the values and "ethic of care and trust beyond individualism and private interest". In addition to these, the Zambian dentist will be expected to be an ardent advocate of health in general and, oral health in particular, on behalf of the community s/he serves.

Demographic Profile

Two important valuable of the demographic profile of Zambia are the age profile and geographical distribution of the population. One feature of Zambia's population, which

is relevant to the planning of dental curriculum, is that the majority of the population is found in rural where dental facilities are least developed. In 2000 the population of Zambia was estimated at 9.9 million of which 65% lived in rural areas (Central Statistics Office Zambia 2003). Table 10.4 shows the percentage distribution of the population of Zambia between rural and urban areas by sex.

Table 10.4: Population Size and Percent Distribution by Sex and Residence, Zambia, 2000

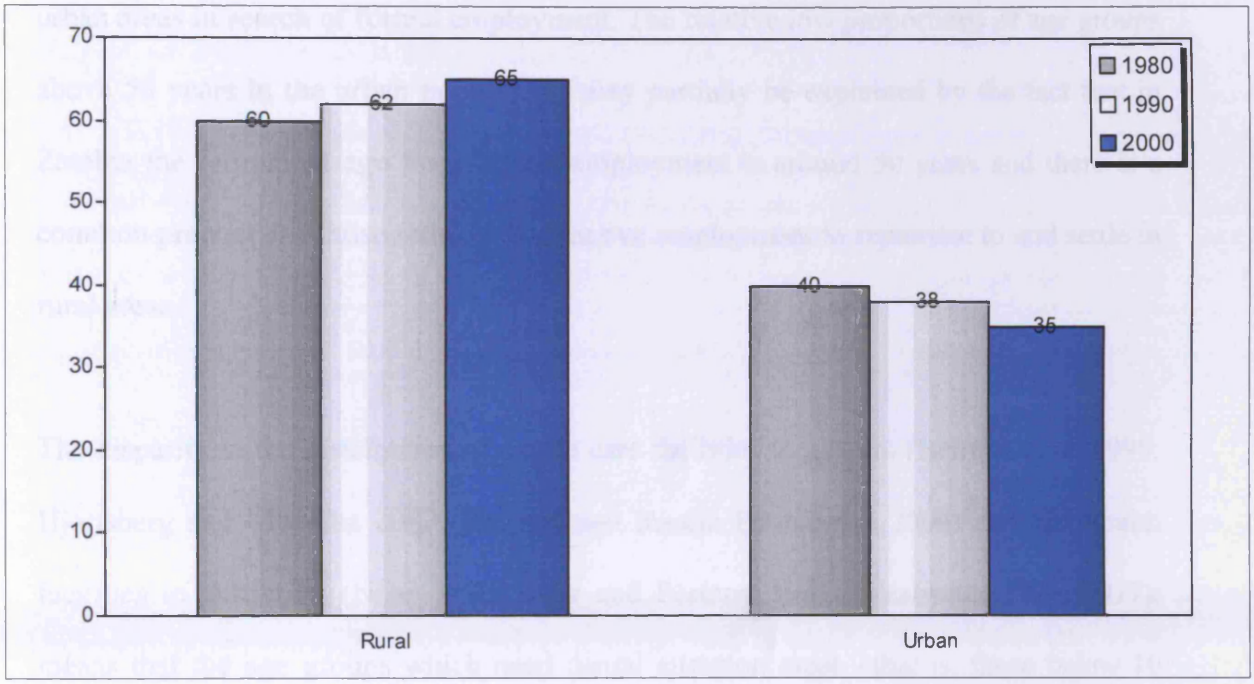
Residence		Male	Female	Cumulative Total
Total Population	(Number)	4,946,298	4,939,293	9,885,591
	(% of Total Pop.)	50.0	*50.0*	100
Rural	(Number)	3,220,939	3,237,790	6,458,729
	(% of Total Pop.)	32.6	32.7	65.3
Urban	(Number)	1,725,359	1,701,503	3,426,862
	(% of Total Pop.)	17.5	17.2	34.7

Source: Central Statistics Office, Census Zambia 2002

There has been an observed urban-to-rural migration over the last three decades. Figure 10.2 shows a steady increase in rural population from 60% in 1980 to 66% in 2000 and a decline in urban population from 40% to 36% over the same period. This is a reversal of the trend in the 1960s when there was a high rate of rural-to-urban migration triggered by a booming economy and the promise of better quality of life in towns

(Berman et al. 1995). The urban-to-rural migration has been attributed to the decline in economic activities in most urban towns following the closure of some mines and the collapse of most industries in the country (Central Statistics Office Zambia 2003, p. 30).

Figure 10.2: Distribution of Population by Residence, Zambia, 1980-2000



Source: Central Statistics Office, 2000 Censuses of Population and Housing

Generally, Zambia's population is described as young. The 2000 national census reveals that 45% of the population is below 15 years, 89% is under 45 years and only 2.7% of the population is 65 years and above. This feature is not unique to Zambia. Other countries in the Sub-Sahara region exhibit similar population characteristic. Luhanga and Ntabaye (2001) have reported a similar picture in Tanzania.

There is no observed significant difference in population distribution between sexes. Appendix J: Figure I shows the population distribution by age-group and sex. The population in Zambia may be described as a young population with an almost

equalpropotion of both sexes. However, a comparison of age-group distribution between rural and urban areas reveals a higher proportion of the age-groups below 10 years and over 50 years in rural than urban populations, while the proportion of age-groups between 15 to 49 years are relatively higher in urban than rural areas as shown in Appendix J: Figure II. These differences may be explained in terms of the general trend among the productive age groups, above 15 and below 50 years, to migrate from rural to urban areas in search of formal employment. The relative low proportions of age groups above 50 years in the urban populations may partially be explained by the fact that in Zambia the retirement age from formal employment is around 50 years and there is a common practice for those retiring from active employment to repatriate to and settle in rural areas.

The disparity in the distribution of health care facilities in general (Berman et al. 1995; Hjortsberg and Mwikisa 2002; International Insulin Foundation 2004) and oral health facilities in particular (Noar 1990; Noar and Portnoy 1991; Westwater 1974, 1977), means that the age groups which need dental attention most—that is, those below 10 years and those above 50 years—are the age groups found in areas where, ironically, oral health care facilities are least developed or completely lacking. Hjortsberg and Mwikisa (2002) note that, in relative terms, the cost of access to health care is higher for rural than urban populations. Ekman (2007) also notes that rural population in Zambia were less likely to afford the fees demanded by the cost sharing scheme. This raises not only the question of access to health care but also the suitability of the Western model of oral care in Zambia.

One of the roles of the dental curriculum should be to try and address oral health disparities. One way in which this can be done is by including a strong component of

interdisciplinary community health promotion and disease prevention programmes within the curriculum. To ensure that this aspect of the dental curriculum is stimulates the interest of students, it could involve an outreach projects in which students plan, implement and present a report about some aspect of a community-based oral health promotion or disease prevention programme, as part of their final continues assessment.

Profile of Oral and Dental Diseases and Conditions

The relationship between dental curriculum and dental disease profile is two fold. The type and level oral disease should dictate the focus of the curriculum if the oral health needs of the community are to be met. Secondly, the level of dental disease should help to determine the curriculum time devoted to a specific subjects or topics as the debate on curriculum time of prosthetics in the undergraduate programme shows. The distribution of oral disease in the community should also dictate where clinical training takes place—the primary care setting in the community or the tertiary hospital setting. The starting point, therefore, should be having some clear picture of the oral disease profile of the community for which the dental programme is developed. However, there is dearth of published data oral disease prevalence in Zambia. The few published literature is outdated, far apart, covers mainly isolated rural schools and focus only on dental caries. The survey by Westwater (1974; 1977) and Noar and Portnoy (1991) help to illustrate this point. Even the WHO (2006) dental caries data on Zambia dates back to 1982. The absence of reliable data on dental disease is not peculiar to Zambia alone. Akpata (2004) reports a similar experience in Nigeria. However, even in the absence of reliable published data it is possible to make a relatively accurate informed picture on the oral health situation in Zambia based on the oral disease experience of other countries in the Sub-Sahara Africa (SSA) region (see, for example, Muhirwe 2006; Thorpe 2006; van Wyk and van Wyk 2004; Varenne , Petersen and Ouattara

2004) as well as from my own personal experience of over 15 years of oral care at the Dental Training School (DTS) in Lusaka and in other parts of the country.

The two most common oral conditions presented by patients attending dental clinics in Zambia are dental caries and periodontal disease. There has also been a noticeable increase in the number of dental patients presenting with HIV related oral lesions, although these are not usually the main reason for attending the dental clinic. Other oral diseases include life threatening conditions such as oral cancrum oris (or gangrene of the face and jaws) and oral cancers. These conditions, although relatively rare, are common not only in Zambia but in other countries in the SSA (Hobdell and Sheiham 1981; Petersen 2004b; Thorpe 2006). The fact that dental disease experience in Zambia is different from that found in most Western countries dictates that emphasis in the undergraduate curriculum be put on a different set of skills and knowledge.

Reports from other SSA countries indicate caries and periodontal disease incidence of low to very low. Akpata (2004) has reported low to very low incidence of caries in Nigeria, with most carious teeth remaining untreated and incidence of periodontal disease between the ages of 15 to 58 years. Other oral problems include oral tumours. Similar results have been reported in South Africa were caries experience is low and declining but with high levels of unmet treatment (van Wyk and van Wyk 2004). Kaimenyi (2004) has reported low caries incidence in both urban and rural Kenya and low periodontal disease. Other oral conditions in Kenya include oral candidiasis (a fungal infection normally common in malnourished children) in HIV/AIDS patients. Varenne et al. (2004) have reported similar results in Burkina Faso and noted differences in incidence caries and periodontal disease between urban and rural areas. They report higher caries incidence in urban than rural and higher periodontal disease in

rural than urban areas. High incidence of caries among urban populations has been attributed to high consumption of soft drinks coupled with low levels of oral health knowledge, attitudes and self-care, infrequent dental visits and failure to use fluoride toothpaste (Varenne , Petersen and Ouattara 2006). The caries and periodontal disease profile may not be any different in Zambia.

Although the incidence of dental caries is relatively low in comparison to that experienced in developed countries, scarcity of dental care facilities and inability to meet the cost of health care by most patients (Ekman 2007) lead to a situation where patients seek dental care as a last resort when they are in severe pain and with advanced stages of dental disease. Petersen (2004b) observes that as a consequence of limited access to oral facilities in Africa, many patients go with untreated teeth or opt for extraction to relief pain and discomfort. A combination of limited dental facilities and the general tendency of seeking help when oral disease has reached advanced stages, gives the general impression of very high and severe levels of dental disease in the community. The practice of some dental clinics to restrict the number of patients attended to each day gives an even more exaggerated impression of the incidence of dental disease in the community. Saparamadu (1984) observes that populations in developing countries experience considerable amounts of unmet dental need.

The dental disease experience the SSA and other developing countries are going through is reminiscent of that experienced by developed countries, including the UK, during the industrial revolution when a combinations of high consumption of sugar and lack of access to health facilities for the majority of low income groups resulted in high unmet demand for dental care. But unlike industrial and post-industrial Western countries, although developing countries like Zambia generally experience low

incidence of dental caries, a combination of poor economic performance and wrong models of oral health manpower and health care delivery systems have led to high unmet demand for dental care for the majority of population. The emergence of life-threatening conditions such as HIV with its associated oral lesions (Ogunbodede 2004; van der Waal , Schulten and Pindborg 1991), cancrum oris and oral cancers (Enwonwu 2002; Hobdell and Sheiham 1981; Thorpe 2006) have all added to the oral health burden of these countries.

Although both dental caries and periodontal disease receive some attention, the dental profession in Zambia remains uninvolved in the fight against HIV/AIDS. This is in spite of the fact that Zambia is among countries in the SSA region with high levels of HIV/AIDS cases. The HIV/AIDS with prevalence in the adult population aged 15 years and above was estimated at 15.8% (World Health Organization 2007). The high prevalence of HIV/AIDS is not peculiar to Zambia alone. As Table 10.5 shows, some Southern African countries experience prevalence levels in excess of 20%.

Ogunbodede (2004) has written a moving account on the gravity of the HIV/AIDS crisis in Africa and has called for a multi-sectoral approach in the fight against HIV/AIDS. Zambia has adopted some strategies aimed at fighting HIV/AIDS. These include the establishment of the National AIDS Council, development of a national HIV/AIDS strategic framework, establishment of HIV voluntary testing centres in all districts, a programme of distributing free antiretroviral drugs to HIV positive patients. HIV/AIDS also features prominently in the National Health Strategic Plan (Central Board of Health 2000). The case for active involvement of oral personnel in the fight against HIV/AIDS is based the observed fact that the first signs of the presence of the disease in most individuals manifest in the mouth (Petersen 2006; van der Waal et al. 1991). However,

many infected individuals remain unaware of their HIV status until when they full blown AIDS. With the availability of antiretroviral drugs which slow down the progress of the disease, early detection becomes crucial. Oral health personnel can play an important role in early detection of the disease, in ensuring that effective infection control measures are in place and in one-on-one health education and health promotion campaigns (Petersen 2006).

Table 10.5: HIV Prevalence among Adults Aged 15 Years and over in Select Southern African Countries

Country/Region	HIV Prevalence (% of Adult Population Aged 15 years and above)
Botswana	23.6
Lesotho	22.7
Malawi	12.5
South Africa	16.6
Swaziland	34.4
Zambia	15.8
Zimbabwe	19.2
African Region	5.7
Global	0.8

Source: World Health Statistic 2007 at: http://www.who.int/whosis/whostat2007.pdf

From a practical point of view, the presence of life threatening conditions such oral cancers, cancrum oris and HIV/AIDS in the Zambian community dictates that a reasonable proportion of curriculum time should be devoted to topics in oral medicine,

oral pathology, oral surgery, general medicine and relevant behavioural sciences which address these conditions. This should be so because unlike in Western dental schools where these conditions are rarely met in general dental practice and when encountered are referred for specialist care, the Zambian dentist will frequently come in contact with these conditions and may be the most qualified person to who everyone would look to carrying out the necessary basic care and/or to offer life-saving advice. This is consistent with the advice of Daniel Calma (DC), one of the participants at the WDS:

> *AK:* What would be your advice to people like us who are just starting an undergraduate dental programme?
>
> *DC:* [...] Whether or not it is treatment of basic Western dental disease which is essentially periodontal disease and caries or whether it is something else, your curriculum has to reflect that. If for the next ten or twenty years it is the case of producing dental students who are very good at taking out teeth and doing oral surgery and perhaps doing a little bit of prosthetics and other procedures, that is fine. The curriculum will develop as the needs of the people develop.

The key principle in Calma's advice is the need for a dynamic curriculum model that is sensitive and responsive to the oral health needs of the wider Zambian community. It is about developing a curriculum model that is contextualised in the Zambian TESE.

Cultural Beliefs and Expectations for Oral Care

This subsection focuses on the cultural practices and beliefs about oral health and disease and the potential role of traditional health providers (THPs) in the provision of oral care in Zambia. In contrast to trends in developed economies, basic knowledge of modern oral hygiene practices and access to modern dental care facilities is not available to large components of the population in developing economies (Hobdell

2001; Hobdell and Sheiham 1981). Many communities continue to rely on traditional oral practices and their first and logical place to seek dental attention is the THP found within the local community. Rather than looking down on traditional practices and beliefs, Enwonwu (1988, p. 91) advised the importance of identifying and promoting good aspects of traditional oral health care practices and to avoid the practice of importing wholesale the "dental health care systems adapted for use in rich countries."

In Zambia (Berman et al. 1995; Kaboru et al. 2006) and in other parts of Africa (Enwonwu 1988, 2002; Hobdell and Sheiham 1981; Puranwasi 2006), THPs are recognized as significant partners in the provision of health care, including oral health. They are the oldest health care providers in Africa. Although their role is generally ignored or dismissed by biomedical practitioners, they enjoy the advantage of being close to the communities they serve. Their social privilege arises from the fact that they understand local traditions, practices and attitudes to health; they are readily accepted by local communities; and they are easily accessible (Hobdell and Sheiham 1981). In Zambia, Berman et al. (1995) estimate around 50,000 THPs. At the current Zambian population of 11,668,000, this gives a density of 4.3 per 1000 of population. This is more than twice the density of all physicians, dentists, pharmacists and nurses put together and more than 170 times the density of all biomedical oral health care practitioners in Zambia.

The other positive aspects about THPs include their willingness to work with and readiness to refer patients with complicated conditions to biomedical practitioners. They have shown willing to learn from orthodox practitioners. In a study of the role of THPs in oral health care in Kwa-Zulu Natal, South Africa, Puranwasi (2006) reports that THPs were able to identify oral lesions associated with HIV infection in their patients,

readily learnt and were willing to put into practice modern infection control measures. In addition, THPs practice a holistic approach to healthcare and are often looked to as leaders in their communities (Kaboru et al. 2006; Puranwasi 2006). The main point here is the potential role of THPs in primary oral healthcare in Zambia. The challenge, however, is how far the dental profession would be willing to collaborate with and share their biomedical knowledge with THPs.

Willingness to collaborate with THPs would partly hinge on the dental profession's conception of a primary oral healthcare team and, more importantly, on the profession's willingness to weaken the frame strength between professional dental knowledge and lay knowledge of THPs and the community. The starting point is how students are socialized into the dental profession. Opportunities should be created throughout the undergraduate dental curriculum for team-working and for inculcation of appropriate values and attitudes that encourage dentists to reach out and share knowledge with non-biomedical practitioners. One of challenges to is how to overcome the potential barrier arising from differences in social status between the elite biomedical dental practitioners, the THPs and the community. Hobdell and Sheinham (1981) observed that biomedical dental practitioners rise in status by virtual of possession of formal professional qualifications and this distances them from the communities they serve. The dental curriculum in Zambia needs to create opportunities for students to interact with the communities they will serve in order to develop awareness of alternative dental practices within these communities.

Scientific and Technological Base

It is an acknowledge fact that the Western model of dentistry relies heavily on high technology and expensive armamentarium (Enwonwu 1988; Hobdell and Sheiham

1981). A range of dental materials also depend on high technology accessories such ultra-violet (UV) light source. Notwithstanding the cost of most modern dental armamentarium and materials (Enwonwu 1988), most developing countries lag behind the rest of the world in access to and utilisation of science and technology. In addition, equipment and gadgets used in dentistry such as the dental unit, x-ray equipment, sterilizers, UV-light sources and other accessories all require some external power source to run. But even the much taken for granted eternal power source needed to operate modern equipment is not readily available in vast areas of developing countries. In Zambia, for example, many parts of rural areas do have access to electric supply, while in urban areas a constant supply of electricity is not always guaranteed due to the practice of load shedding. It is not uncommon to experience interruptions in power supply at certain times of the year. Infrequent power surges also pose a constant risk to unprotected equipment. On top of that, accessories are not readily available. This turns even the simple task of replacing a fuse or lamp bulb into a frustrating task. The economic situation of developing countries dictates the need for maximum utilisation of available equipment well beyond its 'self-life'. But the rapid turnover in technology makes it impossible to repair or replace worn out component because manufacturers have stopped the production of the 'old model' and its accessories.

Of immediate concern is the lack of policy on the procurement of dental equipment and disparity in the distribution of modern dental equipment in public healthcare institutions in Zambia. There has been a general tendency to procure equipment from sundry manufacturers, the main determining factor being the source of funding. This has led to a situation where a diverse make of dental equipment is found at different public health institutions in the country and in different states of disrepair. However, both the University Teaching Hospital (UTH) and the DTS in Lusaka are relatively 'well

stocked' with modern dental equipment. The picture changes in hospitals away from urban centres. This has the potential to be a source of frustration for the future dentist who, having been exposed to modern and well functioning dental equipment during undergraduate training in Lusaka, is suddenly confronted on graduation with old and sometimes non-functioning dental equipment in a rural hospital. One practical solution is to turn outlying hospitals into outreach teaching sites. This would not only expose students to conditions in hospitals outside the capital city, but this would help to draw political attention to the state of dental and other equipment at these institutions.

Socio-economic and Political Contexts

Zambia compares unfavourably with other low income and Sub-Sahara African countries in almost all economic and social indicators (Berman et al. 1995; International Insulin Foundation 2004; Noar 1990), see also World Health Organization (2006; 2007). In the 2007 WHO social indicators, Zambia's gross national income per capita was estimated at US$950. This was below the average for the African region, which stood at US$2,231. Infant mortality rate per 1,000 live births was estimated at 104 for Zambia, compared to 99 for the African region, while maternal mortality ratio per 100,000 live births was 750 for Zambia and 910 for the African region. The HIV prevalence for the adult population aged 15 years and above was estimated at 15.8% for Zambia and 5.7% for the African region (see, World Health Organization 2007 and appendix 11). The presence of a combination of negative social factors such as poor national economic performance and serious health threats such as HIV/AIDS and high infant and maternal mortality rates means that the treatment and prevention of dental disease, which is perceived by many to be non-life threatening, is given low priority. Myburgh (2002), Ogunbodede (2004), Samarawickrama, Batchelor & Hobdell (1998) and Saparamadu (1984) all agree that the presence of more serious life threatening

medical conditions such as HIV/AIDS in low income countries leads to low political support being given to oral health. The association of dentistry by a wide sector of the Zambian community, including politicians, with the 'pulling out' and filling of teeth does little to build the social image of dentistry.

Compounding the problem is the fact that the Western model of dental education and oral care, with its reliance on expensive armamentarium and materials, is expensive to run (ADEA Commission on Change and Innovation in Dental Education et al. 2006d; Behar-Horenstein et al. 2006; Murry 2002). The Western model of dental education and care may, in the short term, be politically and professionally appealing, but for low income countries like Zambia it is unaffordable and untenable (Enwonwu 1988; Muhirwe 2006; Petersen 2004a; Saparamadu 1984; van Palenstein, Mikx, Begum et al. 1999). Even for developed countries such as the UK, funding cuts to higher education tends to impact more negatively on dental education (Chaudhry and Scully 1998; Kerosuo et al. 2001; Murry 2002). These factors all point to the need for a dental curriculum model and a model of dental care that is socially sensitive, practically sustainable and with the highest potential to garner sustained political support regardless of change in policies.

In this chapter, I have identified and discussed the elements of the Zambian total (dental) education and social cultural environment and their potential implications on dental education and the delivery of dental care. In the next chapter concept of TEPE and the theoretical framework developed in chapter 5 are brought together into a conceptual model.

Chapter 11

Theoretically and Empirically Informed Hybrid Curriculum Model for Zambia: The Rationale for a Hybrid Model

Introduction

The importance of paying attention to the education principles and the wider socio-cultural environment when planning curriculum is widely acknowledged. In education, Cornbleth (1990, p. 25) described the curriculum as a "contextualised social process" that is shaped by the wider education and social context in which it is located. In medical and dental education, it is recognised that the success of curriculum innovations, such as the problem-based learning (PBL), requires contextualising the curriculum in the social environment (Carrera et al. 2003; Fincham and Shuler 2001; McLean 2004). That is, the process of curriculum restructuring should include a systematic identification and appraisal of the relevant elements of the total education and socio-cultural environment (TESE). The TESE is unique for every institution. Therefore any attempts at wholesale transplanting of curricula from one country to another without paying due attention to the social environment may prove unproductive. Over 35 years ago, Robbins (1972, p. 34) advised against the practice of imposing dental curricula developed in Western countries on developing countries. He argued that curriculum planning should start with a "realistic appraisal of the social and economic situations as well as patterns of dental pathology" prevailing in a country.

The curriculum has since been recognised as an essential tool in addressing the social inequalities in access to oral care (Berthold and Lopez 1995; Hobdell et al. 2002). It is

argued that to achieve the primary aim of dental education, which is the production of dentists who are scientifically informed, technically competent and socially responsive, dental educators must be cognisant of and take steps to address issues affecting oral health in their communities, and the curriculum is identified as the starting point in this process (Enwonwu 1988; Hobdell 1995; Hobdell and Sheiham 1981; Thorpe 2006). This argument renders further support to the importance of embedding the curriculum in the social context.

This chapter is divided into two sections. The first section gives a brief overview of the three curriculum types—the collection, hybrid and integrated and the rationale for proposing a hybrid curriculum model for Zambia. In the last section, salient features of the proposed model are described. The model synthesises in a comprehensive and systematic manner, features of the analytical framework developed in chapter 5 and the education and socio-cultural elements of the TESE identified in Appendix I. In general education, Kelly (2004) observes that one of the challenges in education has been the lack of a comprehensive model for guiding curriculum planning. Such a model should be grounded in sound education principles; sensitive to the socio-cultural context in which it is embedded; and should inspire and engage the curriculum *'users'*, the teachers and the curriculum *'receivers'* the students (Schwartz 2006, p. 450). The proposed model attempts to meet these basic curricular requirements.

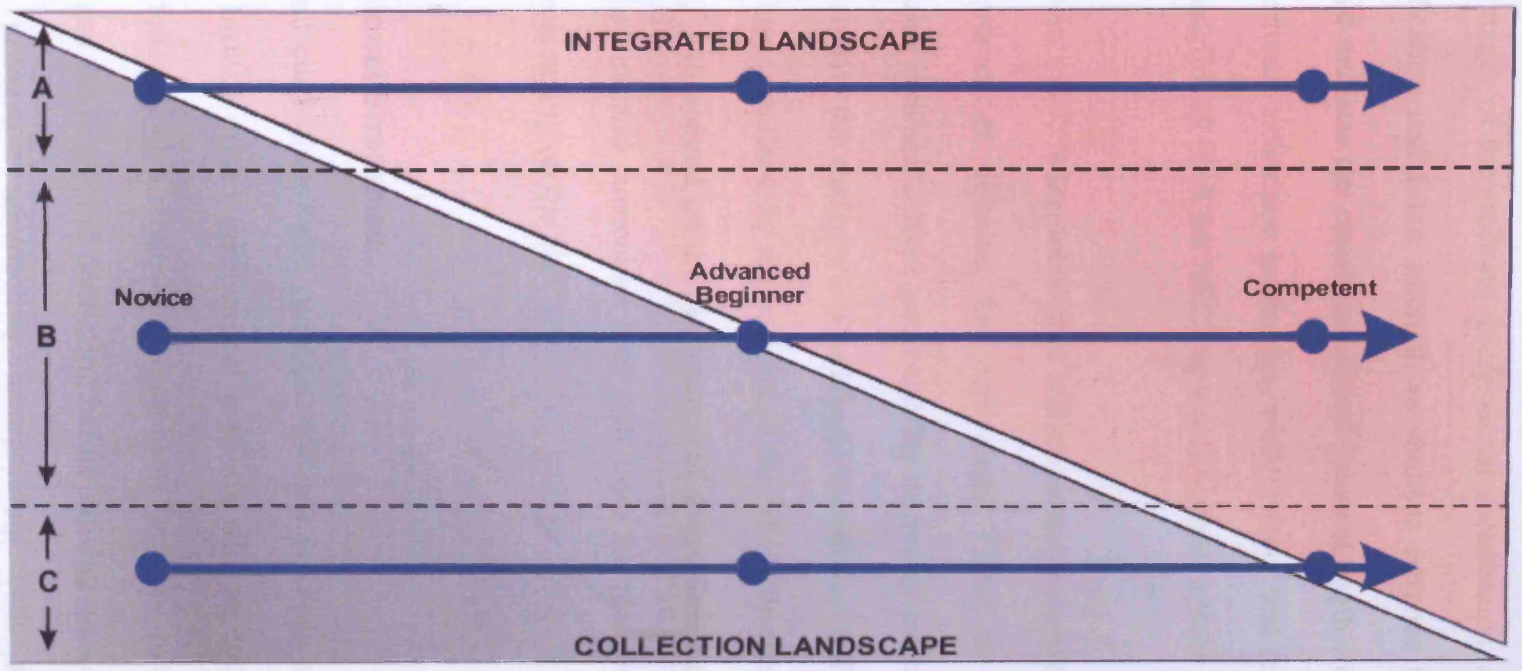
The Three Curriculum Types

I pointed out in chapter 5 that under the conventional approach, the collection and integrated curricula are conceived as two distinct paradigms (Venville et al. 2002) and are usually presented as a continuum of hierarchically organised, mutually exclusive vertical curricula. In this framework, the strong classified and framed collection

curriculum occupies the lower end on the continuum, while the weak classified and framed integrated curriculum occupies the opposite pole of the continuum. The hierarchical positioning of curricula on the continuum is implied by Gehrke (1998), Harden (1998; 2000) and Kysika (1998). But conceptualising curricula rigidly as a series of mutually exclusive vertical collection-integrated landscapes (VECIL) only leads to polarisation of the curriculum by privileging one curriculum over another but without offering any convincing and practical advice on how such curriculum choices are made. It fails to recognise that curricula are dynamic and subject to change in responsive to changes in the TESE. It also fails to take into account the changing education needs of students, from dependence to independence, as they progress on a trajectory of professional socialisation. I have instead proposed a more dynamic approach to conceptualising the curriculum by introducing the concept of a 'diagonal' collection-integrated landscape (DICIL). Under the DICIL, a curriculum is defined by the position of the novice-expert continuum trajectory (NECT).

Figure 11.1 presents a summary of the re-conceptualised three types of curriculum commonly encountered in the medical and dental education literature (e.g. Adea Commission on Change and Innovation in Dental Education et al. 2006c; Bratt 2003; Crawford et al. 2007; Oliver et al. 2008; Patel et al. 2005). Using Bernstein's (1977) concepts of classification and frame strength, curriculum **A** is characterised by weak classification and framing. That is, the boundaries between disciplines are blurred and knowledge is transmitted using active learning student-centred instructional strategies. Curriculum **A** is typified by the PBL curriculum.

Figure 11.1: The Three Main Curricula Varieties



The Collection-Integrated Landscape is divided into three zones, A, B and C. The curriculum is defined by the zone in which the NEC trajectory is located:

A- represents an integrated curriculum. This curriculum type is characterised by blurring of disciplinary boundaries and pedagogic strategies such as PBL in which students exercise greater control over their learning.

B- represents a hybrid curriculum. This is characterised by the blurring of boundaries between some disciplines and strong boundary maintenance for others. It is marked by mixed pedagogic strategies in the transmission of knowledge. The NEC trajectory lies within the middle half of the landscape. This zone corresponds to Bernstein's strong classified-weak framed and weak classified-strong framed quadrants in figure 5.3a and b.

C- is an example of the traditional collection curriculum. It is marked by strong boundary maintenance between disciplines and teacher-centred pedagogic approaches such as lectures.

Curriculum **C** is characterised by strong boundaries between subject areas and the dominance of teacher-centred pedagogic approaches, while **B** combines elements of **A** and **C**. Curriculum **B**, may be characterised by strong classification and framing during the early stages of the students' professional socialisation, and a progressive reduction in classification and frame strength as students advance in their studies. But social factors that increase the classification and frame strength will pull the NECT towards a more traditional collection landscape, while factors that reduce the classification and frame strength will push the NECT upwards towards a more integrated landscape.

In Bernstein's (1977) formulation of collection and integrated curriculum, two variables are importance in defining the curriculum. These are the degree of boundary maintenance between subject areas and the degree of power and control exercised by the teachers and the students in a pedagogic encounter. In the re-conceptualised DICIL, a curriculum is defined by the position of the NECT on the DICIL. But the stability of the NECT will depend on the net balance of social forces constituting the TESE. That is, the implemented curriculum may drift from the planned curriculum as a result of social forces acting on the NECT.

Instructional Strategies

The hybrid curriculum being proposed will not privilege one pedagogic method over another. Instead mixed instructional methods will be employed. These will include lectures, followed by a clinical-based problem scenario, independent study, small group sessions and feedback and debriefing before moving on to the next topic. The use of multiple pedagogic approaches, incorporating both strong and weak framed instructional techniques, enhance the learning experience of students and aid knowledge retention (Bratt 2003; Stjernquist and Crang-Svalenius 2007). The topics will be

organised around five main themes—comprehensive and holistic oral care; health promotion and disease prevention; professional values; oral health advocacy and team-working. The thematic approach is intended to encourage interdisciplinary collaboration and the blurring of disciplinary boundaries.

Topics will be introduced using the didactic lecture method. Lectures will serve the dual function of giving students an overview of the topic and equipping them with the right "vocabulary and definitions" (Barrows 1986, p. 484) for them to meaningfully engage in problem-solving and group discussions. The group sessions will lead to a deeper understanding of biomedical and behavioural science concepts and their application in the clinical context (Davies and Warfvinge 2003). Patel et al.(2005) observe that teaching basic sciences through the traditional didactic lecture method gives students better understanding of the material, while problem-based, small group tutorials facilitate integration of clinical and biomedical knowledge through the use of elaborations and hypothesis-driven strategies. It is also suggested that lectures build the foundation and provides the anchor upon which small group discussions are based (Doig and Werner 2000; Patel et al. 2004; Patel et al. 2005).

Each lecture will be followed by a problem which will be based on some clinical aspect of the topic. Patel et al. (2005) observe that when biomedical and clinical knowledge is organized around patient problems, this makes knowledge more relevant, easily retrievable and facilitates the development of specific clinical reasoning strategies. The students will then be asked to carry out some independent study around the problem. The benefits of encouraging independent study is that this facilitates the development of self-directed learning skills (Patel et al. 2005). Independent study will be followed by small group sessions at which students will discuss their findings. Patel et al (2005, p.

1206) observe that small group sessions help to link experiential knowledge to biomedical knowledge and this "aids the integration of knowledge into coherent structures and consolidation of problem schemas, a characteristic of expert clinicians". That is, small group sessions complement lectures by expanding and elaborating upon the lectures (Patel et al. 2004).

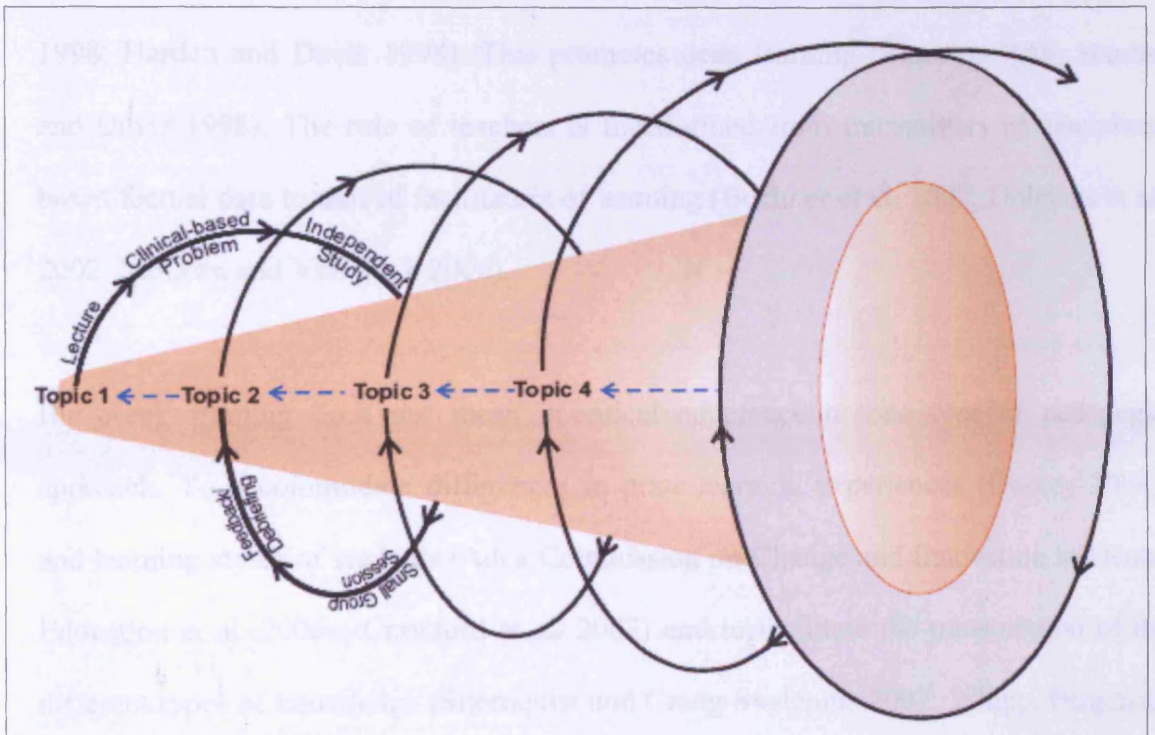
Following the approach taken by Miller, Schwartz and Loten (2000) and Schwartz, Loten and Miller (1999), during the early stages of their studies, students will be given clearly defined learning objectives. The learning activities and questions to be considered during group discussions will be specified beforehand and the learning resources, including reading lists, will also be identified for them (cf. Charlin et al. 1998). At the conclusion of group sessions, students will be given some written feedback and debriefing on all aspects of the topic. But as students mature and expand in their knowledge base, this help will progressively be withdrawn.

Structural Organisation of Topics

The content of the integrated hybrid curriculum will be structured on the principle of the spiral curriculum (Bruner 1977; Dowding 1993; Harden and Stamper 1999; Kabara 1972; Malik and Malik 2004). The topics will be presented at increasing level of complexity from basic to more complex applied knowledge (Bruner 1977; Harden and Stamper 1999). Structuring knowledge in a spiral facilitates horizontal integration across disciplines and vertical integration of behavioural sciences, biomedical sciences and clinical knowledge (Patel et al. 2004; Patel et al. 2005). The dichotomy between pre-clinical and clinical sciences and between pre-clinical laboratory skill training and clinical training are blurred.

Horizontal and vertical integration of the content of the curriculum also means that later education experiences building on earlier learning (Harden and Stamper 1999; Malik and Malik 2004). This is means relatively small number of key concepts and tasks are introduced and progressively built upon at increasing level of complexity throughout the curriculum (Crawford et al. 2007). Figure 11.2 illustrates the organisation of topics in a spiral and the instructional methods that will be employed to transmit knowledge.

Figure 11.2: Structural Organisation of Topics in a Hybrid Curriculum



A hybrid curriculum illustrating the organisation of topics in a spiral to facilitate horizontal and vertical integration. Basic concepts are introduced first and progressively built upon at increasing level of complexity throughout the curriculum. A mix of structured strong and weak framed pedagogic methods are employed to transmit knowledge.

Support for a Hybrid Curriculum

A quick overview of the ideal properties of a curriculum shows that these properties to centre on two variables. The power and control students exercise over the learning process, that is, the strength of framing in the curriculum; and the structural relationship

between the content of the curriculum or, to use Bernstein's (1977) terminology, the strength of classification. Contemporary education thinking supports the weak framed and classified curriculum of the type represented by **A** in figure 11.1.

A weak framed curriculum is characterised by active engagement of students in the learning process (Barrows 1986; Charlin et al. 1998; Crawford et al. 2007; Harden and Davis 1998; Oliver et al. 2008; Reed 1990; Saunders and Dejbakhsh 2007). Because students actively participate in the learning process, they are not passive consumers of factual data and but active processors of information (Barrows 1986; Charlin et al. 1998; Harden and Davis 1998). This promotes deep learning (Barrows 1986; Harden and Davis 1998). The role of teachers is transformed from transmitters of discipline-based factual data to that of facilitators of learning (Bochner et al. 2002; Dolmans et al. 2002; McLean and Van Wyk 2006).

But weak framing does not mean uncritical adherence to one type of pedagogic approach. To accommodate differences in prior learning experiences (Dooley 2004), and learning styles of students (Adea Commission on Change and Innovation in Dental Education et al. 2006c; Crawford et al. 2007) and to facilitate the transmission of the different types of knowledge (Stjernquist and Crang-Svalenius 2007; Whipp, Ferguson, Wells et al. 2000), the use of flexible and varied instructional strategies is encouraged. Other factors, such as the education training and commitment of teachers to curriculum innovations (Dalrymple et al. 2007; Hendricson et al. 2007; Hitchcock and Mylona 2000; Maudsley 2003; Schwartz et al. 1999) and available education resources (Carrera et al. 2003; McLean 2004), will also have some impact on the degree of framing.

A weak classified curriculum is characterised by blurring of boundaries between disciplines (Bernstein 1977). This makes it easy for students to establish the relationship between the different strands of knowledge. But, as noted in chapter 6, differences in emphasis by the different disciplines may prevent the blurring of boundaries between some subject areas (see, Hargreaves et al. 2001; Patel et al. 2002). In dental education, blurring of disciplinary boundaries means that the boundary between behavioural sciences, basic sciences and clinical dentistry are eliminated. The three subject areas are instead vertically and horizontally integrated throughout the curriculum (Reed 1990; Tedesco 1990). Two other characteristic of a weak classified curriculum are the structuring of knowledge at increasing levels of complexity, from basic concepts to applied clinical knowledge and presenting knowledge in the context in which it is applied in professional practice. This aids the development of clinical reasoning and the development of expert attributes (Barrows 1986; Crawford et al. 2007), while repeated exposure to knowledge, skills and values needed for competent professional practice facilitates activation of prior learning and elaboration of knowledge (Charlin et al. 1998).

In figure 12.1, a weak classified and framed curriculum is presented by **A**. This type of curriculum is epitomized by an 'authentic' (Charlin et al. 1998; Fincham and Shuler 2001) PBL curriculum. Debate on the efficacy of the PBL curriculum continue to dominate the medical and dental education literature (Barrows 1986; Charlin et al. 1998; Cohen-Schotanus et al. 2008; Colliver 2000; Fincham and Shuler 2001; Harden and Davis 1998; McLean 2004; Morris 2003; Reeves and Francis 2001). Proponents of PBL argue that it is the most ideal curriculum in meeting the education needs of students in the contemporary knowledge society (Barrows 1986; Boshuizen 2003). It is lauded for providing opportunities for the development of problem solving, critical

thinking and self-directed learning skills (Adea Commission on Change and Innovation in Dental Education et al. 2006c; Barrows 1986; Fincham and Shuler 2001), skills which are considered essential in an environment characterised by rapid proliferation of knowledge. Others have pointed to the lack of sufficient evidence in support of the superiority of the PBL over other curricula innovations. They argue that some claims made about the efficacy of PBL are exaggerated.

A meta-analysis by Colliver (2000) revealed no convincing evidence to suggest that PBL improves the knowledge base and clinical performance to the extent that would justify the resources required for a PBL curriculum. A study by Cohen-Schotanus et al. (2008) report that although graduates of a PBL curriculum scored higher on self-rated competencies, there were no differences in clinical competence between them and graduates of a traditional curriculum. In a similar study, Patel et al. (2001) compared the problem-solving performance of graduates of a traditional and PBL curriculum. They report that traditional curriculum graduates used data-driven strategies while PBL graduates used hypothesis-driven strategies to arrive at a diagnosis. They suggest that data-driven reasoning may be impeded in a PBL curriculum and this may lead to difficulties in acquiring problem schemata. While, Prince and Boshuizen (2007) report that during the transition from pre-clinic to clinical and from medical school into practice, both graduates of PBL and traditional curricula faced difficulties. This has lead Morris (2003) to argue that although adopting a PBL curriculum may be appealing, its processes and outcomes may be no more successful than those of other curricular designs that incorporate the same sound educational design features. Patel et al. (2005) argue that some aspects of problem-based learning can successfully be integrated into the traditional curriculum.

Further support for a hybrid curriculum comes from the advice of participants on the importance of taking into account pragmatic factors such as the socio-cultural environment of Zambia, and from confessional accounts of those who have experimented with the PBL curriculum in the developing countries.

Pragmatic Factors

In response to my request for guidance on the best practice for dental curriculum planning, participants were unequivocal on the important of paying attention to the local social context in which the curriculum will be embedded. Patty Carter (PC) emphasised the important of paying attention to the available resources;

> *AK:* Suppose you had to give advice to people who are just starting a dental program, what would be your advice?
>
> *PC:* I think the most important thing is to focus on your resource at the start. There is an expression which says, 'You should cut your coat according to your cloth'. So you must look at the resource you have in terms of manpower to deliver the course and deliver the course with a suitable number of students based on that resource and then scale up. I think that is most important.

Carter uses the rhetorical device 'Cut your coat according to your cloth' (CYCATYC), to emphasise the importance of planning the dental curriculum within the available resources. This requires careful consideration of the available education and training infrastructure, staffing levels, expertise and teaching experience of faculty; teaching and clinical facilities including seminar rooms, lecture theatres, library facilities, dental unities and the availability of dental supplies. Although most of these may be taken for grated in developed countries, they could be major determinant of the success or failure of a dental programme in a developing country like Zambia.

Patrick McAllen (PM) also emphasised the value of paying attention to the available resources. He, however, went further and admonished against the general practice of most developing countries of contracting outsiders, at usually great cost, to plan and implement the dental curricula for them. He argues that the people who are best informed about the real dental needs of the country are the Zambians themselves;

> AK: Lastly, for us who are just beginning, what would be your advice on what we should do and what we should try to avoid?
>
> PM: Do it your way! Don't follow anyone else's. I think if you have got a medical school and you have got the resources, basic resources, then I think you need to do it your way. Don't spend a lot of money on things that are not really necessary. [...] I think that the actual organisation of the course and all the other things at a higher level, it would be wrong to get people in to tell you what to do because I think that you are in better position to know what works in your country and what doesn't. [...]The other thing to do is to go entirely problem-based and to get a good problem-based school to help you with it and to go thoroughly one way. I am not sure about that...about problem-based...the mission of problem-based learning, I am not too sure. I think it is quite a good idea but I think it is a bit extreme. You need to look into that. You need to go to Manchester and see what they are doing there because they are problem-based. You would have missed something if you don't go to Manchester. You need to go and see what they are doing. They might be a good model. I mean that would be another model.

McAllen strongly opposes the practice of some developing countries of contracting outsiders from the developed countries to plan and implement the curriculum on their behalf because outsiders do not understand the complexity of the local social context. He emphasises that "you are in better position to know what works in your country and what doesn't." But he goes on to suggest the option of adopting an authentic PBL curriculum in Zambia and, in what appears to be a contradiction to his earlier advice,

suggests inviting an outside university with experience of the PBL curriculum such as the University of Manchester, to run the PBL programme on behalf of the country until when it is fully established. In this latter piece of advice, McAllen is more concerned about the importance of securing external accreditation and, implicitly, puts international recognition for the Zambian dental qualification above any other consideration. Although this proposal sounds attractive, the cost 'buying' international accreditation may render the whole experiment economically unviable. It may also have long term negative social consequences such accelerating the brain drain of the newly qualified Zambian dentists.

The advise given by participants has been echoed by Carrera et al. (2003), McLean (2004) and Miller et al. (2000). Carrera et al. (2003) caution against the temptation to adopt curriculum models, such as the PBL, developed in the west without paying attention to local circumstances. They argue that alternative hybrid models may prove to be the best option for developing countries. McLean (2004) has drawn attention to the importance considering beforehand whether there will be a sufficient number of facilitators, the commitment of tutors and adequate healthcare facilities to support extensive clinical exposure of student.

I have paid particular attention to three factors in arriving at the decision that a hybrid curriculum model is the best option for Zambia. These are the students' profile; the faculty; and the available education and training infrastructure.

Dental Student-pool and Prior Education Experience

Two factors that may have some implications on the dental curriculum in Zambia are the student-pool and curriculum discontinuity between secondary education and

university education. I hinted in the last chapter that the dental student-pool will most likely comprise a heterogeneous group drawn from secondary school leavers from rural and urban schools and eligible dental therapists and dental technicians. Carrera et al (2003) have argued that the success of weak framed programmes such as the PBL require students from a relatively homogeneous education background. These students must also receive some initial training in basic skills needed for independent learning.

I have also pointed to the general deterioration in the standard of education in Zambia because of many years of economic stagnation. Consequently, many students entering the University of Zambia are not adequately prepared for the demands of university education. A study by Dooley (2004) has drawn attention to gaps in the education experience of students entering university and the need to find ways of bridging these gaps if quality outcomes in higher education is to be achieved. Doig and Werner (2000) have reported a hybrid curriculum at the College of Human Medicine at Michigan State University, comprising a lecture-based first-year program and a problem-based curriculum in the second year. A hybrid curriculum has been adopted in order to accommodate diverse prior learning experiences of students.

Another factor in support of a hybrid curriculum is what I identified in chapters 6 and 11 as curriculum discontinuity. In chapter 6 curriculum discontinuity is identified as one of the barriers to an integrated curriculum in dental education. In chapter 11, I pointed to curriculum discontinuity between secondary and higher education and between the first two foundation years under the School of Natural Sciences and the medical programme. I have argued that the secondary school curriculum is characterised by very strong classification and framing. The main preoccupation for both students and teachers is on how to pass the highly competitive examinations. It is important that the

education strategies that will be adopted under the dental programme must take into account these factors. A hybrid curriculum appears the best option because it recognises diversity in students' prior education experiences and gradually transfers the responsibility over learning from teachers to students.

Another factor that may need to be taken into account if an authentic PBL curriculum was adopted is the influence of culture on learning. Jippes and Majoor (2008) have advised that schools considering adopting integrated or PBL curricula must take steps to reduce or overcome some obstructive effects of culture. In a study at three Asian universities, Hussain et al. (2007) investigated the impact of the PBL curriculum in facilitating critical thinking. They report that, because it was considered culturally inappropriate to challenge peers and tutors, small group tutorials were largely used as occasions for reporting back the results of independent study.

Staff Recruitment

As a newly established programme, the dental department will face the initial challenge of recruiting and retaining faculty who are both experts in their fields and have experience in teaching and/or possess education training. Some tutors will be recruited locally from the practising Zambian dentists. But more senior academic staff will have to be recruited from outside the country. The first challenge is that nearly all Zambian dentists do not posses any education training. A few have been involved in the teaching of undergraduate medical students at the School of Medicine and dental therapy and dental technician students at the Dental Training School. Secondly, there is an almost equal mix of dentists with professional qualifications based on the odontology and stomatology models. This is because Zambian dentists acquired their professional

qualifications from Western and Eastern block universities including the UK, USA, Russia and China.

The second, and most probably the greatest, challenge will be how to attract and retain a sufficient number of suitably qualified senior academics to a small dental department in a developing country. It is also to be expected that these academics will come with fixed beliefs and practices about teaching and learning, which they have developed over the years (Behar-Horenstein et al. 2006; Sweet et al. 2008b). But Carrera et al. (2003) observe that the integrated nature of programmes such as the PBL require an appropriate number of tutors and subject experts in biomedical and behavioural sciences with uniform pedagogical and scientific background. But recruiting and retaining qualified dental educators is difficult even for universities in developed countries (Bailit and Beazoglou 2003; Treasure 2004). The problem becomes even more desperate if these educators are expected to be content experts and to possess skills in facilitating small group learning (Maudsley 2003).

A hybrid curriculum may be seen as some kind of compromise that helps to accommodate diversity in faculty education beliefs and teaching experience. Instead of seeing diversity faculty as a barrier, in hybrid curriculum it becomes a resource. Senior academics with traditional approaches to teaching can be used as content experts to introduce topics using lectures and to conclude the topics during the feedback and debriefing sessions, while non-expert tutors with skills in student-centred pedagogic approaches can be used facilitators of small group sessions. A similar approach has successfully been used in the hybrid undergraduate curriculum at the University Otago Medical School (Miller et al. 2000; Schwartz et al. 1999). In case-based tutorials, Miller et al. (2000) report that non-expert tutors are used to facilitate small group sessions at

the start and end of each case study, while discipline-based content experts conduct a session in-between. Such an approach has two advantages. The non-expert facilitator ensures that students have the "freedom to reason and learn on their own" (Barrows 1986, p. 485) without the tutor being overly directive, while content experts ensure that all important aspects of the topic have been adequately covered.

Programme of Staff Development

It is widely acknowledged that the critical factors in the success of curriculum innovations such as the PBL is a robust programme of staff development (Fincham and Shuler 2001; Hendricson et al. 2007; Hitchcock and Mylona 2000; McLean 2004; Saunders and Dejbakhsh 2007). Faculty development in PBL aims at helping tutors to move from their traditional roles of "teacher/instructor" to that of a facilitator of learning for student groups (Fincham and Shuler 2001, p. 417). That is, in PBL, tutors must preferably be both process and content experts (Dolmans et al. 2002). The ideal for Zambia would be to put in place a package of faculty development in which all tutors and lecturers recruited to teach on the new programme would receive some education training before taking up their academic duties. Establishing a compulsory education training programme for all academic staff would ensure homogeneity in pedagogic approaches. But it is most unlikely that to receive the support of politicians, who are more anxious to see that sufficient numbers of dentists are being produced in the country as soon as possible and at minimum cost to the Government.

Demand on Learning Resources

The planned dental programme will be established as a department of the School of Medicine and will share education and training facilities with the other established

departments. This puts some limit on the type of curriculum the department way wish to adopt. The weak framed pedagogic approaches, which place responsibility for learning in the hands of students, require the extensive use of physical and learning resources. To run programmes such as the PBL require sufficient number seminar rooms to accommodate small group tutorials (Carrera et al. 2003; Fincham and Shuler 2001) and well stocked library resources in order to carter for student research arising from PBL cases (Carrera et al. 2003). This may, inevitably, put some strain on the traditional library resources. Fincham and Shuler (2001) observe that PBL students place greater demands on library resources than their traditional peers.

To implement a PBL curriculum at the Harvard Medical School, Tosteson, Adelstein and Carver (1994) report that completely new infrastructure was put up, which included new buildings to expand the available space. Under the prevailing economic climate in Zambia, there is very little chance of expanding the existing education infrastructure at the School of Medicine. Mclean (2004) observes that the success of PBL curricula require extensive institutional resources, which may prove costly for developing countries. He therefore advises medical schools in developing countries to consider alternative but cost-effective hybrid curricula.

Key Features of the Model

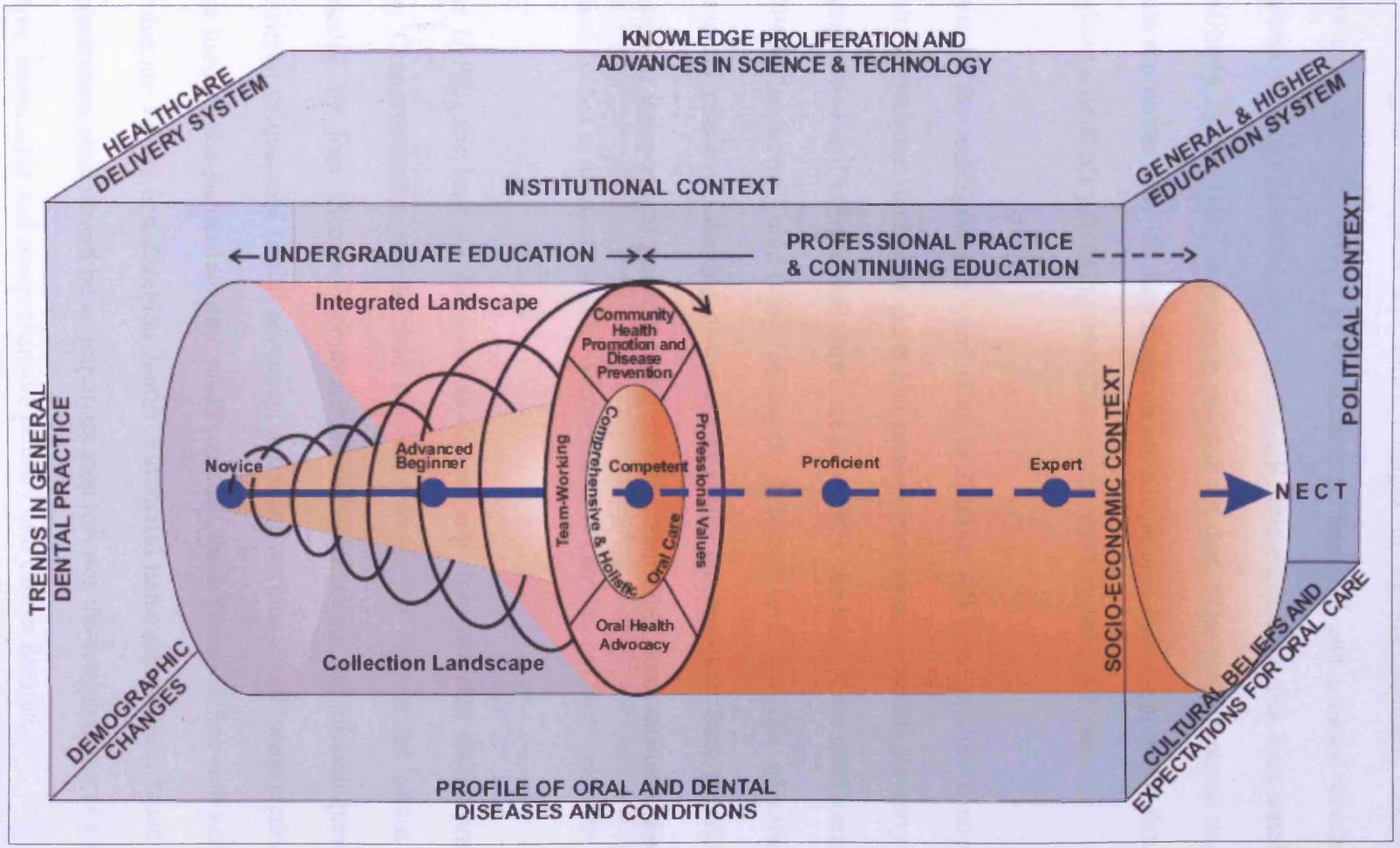
The model is made up of two main parts a horizontal cylinder embedded in the hexagon. The horizontal cylinder represents the undergraduate education-professional practice landscape (UPL), while the hexagon presents the TESE—the wider social context in which the dental school is located. The TESE helps to capture the fact that curriculum is a product of education and social forces. Each edge of the hexagon represents some relevant social element of the TESE. That is, the concept of TESE is

employed as an organising principle for identifying and evaluating social factors impacting on the curriculum. In the case of Zambia, nine elements of the TESE have been identified and the ways in which they are likely to affect the dental curriculum are explored in chapter 11.

The UPL comprises the undergraduate education landscape (UEL) and the professional practice landscape (PPL). The UEL is made up of a diagonal collection-integrated landscape (DICIL). The UEL meshes with the PPL at the undergraduate education-professional practice vertical interface (UPPI). The UPPI marks the transition from undergraduate education to general dental practice and corresponds with the competent stage on the NEC. The UEL focuses attention on the theoretical and conceptual issues underpinning curriculum planning and implementation. Bernstein's (1977) collections-integrated framework (CIF) and the novice-expert continuum (NEC) form the theoretical backbone on which the model is grounded.

Figure 11.3 presents the hybrid curriculum model. A key feature of the model is the NECT lies within the middle-half of the DICIL space. Additional features are a spiral with its apex at the novice stage and its base at the competent stage. The spiral encloses a cone which also has its base at the competent stage. The space occupied by the cone represents the expected expansion in the knowledge-base of students as they progressive on a trajectory from the novice to the competent stage. It also defines the core of the undergraduate curriculum, which is a comprehensive and holistic approach to oral care.

Figure 11.3: Hybrid Dental Curriculum Model Embeded in the Total Education and Socio-cultural Environment



At the UPPI, the spiral continues into the PPL to show the fact that professional education does not cease on graduation. In order to keep abreast with rapid scientific and technological advances and other changes in the socio-cultural environment, dentists must actively engage in continuing professional and personal development throughout their professional lives. In the UK, this expectation has been stated more compellingly by the GDC, who have pointed out that, "The primary dental degree or diploma represents only the first stage on an educational continuum which should last throughout a dentist's practising life" (General Dental Council 2002, par. 2).

The aim of the undergraduate curriculum in Zambia will be to produce dentists with requisite knowledge, technical skills and professional values essential for carrying out 'comprehensive and holistic oral care'. At the U-PPI, the base of the cone merges into the PPCE landscape, signifying continuity between undergraduate education and professional practice. Crossing of the U-PPI marks the transition from undergraduate education to independent general dental practice. From this point onwards, the newly qualified dentist is deemed capable of independently carrying out basic oral care.

At the U-PPI, the base of the spiral is divided into five sections, each represents a theme. Comprehensive and holistic oral care forms the core at the centre and is surrounded by four themes—community health promotion and disease prevention; professional values; oral health advocacy; and team-working. Each theme represents an area of focus in the curriculum and, taken together, these themes define core values and skills that are valued in a Zambian dentist. Successful translation of these broad themes into curriculum content will be an important step towards the establishment of a socially sensitive, sustainable and comprehensive primary oral care in Zambia.

Content of the Curriculum

The content of the proposed curriculum is shown as five interrelated broad defined themes—comprehensive and holistic oral care; community health promotion and disease prevention; professional values; oral health advocacy; and team-working. The content is presented as themes rather than discipline specific subject areas to encourage an integrated approach to curriculum planning and implementation. The actual content of the five themes will be negotiated collaboratively by an interdisciplinary curriculum team drawn from the various disciplines and sub-disciplines of dentistry and other healthcare professions, with the support of education experts from the Department of Medical Education Development and the School of Education. A multidisciplinary approach to curriculum planning will help to foster a sense of collective ownership of the curriculum (Kemahli, Dokmeci, Palaoglu et al. 2004). It is acknowledged that the success of curriculum innovation partly depends on how much the faculty feel they are part and parcel of the change process (cf. Bland et al. 2000; Robins et al. 2000; Schwartz et al. 1999).

The knowledge, skills and values transmitted through the undergraduate curriculum will reflect as closely as possible the requirements for primary oral care. It will constantly be reviewed in order to keep abreast with changes in the wider social environment including changes in oral and dental diseases and other conditions. This will help to minimise the potential discontinuity between the knowledge transmitted in the undergraduate dental curriculum and what is actually practised in general dental practice (Clark et al. 2001; Hendricson et al. 2007; Silversin et al. 1975; Silversin et al. 1978. See also Chapter 9).

Comprehensive and Holistic Approach to Oral Care

A comprehensive and holistic approach to oral care will form the core component of the curriculum (Reed 1990). The GDC (2002) curriculum framework acknowledges the importance of a comprehensive approach to oral care but from the narrow perspective of facilitating the transition to general dental practice and vocational training. It is argued that a comprehensive approach to dental care should facilitate the crossing of "the interface between undergraduate dental education and vocation training", and goes on to define comprehensive dental care as the "delivery of patient dental care in a way that meets all the patients dental needs" (General Dental Council 2002, par. 87). Implicit in this definition of comprehensive care is a focus on the hard dental tissues. But as I have pointed out in the previous chapter, the presence of numerous diseases affecting calcified and soft oral tissues, including HIV related oral conditions and oral cancers, means that the future Zambia dentists should be equipped with knowledge and skills that will enable them address the commonly occurring oral conditions in the community. This will require the allotting of sufficient curricular time to topics addressing conditions of the soft tissues instead of most of the curriculum time being taken up by traditional topics focusing on equipping students with technical skills in the 'drill and fill' aspect of dentistry. The importance of oral surgery, oral medicine, oral pathology and related medical topics, in the Zambian dental curriculum can not be overemphasised.

The achievement of comprehensive and holistic approach to oral care will require grounding dental students in sound scientific knowledge, appropriate technical skills and professional values. These skills and values will be encouraged in the curriculum through early clinical contact and community outreach programmes. In outreach programmes, dental students will participate in established community primary

healthcare programmes such as the 'under-five' and 'antenatal' clinics, in which they will work collaboratively with other healthcare professionals. This is intended to expose students to active oral diseases at an early stage in their professional socialisation. This will also give students an opportunity to experience the social aspect of dentistry by seeing firsthand the impact and extent of social and medical conditions, such as poverty and HIV, on oral health.

Health Promotion and Disease Prevention

Central to achieving comprehensive and holistic dental care is health promotion and disease prevention (Werhane 2006). History has shown that in the presence of a large number of unmet oral care comprehensive care remains a pipe dream because dental practitioners are forced to expend all their energies at alleviating pain and eliminating infection (cf. Inter-Departmental Committee on Dentistry 1946). The achievement of high quality comprehensive oral care should go hand in hand with vigorous programmes in disease prevention and health promotion. This, in turn, requires the oral health personnel working together with other health care professionals. Established healthcare programmes such as the under-five clinics and the antenatal clinics could be a good starting point for dental preventive programmes. Further more, preventive programmes which are carried out in collaboration with other health care programmes are likely to be more cost effective.

In addition to socialising students in the holistic approach to the diagnosis and treatment of individual patients, the curriculum will need to create opportunities for embracing and emphasising the professional ethic of "selfless service to society as a routine part of dental practice expected of all graduates" (Garetto and Yoder 2006, p. 1169). Students should be familiar with the practice of preventive dentistry (General Dental Council

1980, par. 14). "The ethos of preventive dentistry should prevail in every clinical dental department..." (General Dental Council 2002, par. 83)

In addition to carrying out holistic oral care, the Zambian dentist will be expected to be actively engaged in community health promotion and disease prevention and to offer leadership in oral health in a broad based primary care setting. The need for the dental profession to be involved in primary health care, with a focus on disease prevention, is recognised as the most logical approach in the delivery of dental care in developing countries (Gordon 2007; Luhanga and Ntabaye 2001; Monajem 2006; Saparamadu 1984; van Palenstein et al. 1999). But in order for the future dentist to function effectively as a member of a much broader primary health care team, opportunities will have to be created within the undergraduate curriculum for team-working and inter-professional collaboration. In the proposed model, this will be achieved through interdisciplinary learning and through community outreach programmes in which dental students will work side by side with other healthcare professionals. The family study project at the Welsh Dental School and participation of dental students in a malnutrition programme at a South African clinic (Gordon 2007) are some examples of opportunities within the dental curriculum in which dental student can acquire skills in team-working and inter-professional collaboration.

Preventive and health promotion programmes will include identifying traditional beliefs, cultural practices and values surrounding oral health with the view of identifying and encouraging cultural practices that promote oral health and discouraging those that are injurious to health. A multi-sectoral approach, involving collaboration with traditional health practitioners (THPs), will be promoted in the curriculum by

creating time for students to observe the practice of alternative medicine and how oral care is practiced by THPs. This will be part of the community outreach projects.

Professional Values

Professional values and attitudes, marked by altruism, personal integrity, caring, selfless service to society and commitment to high standards of care is the hallmark of professional practice (Masella 2007). The development professional values in students will receive the same attention in the curriculum as the theory and technical skills underlying professional practice. The development of these values at an early stage in the professional socialisation of dental students is critical to the production of an appropriately qualified oral health workforce in Zambian. The attainment of a comprehensive and holistic approach to oral care, health promotion and disease prevention, oral health advocacy and team working will all dependent upon the production of dentists with a high sense of ethical and moral responsibility including sensitivity and responsiveness to social inequalities in oral care (Benn 2003; Dharamsi et al. 2007; Garetto and Yoder 2006; Werhane 2006), willingness to serve socially deprived and remote communities (Bazen et al. 2007; Henzi et al. 2007); personal integrity in dealing with patients, effective communication with patients and colleagues (General Dental Council 2002); and sensitivity towards patients from different socio-economic, ethnic and cultural backgrounds (Rubin 2004; Rubin et al. 2008).

The development of these values in students will largely depend upon faculty who are commitment to high professional ideals and who are ready to take on the role of mentors and role models in both their professional and private lives. An early community involvement, not only exposure to the CODE towards the end of the

undergraduate programme, will help to expose the dental students to the social realities of access to healthcare in general and oral health in particular.

Oral Health Advocacy

Unlike in the developed countries, a newly qualified Zambian dentist will be expected to assume greater responsibility in the provision of dental care as well as administrative and leadership roles. The current healthcare delivery system of Health Boards will require the newly qualified dentist to assume leadership roles at the general hospital where s/he may find her/himself to be the most senior dental professional. Inevitably, at the national level, s/he will be expected to take some leading role in public policy advocacy (Garetto and Yoder 2006). Locally, s/he will be expected to represent the profession on senior management meetings, take a leading role in identifying, planning and delivery of realistic dental programmes, and in the mobilisation of resources.

Although the dental curriculum cannot be expected to be the panacea for all social problems involving the equitable access to oral care, attempts will be made to create opportunities for developing and nurturing humanistic values in students (Dharamsi et al. 2007). The role of community outreach dental education and projects such as the family study (see chapter 9) are among some active learning opportunities that enable dental students to experience, firsthand, the plight of vulnerable communities. .

Team-Working

The attainment of a comprehensive and holistic oral care requires a broad-based health care team comprising oral and other health care personnel in the primary care setting. This is a radical departure from the current narrowly defined dental care team comprising the dentist and professionals complimentary to dentistry (PCDs). In the

GDC undergraduate curriculum frame work the dental student is expected to appreciate the need to "collaborate in prevention, diagnosis, treatment and management of disease with other healthcare professionals and with patients themselves" (General Dental Council 2002, par. 83). In Zambia, the future dentist will be expected to go beyond mere collaboration. S/he will be expected to assuming leadership roles in a broad based healthcare team comprising PCDs, biomedical healthcare professionals and traditional healthcare practitioners who are in close contact with the community.

In deriving the curriculum model for Zambia, I have looked at the dental education environment broadly as a product of "composite and complex" interaction of "intellectual and social forces" (Hobdell 2002, p. 19). I have introduced the concept of the TESE to capture the complexity and multiplicity of factors that are likely to impinge on dental education and on the delivery of oral care in Zambia. The importance of contextualising the curriculum in the wider TESE cannot be overemphasised. Schwartz, Loten and Miller (1999, p. 676) observe that "While the nature of the problems facing medical education and the range of possible solutions may be similar at different medical schools, each school's particular set of problems is unique, as is the set of people trying to solve them." The concept of TESE helps to systematically take into account both the theoretical and the practical realities of the particular local context.

In this chapter, I have developed a comprehensive hybrid curriculum model that is empirically ant theoretically informed. A hybrid curriculum model has been proposed for Zambia. In choosing a hybrid curriculum model as the best option, due attention has been paid to the prevailing Zambian socio-cultural environment. The next and final chapter is a reflection on the study. The aim and process of study are evaluated and suggestions on future work are offered.

Chapter 12

Conclusions, Reflections and Recommendations

This study set out to explore factors that inform contemporary dental curriculum based on a case study of the Welsh Dental School 2001 restructured undergraduate curriculum and the General Dental Council 2002 curriculum framework. The significant factors driving contemporary dental education are educational and socio-cultural in origin. The strong finding from this study is that, whereas in the literature emphasis tends to be placed on the education principles as the main driver of contemporary curriculum, as exemplified by the problem-based learning, what has emerged from this study suggest that, in practice, dental educators place greater attention on the practical reality of the education and socio-cultural environments as the most significant drivers of dental curriculum.

Two interpretative repertoires—the pragmatistic and abstractionist repertoires—were deployed by participants in their discussion dental curriculum. However, in the interview accounts, greater credence was placed on the pragmatistic rather than the abstractionist repertoire. A specific rhetorical device: the "cut your coat according to your cloth" (CYCATYC) device, was repeatedly deployed in participants' accounts. This device drew attention to the important role played by socio-cultural factors in informing curriculum. The problem, however is that, although a number of curriculum models are available for guiding dental curriculum planning, these models suffer from one deficiency, they focus on the education principles and fail to take into account the wider socio-cultural environment in which the curriculum is embedded.

To move beyond the problem of lack of contextualisation, I have introduced the concept of the "total education and socio-cultural environment" (TESE) as a guiding principle for analysing and contextualising the curriculum. Taking Zambia as an example, I have identified the relevant elements of the TESE which are likely to have some significant impact on the curriculum. This then forms the basis for a curriculum model which is more responsive to the prevailing environment in Zambia, and therefore most likely to produce tangible results. The model I am proposing is not divorced of theory. Rather it emphasises the use of theory which is grounded in the practical reality.

The thesis contributes toward a systematic and holistic approach to dental curriculum planning in two ways. First, it proposes a hybrid theoretical framework for analysing dental curriculum, which combines Bernstein's concepts of collection and integrated curriculum, the novice-expert continuum developed by the Dreyfus brothers and Bruner's spiral curriculum. The concept of TESE has been introduced as an organising principle for systematically contextualising dental curriculum in its wider socio-cultural environment. Having developed a theoretical framework and the concept of TESE, I have gone on to develop a hybrid dental curriculum model that comprises two main components: the theoretically grounded inner core and the out TESE. The model helps to approach dental curriculum planning in a systematic and comprehensive way.

The advantages offered by the model are:

1. There is an increasing emphasis placed on meeting the educational needs of students. This, in practice, is translated in various ways including implementing active learning programmes such as the problem-based learning where students assume greater responsibility over their own learning. At the WDS, a mix of pedagogic strategies is employed and it is up to the lecturers to to decide what

learning strategy is suitable for a particular topic or subject. The change in educational approach from the traditional teacher-centred to student-centred also marks a shift in frame strength from a strong to a weak framed curriculum. But without a careful evaluation of the social environment in which the curriculum is embedded the education principles may not fully be realised and the curriculum may drift to a more traditional type.

2. Although there is an increased awareness of the importance of paying attention not only to education principles but also to the social aspects of dental education, the absence of a model that captures both the education principle and the pragmatic factors may mean that one or the other is emphasised during dental curriculum planning. The model I have developed helps to overcome this shortcoming.
3. The need for the dental curriculum to be both educationally sound and socially responsive requires a curriculum model that marries the educational and social aspects of dental education. I have offered such a model.

Reflections

The fact that I started this research with a mission to explore factors that impact on dental curriculum with the view of presenting these factors into a model that can guide curriculum planning and implementation means that in the process I might have narrowed my focus in the interpretation of the data to that which supported my point view and missed the opportunity to interpret it from another angle. Approaching the data from a biased lens of practical application might have also affected the framing of my questions and the relationship I developed with my informants. On my part, I was seeking for what can be applied and on their part, the informants were offering what has been practical. The fact that contextual factors affecting dental curriculum are numerous and interact in complex ways also means that I could not fully capture their impact on

curriculum in a small scale research project such as mine. For this reason my study should be considered as exploratory in nature.

It is well acknowledged that curriculum is a complex topic and the study of factors informing it can not be adequately covered in a small scale study such as this. But as an exploratory study, it has achieved the primary objective of highlighting these factors. The proposed model also helps to move curriculum planning beyond the focus on education theories alone. Although these are important, taking into account social factors can lead to a more socially responsive dental education.

The model I am proposing is not a mathematical model in which, if a given number of variables are present this produces specific results. Having said that, it is important to stress that the hybrid integrated curriculum model that I am proposing for Zambia does not privilege any one pedagogic approach over another. Rather the choice of instructional approaches is dictated, first and foremost, by the education needs of the students, followed by the available education resources and the education training and innovativeness of the teachers. Similarly, the content of the curriculum is relatively strongly classified during the early stages of the programme. However, classification strength progressively decreases with student progression. The blurring of boundaries between clinical disciplines as the students progress in their professional socialisation is aimed at facilitating their transition to professional practice.

Some Limitations of the Study

The limitations of this study include the generasability, the limited range of participants, the limited data on Zambia, and the combined use of theoretical frameworks into a

single model. How each of these may have imposed some limitations on the study is discussed below.

Generalisability

One of the shorting coming of a case study is the generalisability of the findings to other areas. The huge difference between developed and developing countries should make any attempt at generalisation unattainable. However, it must be pointed out that the focus of the study was to explore factors that inform contemporary dental curriculum. The fact that some of these factors will be unique to a particular context should add rather than subtract from my central thesis. That is, the importance of taking into account the 'total education and socio-cultural environment' when planning curriculum. The concept of TESE, therefore, moves the focus in curriculum planning away from the product of undergraduate education to the wide social context in which the dentist will be called upon to serve.

Participants

In this study only heads of subjects, theme leaders and former members of the GDC working party were interviewed. The problem with that is, these were senior members of the dental profession and in that sense the accounts they produced were victors' accounts. The ideal situation would have been to expand the pool of participants to include lecturers, part-time tutors, dental alumni and students. Research where participants representing the various groups and sub-groups of the academic and non-academic community are included give better illumination of the matter.

Secondly, it would have been ideal to have included some participant observations of curriculum meetings and classroom practice as this would have added another angle to the findings and supplied "between method triangulation". But, as I have pointed out already, by the time I commenced this study, the curriculum at the WDS was in the implementation stage and it is doubtful whether classroom observations would have added anything new from what is already available in the literature.

Similarly, although in a way I have attempted to apply the model to Zambia, the greatest obstacle is that there is scanty data on Zambia. I have used secondary documentary data and most of the data are rather outdated. It would have been ideal to have generated primary data on Zambia. But the problem is that the dental programme has not yet been established nor is there in place an academic community in dental education at the level of the undergraduate programme.

Use of a Combined Theoretical Framework

My use of theories from apparently two different knowledge areas is a deliberate attempt to try and show that sociological and cognitive-based theories need not be viewed as incompatible. If they are used in a well thought-out manner they can compliment each other and offer us new insights and fruitful ways of tackling education issues. Bernstein's classification and framing theory, for example, helps to draws our attention to both the structural organisation and the social interaction in the transmission of knowledge, or what Morais (2002, p. 559) terms as the "learning social contexts and the interactions that occur in them." The novice-expert continuum, on the other hand, traces the students' progression and their educational needs at different stages of their education (O'Byrne et al. 1997). Combining the two theories, therefore, provides us with a more holistic approach to curriculum planning and implementation.

Bernstein's classification and frame theory has been applied in a variety of innovative and flexible ways to a range of educational issues (see, for example, Fowler and Poetter 2004; Kirk and MacDonald 2001; Sleeter and Stillman 2005; Walford 1981, 1986, 1995, 2002). Much of this work has adopted a comparative approach. The work of Fowler and Poetter (2004); Morais et al. (1999); Neves and Morais (2001a); and Neves and Morais (2001c) are all examples of the application of Bernstein's theory from a comparative perspective. The work of Jacobsen (1981) and Armstrong (1977) are illustrations of inter- and intra-disciplinary comparative application of Bernstein's concepts of collection and integration.

The approach I have taken differs from this general trend. I have re-constituted Bernstein's collection-integrated framework from a vertical continuum to a diagonal collection-integrated landscape (DICIL) and mapped the NECT on this landscape. In the re-constituted DICIL, the curriculum is defined the location of the NECT in the three main zones: collection, hybrid and integrated. Decisions about of the curriculum type are not arrived at in a vacuum but are informed by careful analysis of social factors constituting the TESE. The combining of concepts in different ways is supported by Kelle (1995) and Coffey and Atkinson (1996). Kelle (1995, p. 47) argues that,

> "Mere application of concepts does not lead to new insight into the investigated phenomenon, for it is a trivial fact. But by the combination of these concepts it becomes possible to build a heuristic framework that serves as a means for the discovery of interesting facts"

Coffey and Atkinson have elaborated on the importance of adapting and transforming concepts developed by previous scholars in the interpretation of our own data. They argue that,

> "Our task as qualitative researchers is to use ideas in order to develop interpretations that go beyond the limits of our data and that go beyond how previous scholars have used those ideas. It is in that synthesis that new interpretations and new ideas emerge. The point is not to follow previous scholarship slavishly but to adapt and transform it in the interpretation of our own data" (Coffey and Atkinson 1996, p. 158).

Contribution of the Diagonal Integrated Hybrid Curriculum Model

The curriculum model I am proposing for Zambia is not a rigid mathematical model. It does not privilege any pedagogic approach over another. Neither does it advocate for indiscriminate integration or differentiation between subject areas. Rather, it is a conceptual model that aims at promoting a more a flexible and practical approach to curriculum planning and implementation. It aims at moving curriculum planning from a passive and unplanned response to external circumstances, to a project which begins with the identification and addressing the relevant socio-cultural factors affecting dental education and the delivery of dental care in a community. It is aimed at achieving specific educational ends (Hobdell 2002). The model also offers a systematic and rational way of selecting and structuring the content of the curriculum. Knowledge selection and organisation should be followed by informed choices about the most appropriate pedagogic approaches of knowledge transmission and the creation of opportunities for engaging students in active learning. In addition, in this model undergraduate dental education is not divorced from general dental practice. In fact it is only the first phase in the continuing professional socialisation of the dentist.

Some of the advantages offered by this model are:

1. The model is sensitive to changes in the external environment in which the dental programme is located. Changes in socio-economic, political, demographic, disease

profile, health care system and other external factors all inform the curriculum. Because of sensitivity to the external environment, this makes the curriculum model dynamic and requiring constant revisions to take on board changes in the TDEPE. The model is founded on sound education principles. The principle of spiral curriculum means that the sequencing of the content of education is orderly with basic material coming first and more complex material coming later thus allowing later learning experiences to logically build on earlier learning.

2. By viewing Bernstein's collection and integrated codes as a continuum, this helps us move beyond the simple dichotomous view of the highly segmented dental curriculum as either a pure collection or integrated code and to recognise the fact that both codes operate at different stages of the undergraduate dental programme.
3. It offers continuity between undergraduate education and professional practice. In this model, socialisation into undergraduate education is seen as part of a continuum which begins with the students' entry into the dental school and continues throughout the professional life of the dentist. Successful completion of undergraduate education does not mark the end of dental education, but is just the first phase on a continuum of lifelong educational experience in which the dentist assumes her/his own responsibility for professional and personal development in response to scientific and technological changes.

The greatest challenge to achieving this model lies with the willingness by the dental profession to identify and blur established traditional boundaries in dental knowledge. It requires the profession to redefine what it holds as valued dental knowledge in the context of the primary health care model. The first step is for the dental profession to re-examine long held assumptions and values about dental education, the image and place of dentistry and the role of the dental profession as members of the primary healthcare

team. This will require the willingness of the dental profession to come out from the sheltered environment and comfort of the dental surgery and/or hospital and take up its position as a part of the primary healthcare team.

Recommendations

The successful application of the model will depend on the team effort of both the teachers and future students of the planned dental programme in Zambia. There will be many obstacles to overcome and what I have proposed is away of being able to identify in advance some of these problems. But the model remains just that. It is only a conceptual framework aimed at guiding a more comprehensive approach to the planning and implementation of the curriculum. The real test is how to successfully translate the curriculum on paper into some practical reality. This is the challenge that awaits the future lectures and dental students in Zambia. The study has highlighted key areas which may need paying attention to when planning the dental programme in Zambia.

The study has also generated some fresh areas of research. In Zambia, these will centre on the use of available clinical resources in the training of students, the impact of government policy including funding to higher education. The following recommendation should therefore be taken into account:

1. The need to put in place a system of constant evaluation of the dental programme in order to be abreast with changes in the TESE in order for dental education to be responsive of the real oral health needs of the country.
2. The need for a robust education training programme for all academic staff including part-time tutors to ensure that modern teaching methods are employed for the benefit of students.

3. To maximise resource utilisation, including teaching staff, inter-disciplinary teaching and research should be promoted. This will prove particularly helpful to emerging departments which may find at a comparative disadvantage in resources.
4. Community outreach programmes in primary care settings should be promoted throughout the undergraduate curriculum and should not be an area of emphasis during the final year of the programme. The advantages of a strong outreach programme in the Zambian environment are numerous. They include enhancing the learning experience of students by exposing them to wide range of patients, oral diseases and working conditions away from the urban centres; and attracting resources at hosting remote health care institions.
5. Both academic staff and students should be encouraged to conduct basic research on the different social factors impacting the delivery of health care in general and oral care in particular. A multidisciplinary approach is recommended. The type of research carried out need not be complex requiring huge funding as this can become an obstacle to research productivity.
6. The development of closer links with existing dental schools within the Southern African region and far afield, is strongly recommended. As an emerging department of dentistry, Zambia has a lot learn from established dental schools in the region. Areas worth exploring include staff and student exchange programmes, collaborative research and the exchange of information on trends in oral diseases.

Clearly, if the six recommendations listed here are operationalised, they would make a considerable contribution to the delivery of dental education and oral health care in general. However, it is important to be cognisant of the numerous challenges that lie ahead including the country's abiliy to deliver a modern and vibrant dental education programme. At a time when the whole world is going through difficult economic

turbulances, the political will, undoubtedly, is bound to be at the lowest level. The infrastructure, resource levels and capacity to implement these recommendations fully is limited. But these should not been seen as an insurmountable obstacles, but rather as opportunities that have be faced headon with zeal and determination.

Throughout the doctoral research, a number of ideas for future research projects have occurred to me. These have been sparked by my wider reading and case study work. Future areas of study could include:

- A quantitative study to explore the significance paid by dental academics to the various variables of the TESE and their implications on the curriculum.
- A detailed study of the interaction between the educational and the socio-cultural elements of the TESE and their implications on the curriculum.
- A comparative study of drivers of dental curriculum within the Sub-Sahara region, and between developed and developing countries.
- The role regional and international (dental) bodies and associations in shaping the dental curriculum.
- The impact political and economic factors on dental curriculum and the delivery of oral care in developing countries.

I hope that future scholars will address some of these important areas and engage in valuable investigative work on the dental curriculum. I am conscious that an exploratory PhD research project such as this cannot adequately address all the pertinent questions within the limited period of three years. However, if my work will succeed in challenging our current conceptions of the curriculum and stimulate further scholarly debate on the subject, then I will consider myself has having contributed something towards the the advancement of knowledge in dental curriculum.

REFERENCES:

Aberbach, J. D. and Rockman, B. A. 2002. Conducting and Coding Elite Interviews. *Political Science and Politics* 35(4), pp. 673 - 676.

ADEA Commission on Change and Innovation in Dental Education, Haden, N. K., Andrieu, S. C., Chadwick, D. G., Chmar, J. E., Cole, J. R., George, M. C., Glickman, G. N., Glover, J. F., Goldberg, J. S., Hendricson, W. D., Meyerowitz, C., Neumann, L., Pyle, M., Tedesco, L. A., Valachovic, R. W., Weaver, R. G., Winder, R. L., Young, S. K. and Kalkwarf, K. L. 2006a. The Dental Education Environment. *Journal of Dental Education* 70(12), pp. 1265-1270.

ADEA Commission on Change and Innovation in Dental Education, Haden, N. K., Andrieu, S. C., Chadwick, D. G., Chmar, J. E., Cole, J. R., George, M. C., Glickman, G. N., Glover, J. F., Goldberg, J. S., Hendricson, W. D., Meyerowitz, C., Neumann, L., Pyle, M., Tedesco, L. A., Valachovic, R. W., Weaver, R. G., Winder, R. L., Young, S. K. and Kalkwarf, K. L. 2006b. Educational Strategies Associated with Development of Problem-Solving, Critical Thinking, and Self-Directed Learning. *Journal of Dental Education* 70(9), pp. 925 - 936.

Adea Commission on Change and Innovation in Dental Education, Hendricson, W. D., Andrieu, S. C., Chadwick, D. G., Chmar, J. E., Cole, J. R., George, M. C., Glickman, G. N., Glover, J. F., Goldberg, J. S., Haden, N. K., Meyerowitz, C., Neumann, L., Pyle, M., Tedesco, L. A., Valachovic, R. W., Weaver, R. G., Winder, R. L., Young, S. K. and Kalkwarf, K. L. 2006c. Educational Strategies Associated with Development of Problem-Solving, Critical Thinking, and Self-Directed Learning. *Journal of Dental Education* 70(9), pp. 925-936.

ADEA Commission on Change and Innovation in Dental Education, Pyle, M., Andrieu, S. C., Chadwick, D. G., Chmar, J. E., Cole, J. R., George, M. C., Glickman, G. N., Glover, J. F., Goldberg, J. S., Haden, N. K., Hendricson, W. D., Meyerowitz, C., Neumann, L., Tedesco, L. A., Valachovic, R. W., Weaver, R. G., Winder, R. L., Young, S. K. and Kalkwarf, K. L. 2006d. The Case for Change in Dental Education. *Journal of Dental Education* 70(9), pp. 921-924.

Aggleton, P., Brannen, J., Brown, A., Chisholm, L., Mace, J. and Power, S. eds. 2001. *A Tribute to Basil Bernstein: 1924 - 2000.* London: Institute of Education, University of London.

Akpata, E. S. 2004. Oral health in Nigeria. *International Dental Journal* 54(6 & Supl 1), pp. 361 - 366.

Al-Bitar, Z. B. , Sonbol, H. N. and Al-Omari, I. K. 2008. Reasons for Choosing Dentistry as a Career by Arab Dental Students. *European Journal of Dental Education* 12, pp. 247-251.

Alaszewski, A. 2002. The Impact of the Bristol Infirmary Disaster and Inquiry on Public Services in the UK *Journal of Interprofessional Care* 16(4), pp. 371 - 378.

Aldridge, A. 1995. Negotiating Status: Social Scientists and the Anglican Clergy. In: Hertz, R. and Imber, J.B. eds. *Studying Elites Using Qualitative Methods.* Thousand Oaks: Sage Publications, pp. 111 - 123.

Allen, D. L. 1988. Philosophy and Rationale of Curriculum Change. *International Dental Journal* 38, pp. 239 - 241.

American Association of Dental Schools (AADS) 1997. Competencies for the New Dentist: (As approved by the 1997 House of Delegates). *Journal of Dental Education* 61(7), pp. 556 - 558.

American Dental Education Association 2004. Competencies for the New Dentist: (As approved by the 1997 House of Delegates) Competencies: a new view of becoming a dentist. *Journal of Dental Education.* 68(7), pp. 742-744.

American Dental Education Association 2005. Competencies for the New Dentist: (As approved by the 1997 House of Delegates). *Journal of Dental Education* 69(7), pp. 800-802.

American Dental Education Association 2006. Competencies for the New Dentist: (As approved by the 1997 House of Delegates. These competencies are being revised in 2006-07.). *Journal of Dental Education* 70(7), pp. 757-759.

Anneroth, G. 1989. Current Curriculum Changes in Dental Education in Europe. *International Journal of Dental Education* 39, pp. 205 - 209.

Aragon, C. E. and Zibrowski, E. M. 2008. Does Exposure to a Procedural Video Enhance Preclinical Dental Student Performance in Fixed Prosthodontics? *Journal of Dental Education* 72(1), pp. 67-71.

Armstrong, D. 1977. The Structure of Medical Education. *Medical Education* 11, pp. 244 - 248.

Armstrong, D. 1980. Health Care and the Structure of Medical Education. In: Noack, H. ed. *Medical Education and Primary Health Care*. London: Croom Helm, pp. 81 - 91.

Armstrong, D. 1990. Medicine as a Profession: times of change. *British Medical Journal* 301, pp. 691-693.

Arnot, M. 2002. The Complex Gendering of Invisible Pedagogies: social reproduction or empowerment? *British Journal of Sociology of Education* 23(4), pp. 583 - 593.

Arnot, M., Apple, M., Beck, J., Davies, B., Edwards, T., Moore, R., Morais, A., Muller, J., Power, S. and Whitty, G. 2002. Editorial: Basil Bernstein's Theory of Social Class, Educational Codes and Social Control. *British Journal of Sociology of Education* 23(4), pp. 525 - 526.

Arredondo, D. E. and Rucinski, T. T. 1998. Principle Perceptions and Beliefs About Integrated Curriculum Use *Journal of Educational Administration* 36(3), pp. 286 - 298

Atkinson, J. C., Zeller, G. G. and Shah, C. 2002. Electronic Patient Records for Dental School Clinics: more than paperless systems. *Journal of Dental Education* 66(5), pp. 634-642.

Atkinson, P. 1977. The Reproduction of Medical Knowledge. In: Dingwall, R., Heath, C., Reid, M. and Stacey, M. eds. *Health Care and Health Knowledge*. London: Croom Helm, pp. 83 - 103.

Atkinson, P. 1983. The Reproduction of the Professional Community. In: Dingwall, R. and Lewis, P. eds. *The Sociology of the Professions: lawyers, doctors and others*. London: Macmillan, pp. 224 - 241.

Atkinson, P. 1985. *Language, Structure and Reproduction; an introduction to the sociology of Basil Bernstein*. London: Methuen.

Atkinson, P. 1995. *Medical Talk and Medical Work*. London: Sage.

Atkinson, P. 1997. *The Clinical Experience: The construction and reconstruction of medical reality*. Aldershot: Ashgate.

Atkinson, P. and Coffey, A. 2004. Analysing Documentary Realities. In: Silverman, D. ed. *Qualitative Research: Theory, Methods and Practice*. Second ed. London: Sage, pp. 56- 75.

Atkinson, P. , Davies, B. and Delamont, S. eds. 1995. *Discourse and Reproduction: Essays in honour of Basil Bernstein*. Cresskill, NJ: Hampton Press.

Ayers, C. S., Abrams, R. and Robinson, M. 2001. U.S. and Canadian Dental School Involvement in Extramural Programming. *Journal of Dental Education* 65(11), pp. 1272-1277.

Bahar-Ozvaris, S., Cetin, F. C., Turan, S. and Peters, A. S. 2006. Cooperative Learning: a new application of problem-based learning in mental health training. *Medical Teacher* 28(6), pp. 553 - 557.

Bailit, H. L. and Beazoglou, T. J. 2003. State Financing of Dental Education: impact on supply of dentists. *Journal of Dental Education* 67(12), pp. 1278-1285.

Baker, C. 2004. Membership Categorization and Interview Accounts. In: Silverman, D. ed. *Qualitative Research: Theory, Method and Practice.* London: Sage, pp. 162 - 176.

Ball, S. J. 1981. *Beachside Comprehensive.* Cambridge: Cambridge University Press.

Barbour, R. S. 2001. Checklists for improving rigour in qualitative research: a case of the tail wagging the dog? *BMJ* 322(7294), pp. 1115-1117.

Barnnet, R. and Coate, K. 2005. *Engaging the Curriculum in Higher Education.* Berkshire: McGraw-Hill.

Barnnet, R., Parry, G. and Coate, K. 2001. Conceptualising Curriculum Change. *Teaching in Higher Education* 6(4), pp. 435 - 449.

Barrows, H. S. 1986. A Taxonomy of Problem-Based Learning Methods. *Medical Education* 20(6), pp. 481 - 486.

Baum, B. J., Scott, J., Bickel, M., Gombos, G., Greenspan, J. S., Guo, W., Park, N.-H., Purdell-Lewis, D., Ranney, R., Schwarz, E., Seymour, G. and Uoshima, K. 2002. 5.3 Global Challenges in Research and Strategic Planning. *European Journal of Dental Education* 6(s3), pp. 179-184.

Bazen, J. J. , Kruger, E. , Dyson, K. and Tennant, M. 2007. An Innovation in Australian Dental Education: rural, remote and Indigenous pre-graduation placements. *Rural and Remote Health* [Online] 7. Available at: http://www.rrh.org.au/publishedarticles/article_print_703.pdf [Accessed: 10/11/2008].

BDA Working Party 1973. Comments on the General Dental Council's Recommendations Concerning the Dental Curriculum - Report of the British Dental Association Working Party. *British Dental Journal* 135, pp. 415 - 416.

Bean, C. Y., Rowland, M. L., Soller, H., Casamassimo, P., Van Sickle, R., Levings, K. and Agunga, R. 2007. Comparing Fourth-Year Dental Student Productivity and

Experiences in a Dental School with Community-Based Clinical Education. *Journal of Dental Education* 71(8), pp. 1020-1026.

Becker, H. S. , Geer, B. , Hughes, E. C. and Strauss, A. L. 1961. *Boys in White: student culture in medical school.* Chicago: University of Chicago Press.

Beeley, J. A. 2003. Biomolecular Sciences in the Dental Curriculum - broadening the base to increase the relevance. *European Journal of Dental Education* 7(2), pp. 94-94.

Behar-Horenstein, L. S., Mitchell, G. S. and Dolan, T. A. 2005. A Case Study Examining Classroom Instructional Practices at a U.S. Dental School. *Journal of Dental Education* 69(6), pp. 639-648.

Behar-Horenstein, L. S., Mitchell, G. S., Notzer, N., Penfield, R. and Eli, I. 2006. Teaching Style Beliefs Among U.S. and Israeli Faculty. *Journal of Dental Education* 70(8), pp. 851-856.

Beltran-Neira, R. J. and Beltran-Aguilar, E. D. 2004. Taxonomy for Competency-Based Dental Curricula. *Journal of Dental Education* 68(9), pp. 978-984.

Benn, D. K. 2003. Professional Monopoly, Social Covenant, and Access to Oral Health Care in the United States. *Journal of Dental Education* 67(10), pp. 1080-1090.

Benner, P. 1984. *From Novice to Expert: excellence and power in clinical nursing practice*. Menlo Park: Addison-Wesley.

Benner, P. 2004. Using the Dreyfus Model of Skill Acquisition to Describe and Interpret Skill Acquisition and Clinical Judgment in Nursing Practice and Education. *Bulletin of Science Technology Society* 24(3), pp. 188-199.

Berman, P., Nwuke, K., Rannan-Eliya, R. and Mwanza, A. 1995. *Zambia: Non-Governmental Health Care Provision* [Online]. Harvard: Available at: http://www.hsph.harvard.edu/ihsg/publications/pdf/No-19.PDF [Accessed: 8th March 2006].

Bernabe, E., Icaza, J. L. and Delgado-Angulo, E. K. 2006. Reasons for Choosing Dentistry as a Career: a study involving male and female first-year students in Peru. *European Journal of Dental Education* 10(4), pp. 236-241.

Bernier, G. M. , Adler, S. , Kanter, S. and Meyer, W. J. 2000. On Changing Curricula: lessons learnt at two dissimilar medical School. *Academic Medicine* 75(6), pp. 595-601.

Bernstein, B. 1975. *Class, Codes and Control: Towards a Theory of Educational Transmissions* London Routledge and Kegan Paul.

Bernstein, B. ed. 1977. *Class, Codes and Control.* 2nd ed. London: Routledge and Kegan Paul.

Berthold, P. and Lopez, N. eds. 1995. *International Collaboration in Dental Education: Facing the Challenge of Providing Adequate Access to Oral Health Care.* Philadelphia: University of Pennsylvania.

Bertolami, C. N. 2001. Rationalizing the Dental Curriculum in Light of Current Disease Prevalence and Patient Demand for Treatment: form vs. content. *Journal of Dental Education* 65(8), pp. 725 - 735.

Bird, E. 2001. Disciplining the Interdisciplinary: radicalism and the academic curriculum. *British Journal of Sociology of Education* 22(4), pp. 463 - 478.

Bland, C. J., Starnaman, S., Wersal, L., Moorhead-Rosenberg, L., Zonia, S. and Henry, R. 2000. Curricular Change in Medical Schools: how to succeed. *Academic Medicine* 75(6), pp. 575 - 593.

Bloom, S. W. 1989. The Medical School as a Social Organization: the sources of resistance to change. *Medical Education* 23(3), pp. 228 - 241.

Bochner, D., Badovinac, R. L., Howell, T. H. and Karimbux, N. Y. 2002. Tutoring in a Problem-based Curriculum: expert versus non-expert. *Journal of Dental Education* 66(11), pp. 1246-1251.

Boshuizen, H. P. A. 2003. *Expertise Development: How to bridge the gap between school and work.* Heerlen: Open Universiteit Nederland.

Boshuizen, H. P. A. 2004. Does Practice Make Perfect? A slow and continuous process. In: Boshuizen, H.P.A. , Bromme, R. and Gruber, H. eds. *Professional Learning: Gaps and transitions on the way from novice to expert.* Vol. 2. Dordrecht: Kluwer Academic Publishers, pp. 73 - 95.

Boyd, M. A. 1988. Curricular Trends in North America. *International Dental Journal* 38, pp. 247 - 251.

Boyd, M. A., Gerrow, J. D., Chambers, D. W. and Henderson, B. J. 1996. Competencies for Dental Licensure in Canada. *Journal of Dental Education* 60(10), pp. 842 - 846.

Bradlaw, R. 1974. President's Address at the opening of the Thirty-Ninth Session of the General Dental Council. *British Dental Journal* 136, pp. 425 - 428.

Bradnock, G., White, D. A., Nuttall, N. M., Morris, A. J., Treasure, E. T. and Pine, C. M. 2001. Dental Attitudes and Behaviours in 1998 and Implications for the Future. *British Dental Journal* 190, pp. 228 - 232.

Brand, A. A. and Chikte, U. M. E. 1992. Choosing Dentistry as a Career. Part II – The meaning of motives. *Journal of the Dental Association of South Africa* 47, pp. 509–512.

Brand, A. A., Chikte, U. M. E. and Thomas, C. J. 1996. Choosing Dentistry as a Career – a profile of entering students (1992) to the university of Sydney, Australia. *Australian Dental Journal* 41(3), pp. 198 - 205.

Bratt, A. M. 2003. A Large Group Hybrid Lecture and Problem-based Learning Approach to Teach Central Nervous System Pharmacology within the Third Year of an Integrated Masters Level Pharmacy Degree Course *Pharmacy Education* 3:(1), pp. 35 - 52.

Bristol Royal Infirmary Inquiry. 2001. *Learning from Bristol: The Report of the Public Inquiry into Children's Heart Surgery at the Bristol Royal Infirmary 1984 - 1995* [Online]. Norwich: Bristol Royal Infirmary Inquiry. Available at: www.bristol-inquiry.org.uk [Accessed: 5th March 2006].

British Dental Association ed. 1979. *The Advances of the Dental Profession: A centenary history 1880 - 1980.* Brighton: Southern Publishing.

Bruer, J. T. 1993. The Mind's Journey from Novice to Expert: if we know the route, we can help students negotiate their way *American Educator* 6-15, pp. 38 - 46.

Bruner, J. 1977. *The Process of Education.* 2nd ed. Cambridge, MA: Harvard University Press.

Buchanan, R. N., Goldberg, J., Groeneveld, H., Alvesalo, L., Anderton, R., Angelopoulos, A., Bausch, J. R., Haanaes, H., Nagy, G., MacInnis, W., Sapelli, P. and Songpaisan, U. 2002. 3.4 Securing the Financial Future of the University. *European Journal of Dental Education* 6(s3), pp. 115-124.

Burgess, R. G. 1984. *In the Field: an introduction to field research.* London: Allen & Unwin.

Burgess, R. G. 1985. *Strategies of Educational Research: Qualitative Methods.* Lewes, Sussex: Falmer.

Burton, J. L. and McDonald, S. 2001. Curriculum or Syllabus: which are we reforming? *Medical Teacher* 23(2), pp. 187-191.

Camara, V. L. 1988. Curriculum Changes in Dental Education in Latin America. *International Dental Journal* 38, pp. 242 - 246.

Campbell, M. J. 1958. *From a Trade to a Profession: byways in dental history.* Glasgow.

Campbell, M. J. 1981. *Dentistry Then and Now*. 3rd ed. Glasgow.

Canton, F. 1896. Inaugural Address Upon Dental Education. *Lancet* 148(3808), pp. 519 - 520.

Carlgren, I. and Kallos, D. 1997. Lessons from a Comprehensive School System for Curriculum Theory and Research: Sweden revisited after twenty years. *Journal of Curriculum Studies* 29(4), pp. 407– 430.

Carrera, L. I. , Tellez, T. E. and D'Ottavio, A. E. 2003. Implementing a Problem-based Learning Curriculum in an Argentinean Medical School: Implications for developing countries *Academic Medicine* 78(8), pp. 798-801.

Cartwright, S. 1876. The Dental Profession and the Odontological Society. *Lancet* 107(2742), pp. 446 - 447.

Cartwright, S. 1877. Dental Reform. *Lancet* 109(2800), p. 628.

Cassel, J. 1988. The Relationship of Observer to Observed when Studying up. In: Burgess, R.G. ed. *Conducting Qualitative Research Studies in Qualitative Methodology: a research annual.* Vol. 1. London: Jai Press.

Central Board of Health 2000. *National Health Strategic Plan, 2001-2005.* Lusaka: Central Board of Health.

Central Statistical Office [Zambia] and ORC Macro 2003. *Zambia DHS EdData Survey 2002: Education Data for Decision-Making.* Calverton, Maryland, USA Central Statistical Office and ORC Macro.

Central Statistics Office Zambia. 2003. *Census Data from Zambia: Main Zambia Census Report, Vol. 10* [Online]. Lusaka: Central Statistics Office Zambia. Available at: http://www.zamstats.gov.zm/census.php [Accessed: 20 February 2007].

Chambers, D. W. 1993. Towards a Competency-Based Curriculum. *Journal of Dental Education* 57(11), pp. 790 - 793.

Chambers, D. W. 1994. Competencies: a new view of becoming a dentist. *Journal of Dental Education* 58(5), pp. 342 - 345.

Chambers, D. W. 1996. Dental Curriculum and Accreditation - means, ends and the continuum. *Journal Dental Education* 60(10), pp. 816 - 820.

Chambers, D. W. and Geissberger, M. 1997. Toward a Competency Analysis of Operative Dentistry Technique Skills. *Journal of Dental Education* 61(10), pp. 795 - 803.

Chambers, D. W. and Gerrow, J. D. 1994. Manual for Developing and Formatting Competency Statements. *Journal of Dental Education* 58(5), pp. 559 - 562.

Chambers, D. W. and Glassman, P. 1997. A Primer on Competency-Based Evaluation. *Journal of Dental Education* 61(8), pp. 651 - 666.

Chapman, H. 1999. Some Important Limitations of Competency-Based Education with Respect to Nurse Education: an Australian perspective. *Nurse Education Today* 19, pp. 129-135.

Charlin, B., Mann, K. and Hansen, P. 1998. The Many Faces of Problem-Based Learning: a framework for understanding and comparison. *Medical Teacher* 20 (4), pp. 323 - 330.

Chaudhry, Z. and Scully, C. 1998. Dental Manpower: many questions, weak data and inadequate answers. *British Dental Journal* 184(9), pp. 432 - 536.

Chisholm, L. 2005. The Making of South Africa's National Curriculum Statement *Journal of Curriculum Studies* 37(2), pp. 193–208.

Christian, C. G. 2000. Ethics and Politics in Qualitative Research. In: Denzin, N.K. and Lincoln, Y.S. eds. *Handbook of Qualitative Research.* Thousand Oaks, Calif: Sage.

Cinotti, W. R., Saporito, R. A., Feldman, C. A., Mardirossian, G. and DeCastro, J. 1999. Community-Based Dental Programs: University of Medicine and Dentistry of New Jersey-New Jersey Dental School. *Journal of Dental Education* 63(12), pp. 969-975.

Clancy, J. M. , Lindquist, T. J. , Palik, J. F. and Johnson, L. A. 2002a. A Comparison of Student Performance in a Simulation Clinic and a Traditional Laboratory Environment: three-year results. *Journal of Dental Education* 66(12), pp. 1331-1337.

Clancy, J. M. , Lindquist, T. J. , Palik, J. F. and Johnson, L. A. 2002b. A Comparison of Student Performance in a Simulation Clinic and a Traditional Laboratory Environment: three-year results. *Journal of Dental Education* 66(12), pp. 1331-1337.

Clark, D. M. , Oyen, O. J. and Feil, P. 2001. The use of Specific Dental School-Taught Restorative Techniques by Practicing Clinicians. *Journal of Dental Education* 65(8), pp. 760-765.

Clitter, C. 1997. New Undergraduate Curriculum Requirements from the General Dental Council. *General Dental Practitioner* 9(4), pp. 14 -15.

Coffey, A. and Atkinson, P. 1996. *Making Sense of Qualitative Data: Complementary Research Strategies*. Thousand Oaks Ca: Sage.

Coffey, A. , Holbrook, B. and Atkinson, P. 1996. Qualitative Data Analysis: Technologies and Representations.*Sociological Research Online*.

Coffey, A. J. 1993. *Double Entry: the professional and organizational socialization of graduate accountants.* Ph.D, UWCC.

Cohen-Schotanus, J., Muijtjens, A. M. M., Scho¨nrock-Adema, J., Geertsma, J. and van der Vleuten, C. P. M. 2008. Effects of Conventional and Problem-Based Learning on Clinical and General Competencies and Career Development *Medical Education :* 42 pp. 256-265.

Cohen, L. , Manion, L. and Morrison, K. 2000. *Research Methods in Education.* 5th ed. London: Routledge.

Cohen Mm, Jr. 2002. Major Long-term Factors Influencing Dental Education in the Twenty-First Century. *Journal of Dental Education* 66(3), pp. 360-373.

Colditz, G. A. and Sheehan, M. 1982. The Impact of Instructional style on the Development of Professional Characteristics. *Medical Education* 16(3), pp. 127 - 132.

Colliver, J. A. 2000. Effectiveness of Problem-based Learning Curricula: Research and theory *Academic Medicine* 7 5(3), pp. 259–266.

Collura, M. A. , Aliane, B. , Daniels, S. and Nocito-Gobel, J. 2004. Development of Multidisciplinary Engineering Foundation Spiral *Proceedings of the 2004 American Society for Engineering Education Annual Conference and Exposition* Salt Lake City, Utah: American Society for Engineering Education.

Conny, D. J. 1994. Competencies for Preclinical and Didactic Courses. *Journal of Dental Education* 58(5), pp. 346 - 348.

Cooke, B. E. D. 1997. *The History of the University of Wales Dental School from 1961 until 1982.* Cardiff: B.E.D. Cooke.

Cooke, H. 1993. Boundary Work in the Nursing Curriculum: the case of sociology. *Journal of Advanced Nursing* 18, pp. 1990 - 1998.

Cookson, P. W. 1994. The Power Discourse: Elite Narratives and Educational Policy Formation. In: Walford, G. ed. *Researching the Powerful in Education.* London: UCL Press.

Cookson, P. W. and Persell, C. H. 1995. Knowledge for Power's Sake: Bernstein's theoretical contributions to the elite education. In: Sadovnik, A.R. ed. *knowledge and Pedagogy: the sociology of Basil Bernstein.* Westport, Conn.: Ablex, pp. 281 - 293.

Cooper, B. 1998. Using Bernstein and Bourdieu to Understand Children's Difficulties with "Realistic" Mathematics Testing: an exploratory study. *Qualitative Studies in Education* 11(4), pp. 511 - 532.

Cooper, B. and Dunne, M. 1998. Anyone for Tennis? social class difference in children's response to national curriculum mathematics. *Sociological Review*, pp. 115 - 148.

Cornbleth, C. 1990. *Curriculum in Context.* London: Falmer

Cornford, I. R. 1997. Ensuring Effective Learning from Modular Courses: a cognitive psychology-skill learning perspective. *Journal of Vocational Education and Training* 49(2), pp. 237 - 251.

Costa, V. B. 1997. Honours Chemistry: high-status knowledge or knowledge about high status? *Journal of Curriculum Studies* 29(3), pp. 289–313.

Crawford, J. M., Adami, G., Johnson, B. R., Knight, G. W., Knoernschild, K., Obrez, A., Patston, P. A., Punwani, I., Zaki, A. M. and Licari, F. W. 2007. Curriculum Restructuring at a North American Dental School: Rationale for Change. *Journal of Dental Education* 71(4), pp. 524-531.

Crespo, K. E., Torres, J. E. and Recio, M. E. 2004. Reasoning Process Characteristics in the Diagnostic Skills of Beginner, Competent, and Expert Dentists. *Journal of Dental Education* 68(12), pp. 1235-1244.

Daley, G. T. 1985. Presidential Address Delivered at the Annual and Scientific Meeting of the British Dental Association. *British Dental Journal* 159, pp. 1 -2.

Dalrymple, K. R., Wuenschell, C., Rosenblum, A., Paine, M., Crowe, D., von Bergmann, H. C., Wong, S., Bradford, M. S. and Shuler, C. F. 2007. PBL Core Skills Faculty Development Workshop 1: An Experiential Exercise with the PBL Process. *Journal of Dental Education* 71(2), pp. 249-259.

Dalton, L. M. , Routley, G. K. and Peek, K. J. 2008. Rural Placements in Tasmania: do experiential placements and background influence undergraduate health science student's attitudes toward rural practice? . *Rural and Remote Health* [Online] 8(3). Available at: http://www.rrh.org.au/articles/subviewnew.asp?ArticleID=962 [Accessed: 03/11/2008].

Daugherty, R. and Elfed-Owens, P. 2003. A National Curriculum for Wales: a case study of education policy-making in the era of administrative devolution *British Journal of Educational Studies* 51 (3), pp. 233 - 253.

Davidson, P. L., Carreon, D. C., Baumeister, S. E., Nakazono, T. T., Gutierrez, J. J., Afifi, A. A. and Andersen, R. M. 2007. Influence of Contextual Environment and Community-Based Dental Education on Practice Plans of Graduating Seniors. *Journal of Dental Education* 71(3), pp. 403-418.

Davies, J. R. and Warfvinge, G. 2003. Basic Biology Integration - the Malmo model. *European Journal Dental Education* 7(2), pp. 94-94.

Davis, M. H. and Harden, R. M. 2003. Planning and implementing an undergraduate medical curriculum: the lessons learned. *Medical Teacher* 25(6), pp. 596-608.

Davis, P. 1981. The Social Sciences and Dentistry: current influence and future opportunity. *Social Science & Medicine. Part A: Medical Sociology* 15(3, Part 2), pp. 387-395.

DeCastro, J. E., Matheson, P. B., Panagakos, F. S., Stewart, D. C. and Feldman, C. A. 2003. Alumni Perspectives on Community-Based and Traditional Curricula. *Journal of Dental Education* 67(4), pp. 418-426.

Dederich, D. N., Lloyd, P. M., Dixon-Farmer, C., Geurink, K. V., Nadershahi, N. A., Robinson, F. G. and Scannapieco, F. A. 2004. Perceptions of Dental Schools from Within and Outside the University. *Journal of Dental Education* 68(11), pp. 1163-1171.

Delamont, S. 1989. *Knowledgeable Women: Structuralism and the reproduction of elites*. London: Routledge.

Delamont, S. 2002. *Fieldwork in Educational Settings: Methods, pitfalls and perspectives*. Second ed. London: Routledge.

Delamont, S. , Atkinson, P. and Parry, O. 2000. *The Doctoral Experience: success and failure in graduate school*. London: Falmer.

Dental Sedation Teachers Group 1999. *Sedation in Dentistry: undergraduate training: guidelines for Teachers*. London: Dental Sedation Teachers Group.

Denzin, N. K. and Lincoln, Y. S. 2000. The Discipline and Practice of Qualitative Research. In: Denzin, N.K. and Lincoln, Y.S. eds. *Handbook of Qualitative Research.* Thousand Oaks: Sage.

DePaola, D., Howell, H., Baker, C. G., Boy-Lefevre, M. L., Hull, P., Holmstrup, P., Jerolimov, V., Hardwick, K., Lamster, I. B., Lopez, N. J. and Rifkin, B. 2002. 1.4 Research and the Dental Student. *European Journal of Dental Education* 6(s3), pp. 45-51.

DePaola, D. P. and Slavkin, H. C. 2004. Reforming Dental Health Professions Education: A White Paper. *Journal of Dental Education* 68(11), pp. 1139-1150.

Department of Health 2002. NHS Dentistry: options for change. London: Department of Health, pp. 47-58.

Derringer, K. A. 2004. Undergraduate Orthodontic Teaching in UK Dental Schools. *British Dental Journal* 197(4), pp. 224 - 232.

Dharamsi, S. , Pratt, D. D. and MacEntee, M. I. 2007. How Dentists Account for Social Responsibility: Economic imperatives and professional obligations. *Journal of Dental Education* 71(12), pp. 1583-1592.

DHSS 1981. *Towards Better Dental Health: guidelines for the future. The report of the Dental Strategy Review Group* London: Great Britain Department of Health and Social Security.

DHSS 1983. *Dental Manpower: Report of the Departmental Study Group on Dental Manpower*. London: Department of Health and Social Security.

DHSS 1986. *Report of the Committee of Enquiry into Unnecessary Dental Treatment.* London: Department of Health and Social Security.

DHSS 1987. *Dental Manpower*. London: Department of Health and Social Security.

DiBiasio, D., Clark, W. M., Dixon, A. G., Comparini, L. and O'Connor, K. 1999. Evaluation of a Spiral Curriculum for Engineering *29th ASEE/IEEE Frontiers in Education Conference* San Juan, Puerto Rico.

Doig, K. and Werner, E. 2000. The Marriage of a Traditional Lecture-Based Curriculum and Problem-Based Learning: are the offspring vigorous? *Medical Teacher* 22(2), pp. 173 - 178.

Dolmans, D. H. J. M., Gijselaers, W. H., Moust, J. H. C., de Grave, W. S., Wolfhagen, I. H. A. P. and van der Vleuten, C. P. M. 2002. Trends in Research on the Tutor in Problem-Based Learning: conclusions and implications for educational practice and research *Medical Teacher* 24 (2), pp. 173 - 180.

Donaldson, J. A. 1979. The Association and Dental Legislation. In: BDA ed. *The Advances of the Dental Profession: A centenary history 1880 - 1980.* Brighton: Southern Publishing.

Dooley, K. 2004. Pedagogy in Diverse Secondary School Classes: Legacies for higher education. *Higher Education* 48, pp. 231-252.

Douglass, C. W. and Sheets, C. G. 2000. Patient 's Expectations for Oral Health Care in the 21st Century. *Journal of American Dental Association* 131, pp. 3S - 7S.

Dowding, T. J. 1993. The Application of a Spiral Curriculum Model to Technical Training Curricula. *Educational Technology* 33(2), pp. 18 - 28.

Drake, S. M. 1991. How Our Team Dissolved the Boundaries. *Educational Leadership* 49(2), pp. 20 - 22.

Dreyer, W. P. 1989. Dental Education Trends in Africa with Special Reference to Southern Africa. *International Journal of Dental Education* 39, pp. 211 - 215.

Dreyfus, H. 2001. How Far Is Distance Learning From Education? *Bulletin of Science Technology Society* 21(3), pp. 165-174.

Dreyfus, H. L. and Dreyfus, S. E. 1986. *Mind Over Machine: the power of human intuition and expertise in the era of the computer*. New York: The Free Press, p. 231.

Dreyfus, S. E. 2004. The Five-Stage Model of Adult Skill Acquisition. *Bulletin of Science Technology Society* 24(3), pp. 177-181.

Dreyfus, S. E. and Dreyfus, H. L. 1980. A Five-Stage Model of the Mental Activities Involved in Directed Skill Acquisition.Berkeley: University of California, Berkeley p. 18.

Dunbabin, J. and Levitt, L. 2003. Rural Origin and Rural Medical Exposure: Their impact on the rural and remote medical workforce in Australia. *Rural and Remote Health* [Online] 3. Available at: http://www.rrh.org.au/publishedarticles/article_print_212.pdf [Accessed: 03/10/2008].

Dussault, G. and Sheiham, A. 1982. Medical Theories and Professional Development: The theory of focal sepsis and dentistry in early twentieth century Britain *Social Sciences and Medicine* 16 pp. 1405 - 1412

Eason, H. L. 1938. Dental Education and Practice. *Lancet* 232(6006), pp. 861 - 862.

Eaton, K., de Vries, A. J., Widstro¨m, E., Gait, T. C., Bedi, R., Meyers, I., Feldman, C. A. and Hobson, R. 2006. 'Schools Without Walls?' Developments and challenges in

dental outreach teaching – report of a recent symposium. *European Journal of Dental Education* 10, pp. 186 - 191.

Eaton, K. A., Adamidis, J. P., Mcdonald, J. P., Seeholzer, H. and Siaminska-Piekarczyk, B. 2000. Suggested Guidelines for the Provision and Assessment of Orthodontics Education in Europe: A Report from the Professional Developemnt Group of Euro-Qual Biomed II Project. *Journal of Orthodontics* 27(4), pp. 349 - 351.

Edgren, G. 2006. Developing a Competence-Based Core Curriculum in Biomedical Laboratory Science: a Delphi study. *Medical Teacher* 28(5), pp. 409 - 417.

Ekman, B. 2007. Catastrophic Health Payments and Health Insurance: Some counterintuitive evidence from one low-income country. *Health Policy* 83(2-3), pp. 304-313.

Elkind, A. 2002. Outreach Teaching: is this the future for dental education? *British Dental Journal* 193(2), pp. 111 - 112.

Elkind, A., Blinkhorn, A., Watts, C. and Harvey, L. 2003. Developing Dental Education In Primary Care: report of the first year of a pilot outreach course in restorative dentistry. Manchester: University Dental Hospital of Manchester.

Elkind, A., Potter, C., Watts, C., Blinkhorn, F., Duxbury, J., Hull, P. and Blinkhorn, A. S. 2005. Patients Treated by Dental Students in Outreach: the first year of a pilot project *European Journal of Dental Education* 9, pp. 49 - 52.

English, I. 1993. Intuition as a Function of the Expert Nurse: a critique of Benner's novice to expert model. *Journal of Advanced Nursing* 18, pp. 387 - 393.

Enwonwu, C. O. 1981. Review of Oral Diseases in Africa and the Influence of Socioeconomic Factors. *International Dental Journal* 31(1), pp. 29 - 38.

Enwonwu, C. O. 1988. Societal Expectations for Oral Health: response of the dental care system in Africa. *Journal of Public Health Dentistry* 48(2), pp. 84-93.

Enwonwu, C. O. 2002. Oral Health Research Priorities in the African Region. In: *WHO Consultative Meeting: New Approach to Oral Health Training, Research & Education* Cape Town, South Africa, Tuesday 23rd to Friday 26th April 2002 African Oral Health Association,

Erevelles, N. 2005. Understanding Curriculum as Normalizing Text: disability studies meet curriculum theory. *Journal of Curriculum Studies* 37(4), pp. 421–439.

European Society of Endodontology 2001. Undergraduate Curriculum Guidelines for Endodontology. *International Endodontics Journal* 34, pp. 574 - 580.

Falk-Nilsson, E., Walmsley, D., Brennan, M., Fournier, D. M., Junfin Glass, B., Haden, K., Kersten, H., Neumann, L., Lian, G. O. H. and Petersson, K. 2002. 1.2 Cognition and Learning. *European Journal of Dental Education* 6(s3), pp. 27-32.

Fealy, G. M. 2002. Aspects of Curriculum Policy in Preregistration Nursing Education in the Republic of Ireland: issues and reflections. *Journal of Advanced Nursing* 37(6), pp. 558-565.

Fenesy, K. E. and DeCastro, J. E. 2008. A Predental School Experience to Expose Potential Applicants to Dental School and the Dental Profession. *Journal of Dental Education* 72(5), pp. 593-599.

Ferrillo, P., Jonas, I., Gundersen, S., Jones, M., Whitehouse, N., Wierzbicka, M., Wochna-Sobanska, M., Mario, C., Yen, E., Boari, A. and Frithiof, L. 2002. 3.3 Human Resource Management. *European Journal of Dental Education* 6(s3), pp. 107-114.

Fetterman, D. M. 1998. *Ethography: step by step.* 2nd ed. London: Sage.

Fiehn, N. E. 2002. Perspectives on Dental Education in the Nordic Countries. *Journal of Dental Education* 66(12), pp. 1374-1380.

Fincham, A. G. and Shuler, C. F. 2001. The Changing Face of Dental Education: the impact of PBL. *Journal of Dental Education* 65(5), pp. 406-421.

Fogarty, R. 1991. Ten Ways to Integrate Curriculum. *Educational Leadership* 49(2), pp. 61 - 65.

Fonseca, R. 1995. The Challenge to Dental Education: educating dentists for the future. In: Lopez, N. and Berthold, P. eds. *International Collaboration in Dental Education: Facing the Challenge of Providing Adequate Access to Oral Health Care.* Philadelphia: University of Pennsylvania.

Formicola, A. J. 1984. Educational Goals versus Patient Needs. *Journal of Dental Education* 48(6 (supplement)), pp. 20 - 24.

Formicola, A. J. 1991. The Dental Curriculum: The interplay of pragmatic necessities, national needs, and educational philosophies in shaping its future. *Journal of Dental Education* 55, pp. 358 - 364.

Fowler, F. C. and Poetter, T. S. 2004. Framing French Success in Elementary Mathematics: policy, curriculum, and pedagogy. *Curriculum Inquiry* 34(3), pp. 283-314.

Fry, H. , Hector, M. P. , Hardie, J. M. and Larkin, K. E. 1998. Evolution of the Curriculum at One London Dental School: An Interim Account. *Journal Dental Education* 62(9), pp. 709-713.

Fyrenius, A. , Bergdahl, B. and Silén, C. 2005. Lectures in Problem-based Learning - Why, when and how? An example of interactive lecturing that stimulates meaningful learning. *Medical Teacher,* 27(1), pp. 61 - 65.

Gaengler, P., de Vries, J., Akota, I., Balciuniene, I., Berthold, P., Gajewska, M., Johnsen, D., Urtane, I., Walsh, L. and Zijlstra, A. 2002. 1.1 Student Selection and the Influence of their Clinical and Academic Environment on Learning. *European Journal of Dental Education* 6(s3), pp. 8-26.

Gaengler, P. , Leous, L. and Agievceva, S. 2002. The Positive Tendency in Approaches to the Dental Curriculum in Belarus: a report arising from a WHO-

sponsored visitation to schools in the former USSR and Eastern Europe. *European Journal of Dental Education.* 6, pp. 45-47.

Gallagher, J. , Clarke, W. and Wilson, N. 2008. Understanding the Motivation: a qualitative study of dental students choice of professional career. *European Journal of Dental Education* 12, pp. 89-98.

Garbett, R. and McCormack, B. 2001. The Experience of Practice Development: an exploratory telephone interview study. *Journal of Clinical Nursing* 10(1), pp. 94-102.

Garetto, L. P. and Yoder, K. M. 2006. Basic Oral Health Needs: A Professional Priority? *Journal of Dental Education* 70(11), pp. 1166-1169.

GDC-DentEd 2003. *Dental Education Accreditation and Convergence: GDC-DentEd Report of the Meeting at General Dental Council* London GDC-DentED.

Gehrke, N. J. 1998. A Look at Curriculum Integration from the Bridge *Curriculum Journal* 9 (2), pp. 247 - 260.

General Dental Council 1963. *Recommendations Concerning the Dental Curriculum.* London: General Dental Council.

General Dental Council 1972. *Implications for Dentistry of the Recommendations of the Royal Commission on Medical Education and Related Questions.* London: General Dental Council.

General Dental Council 1980. *Recommendations Concerning the Dental Curriculum.* London: General Dental Council.

General Dental Council 1985. *Recommendations Concerning the Dental Curriculum.* London: General Dental Council.

General Dental Council 1990. *Recommendations Concerning the Dental Curriculum.* London: General Dental Council.

General Dental Council 1997. *The First Five Years: the undergraduate dental curriculum*. First ed. London: GDC.

General Dental Council 2002. *The First Five Years: A Framework for Undergraduate Dental Education*. Second ed. London: GDC.

General Dental Council. 2005. *The Education Committee* [Online]. London: GDC. Available at: www.gdc-uk.org/about+us/How+we+work/Education+Committee [Accessed: 27 May 2006].

General Medical Council 1997. *Student Health and Conduct, Protecting Patients and Guiding Doctors*. London: General Medical Council.

General Medical Council 2003. *Tomorrow's Doctors: Recommendations on undergraduate medical education*. London: GMC.

Genn, J. M. 2001. AMEE Medical Education Guide No. 23 (Part 1): Curriculum, environment, climate, quality and change in medical education—a unifying perspective *Medical Teacher* 23(4), pp. 337 - 344.

Gerrow, J. D. , Murphy, H. J. and Boyd, M. A. 2006. Competencies for the Beginning Dental Practitioner in Canada: A validity survey. *Journal of Dental Education* 70(10), pp. 1076-1080.

Gerzina, T. M. , McLean, T. and Fairley, J. 2005. Dental Clinical Teaching: Perceptions of Students and Teachers. *Journal of Dental Education* 69(12), pp. 1377-1384.

Giddon, D. B. 2006. Why Dentists Should Be Called Oral Physicians Now. *Journal of Dental Education* 70(2), pp. 111-114.

Giddon, D. B. and Assael, L. A. 2004. Should Dentists Become 'Oral Physicians'?: Yes, dentists should become 'oral physicians.' *Journal of American Dental Association* 135(4), pp. 438-449.

Gilbert, G. N. and Mulkay, M. 1984. *Opening Pandora's Box: A sociological analysis of scientists' discourse* Cambridge: Cambridge University Press

Gillham, B. 2000. *The Research Interview* London: Continuum.

Glassman, P. and Chambers, D. W. 1998. Developing Competency Systems: a never-ending story. *Journal of Dental Education* 62(2), pp. 173-182.

Goldon, J. 2004. Trends to Curriculum Change: a global view. In: *30th ADEE Conference.* Cardiff, 2 - 4 September 2004. ADEE,

Goldstein, K. 2002. Getting in the Door: sampling and completing elite interviews. *Political Science and Politics* 35(4), pp. 669 - 672.

Gordon, N. 2007. Oral Health Care for Children Attending a Malnutrition Clinic in South Africa. *International Journal of Dental Hygiene* 5(3), pp. 180-186.

Grace, G. 1995. Theorizing Social Relations within Urban Schooling: a socio-historical analysis. In: Atkinson, P. , Davies, P. and Delamont, S. eds. *Discourse and Reproduction, Essays in Honor of Basil Bernstein.* Cresskill, NJ: Hampton Press, pp. 209 - 227.

Grant, J. 2006. *Principles of Curriculum Design.* Edinburgh: ASME.

Gray, D., Griffin, C. and Nasta, T. 2000. *Training to Teach in Further and Adult Education.* Cheltenham: Stanley Thornes.

Guba, E. G. and Lincoln, Y. S. 2005. Paradigmatic Controversies, Contradictions, and Emerging Confluencies. In: Denzin, N.K. and Lincoln, Y.S. eds. *The Sage Handbook of Qualitative Research.* Third ed. Thousand Oaks: Sage, pp. 191 - 215.

Haas, J. and Shaffir, W. 1987. *Becoming Doctors.* Greenwich CT: JAI Press.

Haden, N. K., Catalanotto, F. A., Alexander, C. J., Bailit, H., Battrell, A., Broussard, J., Jr., Buchanan, J., Douglass, C. W., Fox, C. E. [r.], Glassman, P., Lugo, R. I., George,

M., Meyerowitz, C., Scott, E. R. [n.], Yaple, N., Bresch, J., Gutman-Betts, Z., Luke, G. G., Moss, M., Sinkford, J. C., Weaver, R. G. and Valachovic, R. W. 2003. Improving the Oral Health Status of all Americans: roles and responsibilities of academic dental institutions: the report of the ADEA President's Commission. *Journal of Dental Education* 67(5), pp. 563-583.

Haden, N. K., Morr, K. E. and Valachovic, R. W. 2001. Trends in Allied Dental Education: an analysis of the past and a look to the future. *Journal of Dental Education* 65(5), pp. 480-495.

Hafferty, F. W. and Light, D. W. 1995. Professional Dynamics and the Changing Nature of Medical Work. *Journal of Health and Social Behavior* 35(Extra Issue), pp. 132 - 153.

Hallissey, J., Hannigan, A. and Ray, N. 2000. Reasons for Choosing Dentistry as a Career - a survey of dental students attending a dental school in Ireland during 1998-99. *European Journal of Dental Education* 4(2), pp. 77-81.

Hamilton, D. 2001. The Disenchanted Curriculum *Pedagogy, Culture and Society* 9 (3), pp. 301 - 305.

Hammersley, M. and Atkinson, P. 1995. *Ethnography: principles in practice*. 2nd ed. London: Routledge.

Hampshire 1998. Providing Early Clinical Experience in Primary Care. *Medical Education* 32(5), pp. 495-501.

Harden, R. M. 1998. Integrated Teaching - What Do We Mean? A proposed taxonomy *Medical Education* 32(2), pp. 216 - 217.

Harden, R. M. 2000. The Integration Ladder: a tool for curriculum planning and evaluation. *Medical Education* 34(7), pp. 551-557.

Harden, R. M. 2002a. Developments in Outcome-Based Education. *Medical Teacher* 24, pp. 117-120.

Harden, R. M. 2002b. Learning Outcomes and Instructional Objectives: is there a difference? *Medical Teacher* 24, pp. 151-155.

Harden, R. M. and Davis, M. H. 1998. The Continuum of Problem-Based Learning *Medical Teacher* 20(4), pp. 317 - 322.

Harden, R. M., Sowden, S. and Dunn, W. R. 1984. Educational Strategies in Curriculum Development: the SPICES model. *Medical Education* 18(4), pp. 284 - 297.

Harden, R. M. and Stamper, N. 1999. What is a Spiral Curriculum? *Medical Teacher* 21(2), pp. 141 - 143.

Harding, G. and Gantley, M. 1998. Qualitative methods: beyond the cookbook. *Fam. Pract.* 15(1), pp. 76-79.

Hargreaves, A. 1981. Contrastive Rhetoric and Extremist Talk: Teachers hegemony and the educationist context. In: Barton, L. and Walker, S. eds. *Schools, Teachers and Teaching*. Lewes: Falmer Press, pp. 303 - 329.

Hargreaves, A. 1984. Experience Counts, Theory Doesn't: How Teachers Talk About Their Work. *Sociology of Education* 57(4), pp. 244-254.

Hargreaves, A., Earl, L., Moore, S. and Manning, S. 2001. *Learning to Change: Teaching beyond subjects and standards*. San Francisco: Jossey-Bass.

Hargreaves, A., Earl, L. and Ryan, J. 1996. *Schooling for Change: Reinventing education for early adolescents*. London: Falmer Press.

Harris, R., Kelly, D., Hunt, J. A., Plant, H., Kelley, K., Richardson, A. and Sitzia, J. 2008. Accessing Elite Nurses for Research: reflections on the theoretical and practical issues of telephone interviewing. *Journal of Research in Nursing* 13(3), pp. 236-248.

Hendricson, W. D., Anderson, E., Andrieu, S. C., Chadwick, D. G., Cole, J. R., George, M. C., Glickman, G. N., Glover, J. F., Goldberg, J. S., Haden, N. K.,

Kalkwarf, K. L., Meyerowitz, C., Neumann, L. M., Pyle, M., Tedesco, L. A., Valachovic, R. W., Weaver, R. G., Winder, R. L. and Young, S. K. 2007. Does Faculty Development Enhance Teaching Effectiveness? *Journal of Dental Education* 71(12), pp. 1513-1533.

Hendricson, W. D. and Cohen, P. A. 2001. Oral Health Care in the 21st Century: Implications for dental and medical education. *Academic Medicine* 76(12), pp. 1181-1206.

Hendricson, W. D. and Kleffner, J. H. 1998. Curricular and Instructional Implications of Competency-based Dental Education. *Journal Dental Education* 62(2), pp. 183 - 196.

Hendricson, W. D. and Kleffner, J. H. 2002. Assessing and Helping Challenging Students: Part One, Why do some students have difficulty learning? *Journal of Dental Education* 66(1), pp. 43-61.

Hennequin, M., Tubert, S., Devillers, A., Muller, M., Michailesco, P., Peli, J. F. and Pouezat, J. 2002. Socio-economic and Schooling Status of Dental Undergraduates from six French Universities. *European Journal of Dental Education* 6(3), pp. 95-103.

Henzi, D., Davis, E. , Jasinevicius, R. and Hendricson, W. 2007. In the Students' Own Words: What Are the Strengths and Weaknesses of the Dental School Curriculum? *Journal of Dental Education* 71(5), pp. 632-645.

Heo, S.-M., Kim, K. J., Kawamura, M. and Komabayashi, T. 2004. Comparison of the Dental Education Systems in Korea and Japan *International Dental Journal* 54(2), pp. 70 - 72.

Hietala, E.-L., Karjalainen, A. and Raustia, A. 2004. Renewal of the Clinical-Phase Dental Curriculum to Promote Better Learning at the University of Oulu. *European Journal of Dental Education* 8, pp. 120 - 126.

Hindley-Smith, D. 1970. The General Dental Council: Its Origins, Purpose and Functions. *British Dental Journal* 128, pp. 345 - 349, 411 - 414.

Hindley-Smith, D. 1981. The General Dental Council: twenty-five years on. *British Dental Journal* 151, pp. 31 - 32.

Hitchcock, M. A. and Mylona, Z.-H. E. 2000. Teaching Faculty To Conduct Problem-Based Learning. *Teaching and Learning in Medicine* 12(1), pp. 52 - 57.

Hjortsberg, C. A. and Mwikisa, C. N. 2002. Cost of Access to Health Services in Zambia. *Health Policy and Planning* 17(1), pp. 71 - 77.

Hoad-Reddick, G. and Theaker, E. 2003. Providing Support for Problem-Based Learning in Dentistry: the Manchester experience. *European Journal of Dental Education* 7(1), pp. 3-12.

Hoadley, U. 2003. Time to Learn: pacing and the external framing of teachers' work *Journal of Education for Teaching* 29(3), pp. 265 - 274.

Hobdell, M. 1995. The Role of Education in Providing Access to Oral Health Care. In: Lopez, N. and Berthold, P. eds. *International Collaboration in Dental Education: Facing the Challenge of Providing Adequate Access to Oral Health Care.* Philadelphia: University of Pennsylvania., pp. 7 - 33.

Hobdell, M. 2002. New Approaches in Oral Health Training and Education in Africa. In: *WHO Consultative Meeting: New Approach to Oral Health Training, Research & Education* Cape Town, South Africa, Tuesday 23rd to Friday 26th April 2002 African Oral Health Association,

Hobdell, M., Mante, F., Finau, S., Galbally, J., Nash, D., Robison, V., Vianna, R. and Yellowitz, J. 1995a. Aspects of rhe Dental Curriculum that should be Made Responsive to Social Conditions, Needs and Changes. In: Lopez, N. and Berthold, P. eds. *International Collaboration in Dental Education: Facing the Challenge of Providing Adequate Access to Oral Health Care.* Philadelphia: University of Pennsylvania., pp. 151 - 156.

Hobdell, M., Mante, F., Finau, S., Galbally, J., Nash, D., Robison, V., Vianna, R. and Yellowitz, J. 1995b. Aspects of the Dental Curriculum that should be Made Responsive to Social Conditions, Needs and Changes. In: Lopez, N. and Berthold, P. eds. *International Collaboration in Dental Education: Facing the Challenge of Providing Adequate Access to Oral Health Care.* Philadelphia: University of Pennsylvania., pp. 151 - 156.

Hobdell, M., Sinkford, J., Alexander, C., Alexander, D., Corbet, E., Douglas, C., Katrova, L., Littleton, P., MacCarthy, D., Cherrett, H. M., Schou, L., Wen, F. M. and Zhuan, B. 2002. 5.2 Ethics, Equity and Global Responsibilities in Oral Health and Disease. *European Journal of Dental Education* 6(s3), pp. 167-178.

Hobdell, M. H. 2001. Economic Globalization and Oral Health. *Oral Diseases* 7(3), pp. 137-143.

Hobdell, M. H. and Sheiham, A. 1981. Barriers to the Promotion of Dental Health in Developing Countries. *Social Science & Medicine. Part A: Medical Sociology* 15(6), pp. 817-823.

Hobson, R. S. , Carter, N. E. , Gordon, P. H. and Mattick, C. R. 2004. Undergraduate Orthodontic Teaching in the New Millennium-the Newcastle Model *British Dental Journal* 197(5), pp. 269 - 271.

Hollister, M. C. and Weintraub, J. A. 1993. The Association of Oral Status with Systemic Health, Quality of Life, and Economic Productivity. *Journal of Dental Education* 57(12), pp. 901-912.

Holstein, J. A. and Gubrium, J. F. 2004. Active Interviewing. In: Silverman, D. ed. *Qualitative Research: Theory, Method and Practice.* London: Sage., pp. 140 - 161.

Hunter, M. L., Oliver, R. and Lewis, R. 2007. The Effect of a Community Dental Service Outreach Programme on the Confidence of Undergraduate Students to Treat Children: a pilot study. *European Journal of Dental Education* 11, pp. 10 -13.

Hussain, R. M. R., Mamat, W. H. W., Salleh, N., Saat, R. M. and Harland, T. 2007. Problem-based Learning in Asian Universities. *Studies in Higher Education* 32 (6), pp. 761 - 772.

Institute for International Medical Education 2002. Global Minimum Essential Requirements in Medical Education. *Medical Teacher* 24(2), pp. 130-135.

Inter-Departmental Committee on Dentistry 1946. *Final Report of the Inter-departmental Committee on Dentistry (Teviot Report)*. London: Great Britain Inter-Departmental Committee on Dentistry.

International Insulin Foundation. 2004. *Final Report of the International Insulin Foundation on the Rapid Assessment Protocol for Insulin Access in Zambia* [Online]. London: International Insulin Foundation. Available at: http://www.access2insulin.org/html/zambia_s_health_system.html [Accessed: 27/06/2007].

Jacobsen, B. 1981. Collection Type and Integrated Type curricula in Systems of higher Education: an empirical and theoretical study. *Acta Sociologica* 24(1 - 2), pp. 25 - 41.

Jago, J. D. 1984. To Protect the Public: professionalism vs competence in dentistry. *Social Science & Medicine* 19(2), pp. 117-122.

Japan Dental Association. *The Road to Becoming a Dentist* [Online]. Japan Dental Association. Available at: http://www.jda.or.jp/en/index.html#label3 [Accessed: 20/06/2007].

Jaye, C. 2002. Doing qualitative research in general practice: methodological utility and engagement. *Family Practice* 19(5), pp. 557-562.

Jeboda, S. O. 1997. Dental Education in Africa with Special Reference to Nigeria. *International Dental Journal* 47, pp. 21-.

Jippes, M. and Majoor, G. D. 2008. Influence of National Culture on the Adoption of Integrated and Problem-Based Curricula in Europe. *Medical Education ::* 42, pp. 279-285.

Jira, C. and Kaba, M. 1998. The Jimma Community-Based Training Programme *Education for Health* 11 (2), pp. 165 - 171.

Johnson, J. M. 2001. In-Depth Interviewing. In: Holstein, J.A. and Gubrium, J.F. eds. *Handbook of Interview Research: Context and Methods.* Thousand Oaks CA: Sage, pp. 103 - 119.

Johnson, N. W. , Glick, M. and Mbuguye, T. N. L. 2006. (A2) Oral Health and General Health. *Advances in Dental Research* 19(1), pp. 118-121.

Jones, H. J. 1987. Dental Hospitals and Schools: planning for the future. *Journal of the Royal Society of Medicine* 80, pp. 611 - 614.

Jones, P. W. 1994. Research Perspectives on the World Bank. In: Walford, G. ed. *Researching the Powerful in Education.* London: UCL Press.

Jones, R. and Oswald, N. 2001. A Continuous Curriculum for General Practice? proposals for undergraduate-postgraduate collaboration *British Journal of General Practice* 51 (463), pp. 135 -137.

Jover, M. , Doudoux, D. and Deveaux, E. 2006. Representations of the Dental Surgery Profession and the Motivations Given by Second-Year French Students for Applying for Dental Surgery. *European Journal of Dental Education* 10(1), pp. 2-9.

Kabara, J. J. 1972. Spiral Curriculum. *Journal of Medical Education* 47, pp. 314 - 316.

Kaboru, B. B., Falkenberg, T., Ndubani, P., Höjer, B., Vongo, R., Brugha, R. and Faxelid, E. 2006. Can Biomedical and Traditional Health Care Providers Work Together? Zambian practitioners' experiences and attitudes towards collaboration in relation to STIs and HIV/AIDS care: a cross-sectional study *Human Resources for Health* 4(16).

Kaimenyi, J. T. 2004. Oral Health in Kenya. *International Dental Journal* 54(6 & Supl 1), pp. 378 - 382.

Karibe, H., Suzuki, A., Sekimoto, T., Srithavaj, M. L. T., Iamaroon, A., Warita, S., Kawakami, T., Ogata, K., Shirase, T. and Nakahara, S. 2007. Cross-Cultural Comparison of the Attitudes of Dental Students in Three Countries. *Journal of Dental Education* 71(11), pp. 1457-1466.

Karydis, A. , Komboli-Kodovazeniti, M. , Hatzigeorgiou, D. and Panis, V. 2001. Expectations and Perceptions of Greek Patients Regarding the Quality of Dental Health Care. *International Journal of Quality in Health Care* 13(5), pp. 409-416.

Katz, R. V. 1986. Changing the Curriculum: mirror the times, not the trends. *Journal Dental Education* 50(8), pp. 470 - 473.

Kelle, U. 1995. Theories as Heuristic Tools in Qualitative Research. In: Maso, I. , Atkinson, P.A. , Delamont, S. and Verhoeven, J.C. eds. *Openness in Research: The tension between self and other* Assen: Van Gorgum, pp. 33 - 50.

Kelle, U. 1997. Theory Building in Qualitative Research and Computer Programs for Management of Textual Data. *Sociological Research Online* [Online] 2(2). Available at: http://www.socresonline.org.uk/socresonline/2/2/1.html.

Kelly, A. V. 2004. *The Curriculum: theory and practice*. 5th ed. London: Sage.

Kemahli, S., Dokmeci, F., Palaoglu, O., Aktug, T., Arda, B., Demirel-Yilmaz, E., Karahan, T., Ozyurda, F., Akan, H. and Ayhan, I. H. 2004. How We Derived a Core Curriculum: from institutional to national - Ankara University experience. *Medical Teacher* 26(4), pp. 295 - 298.

Kerosuo, E., Ruotoistenmaki, J. and Murtomaa, H. 2001. Report on the Development of a New Dental Curriculum at Helsinki. *European Journal of Dental Education* 5, pp. 23 - 30.

Kezar, A. 2003. Transformational Elite Interviews: principles and problems. *Qualitative Inquiry* 9(3), pp. 395-415.

Khami, M. R., Murtomaa, H., Jafarian, M., Vehkalahti, M. M. and Virtanen, J. I. 2008. Study Motives and Career Choices of Iranian Dental Students. . *Medical Principles and Practice* 17(3), pp. 221-226.

Kim, M. M., Andrews, R. L. and Carr, D. L. 2004. Traditional versus Integrated Preservice Teacher Education Curriculum: A case study. *Journal of Teacher Education* 55(4), pp. 341-356.

Kim, P.-G. and Marshall, J. D. 2005. Synoptic Curriculum Texts: representation of contemporary curriculum scholarship. *Journal of Curriculum Studies* 37(3), pp. 291–311.

Kirk, D. and MacDonald, D. 2001. Teacher Voice and Ownership of Curriculum Change. *Journal of Curriculum Studies* 33(5), pp. 551 - 567.

Klein, R. 1998. Competence, Professional Self-regulation, and the Public Interest. *British Medical Journal* 316, pp. 1740-1742.

Kozma, R. B. and Russell, J. 1997. Multimedia and Understanding: expert and novice responses to different representations of chemical phenomena *Journal of Research in Science Teaching* 34(9), pp. 949 - 968.

Kuusela, S., Honkala, E., Hausen, H., Rwakatema, D., Gyua, I. and Lampiranta, M. 1993. Opinions of Dental Students in Dar es Salaam (Tanzania) and in Kuopio (Finland) Concerning Studies and Expectations for Future Career. *African Dental Journal;* 7, pp. 20-26.

Kysilka, M. L. 1998. Understanding Integrated Curriculum. *Curriculum Journal* 9(2), pp. 197 - 209.

Lalloo, R., Ayo-Yusuf, O. A. and Yengopal, V. 2008. Early-Phase Dental Students' Motivations and Expectations Concerning the Study and Profession of Dentistry. *Journal of the Dental Association of South Africa* 63(4), pp. 216-220.

Lambert, H. and McKevitt, C. 2002. Anthropology in health research: from qualitative methods to multidisciplinarity. *BMJ* 325(7357), pp. 210-213.

Lancet 1851. The Necessity for a College of Dental Surgery. *Lancet* 58(1463), p. 263.

Lancet 1855. Necessity for a College of Dental Surgery. *Lancet* 66(1669), p. 181.

Lancet 1894. The Curriculum for the Irish Dental Diploma. *Lancet* 143(3693), pp. 1459 - 1460.

Lancet 1911. The Dental Curriculum. *Lancet* 177(4562), pp. 320 - 321.

Lancet 1922. The Profession of Dentistry. *The Lancet* 200(5180), p. 1231.

Lancet 1960. University Hospital of Wales. *Lancet* 275(7136), p. 1245.

Langabeer, J. R., II , Walji, M. F. , Taylor, D. and Valenza, J. A. 2008. Economic Outcomes of a Dental Electronic Patient Record. *Journal of Dental Education* 72(10), pp. 1189-1200.

Lawton, D. 1983. *Curriculum Studies and Educational Planning*. London: Hodder and Stoughton.

Leach, D. C. 2002. Competence is a Habit. *Journal of American Medical Association* 287(2), pp. 243 - 244.

Lennon, M. A., Ireland, R. S., Tappin, J., Ratcliffe, P. M., Taylor, I., Turner, R. and Jenner, A. M. 2004. The Personal Dental Service as a Setting for an Undergraduate Clinical Programme. *British Dental Journal* 196(7), pp. 419 - 422.

Lewis-Payne, J. 1924. Milestones in the History of British Dentistry, 1855-1860, 1877-1880, 1919 and After. *British Dental Journal* XLV(3), pp. 137 - 142.

Lilleker, D. G. 2003. Interviewing the Political Elite: navigating a potential minefield. *Politics* 23(3), pp. 207–214.

Loon, J. V. 2001. Ethnography: A Critical Turn in Cultural Studies. In: Atkinson, P., Coffey, A., Delamont, S., Lofland, J. and Lofland, L. eds. *Handbook of Ethnography.* London: Sage.

Lowndes, P. 1997. The General Dental Practice: the evolution of a discipline. *British Dental Journal* 151, pp. 299 - 303.

Luhanga, C. and Ntabaye, M. 2001. Geriatric Oral Health Issues in Africa: Tanzanian perspective. *Internal Dental Journal* 51(3), pp. 219 - 227.

Malik, A. S. and Malik, R. H. 2004. Core Curriculum and Special Study Modules at the Faculty of Medicine and Health Sciences, Universiti Malaysia Sarawak. *Education for Health* 17(3), pp. 292 - 302.

Marchese, T. J. 1994. Contexts for Competency-Based Curricula in Dental Education. *Journal of Dental Education* 58(5), pp. 339 - 342.

Marino, R. J., Morgan, M. V., Winning, T., Thomson, W. M., Marshall, R. I., Gotjamanos, T. and Evans, W. 2006. Sociodemographic Backgrounds and Career Decisions of Australian and New Zealand Dental Students. *Journal of Dental Education* 70(2), pp. 169-178.

Martinez-Alvarez, C. , Sanz, M. and Berthold, P. 2001. Basic Science Education in the Dental Curriculum in Southern Europe. *European Journal of Dental Education* 5, pp. 63 - 66.

Mascarenhas, A. K., Freilich, S. R., Henshaw, M. M., Jones, J. A., Mann, M. L. and Frankl, S. N. 2007. Evaluating Externship Programs: Impact of program length on clinical productivity. *Journal of Dental Education* 71(4), pp. 516-523.

Masella, R. S. 2006. The Hidden Curriculum: Value Added in Dental Education. *Journal of Dental Education* 70(3), pp. 279-283.

Masella, R. S. 2007. Renewing Professionalism in Dental Education: Overcoming the Market Environment. *Journal of Dental Education* 71(2), pp. 205-216.

Matson, C., Davis, A., Steinkohl, D. C. and Bravo, C. 2001. How Did We Make the Generalist Curriculum Project Work? School-Level Efforts to Facilitate Success *Academic Medicine* 76(4 Suppl.), pp. 31 - 40.

Matsumoto, M., Inoue, K. and Kajii, E. 2008. Characteristics of Medical Students with Rural Origin: implications for selective admission policies. *Health Policy* 87(2), pp. 194-202.

Maudsley, G. 2003. The Limits of Tutors' Comfort Zones with four Integrated Knowledge Themes in a Problem-based Undergraduate Medical Curriculum (Interview study). *Medical Education* 37, pp. 417-423.

Mays, N. and Pope, C. 2000. Qualitative research in health care: Assessing quality in qualitative research. *BMJ* 320(7226), pp. 50-52.

Mayya, S. S., Rao, A. K. and Ramnarayan, K. 2002. Learning Approaches and Learning Difficulties: a comparison of Indian and Nepali dental science students. *Journal of Dental Education* 66(11), pp. 1297-1302.

McCann, A. L., Babler, W. J. and Cohen, P. A. 1998. Lessons Learned from the Competency-Based Curriculum Initiative at Baylor College of Dentistry. *Journal of Dental Education* 62(2), pp. 197-207.

McDowell, L. 1998. Elites in the City of London: some methodological considerations. *Environment and Planning* 30(12), pp. 2133-2146.

McEvoy, J. 2006. Elite Interviewing in a Divided Society: lessons from Northern Ireland *Politics* 26(3), pp. 184 - 191.

McGoldrick, P. and Pine, C. 1999. A Review of Teaching of Behavioural Sciences in the United Kingdom Dental Undergraduate Curriculum. *British Dental Journal* 186 (11), pp. 576 - 580.

McGowan, D. A. 1999. The Development of Dental Schools - An Evolutionary Hypothesis. *Dental Historian* 35, pp. 15 - 19.

McLean, M. 2004. Sustaining Problem-based Learning Reform: advice in hindsight! . *Medical Teacher* 26(8), pp. 726 - 728.

McLean, M. and Van Wyk, J. 2006. Twelve Tips for Recruiting and Retaining Facilitators in a Problem-Based Learning Programme. *Medical Teacher* 28(8), pp. 675 - 679.

Merriam, S. B. 1988. *Case Study in Education: a qualitative approach.* London: Jossey-Bass.

Merton, R. K., Reader, G. and Kendall, P. L. eds. 1957. *The Student Physician.* Cambridge Mass: Harvard University Press.

Miles, M. B. and Huberman, A. M. 1984. *Qualitative Data Analysis : a sourcebook of new methods*. Beverly Hills: Sage.

Miles, M. B. and Huberman, A. M. 1994. *Qualitative Data Analysis: an expanded sourcebook.* 2nd ed. Thousand Oaks, CA: Sage.

Miller, A. P., Schwartz, P. L. and Loten, E. G. 2000. `Systems Integration': a middle way between problem-based learning and traditional courses. *Medical Teacher* 22(1), pp. 51 - 58.

Ministry of Health 1956. *Report of the Committee on Recruitment to the Dental Profession (McNair Report)*. London: Great Britain. Ministry of Health.

Miyatake, Y., Kazama, M., Isoda, M. and Nejima, J. 2004. Internal Medicine Education in Dentistry: knowledge required varies according to dental specialty. *European Journal of Dental Education.* pp. 18-23.

Mizrachi, N., Shuval, J. T. and Gross, S. 2005. Boundary at Work: alternative medicine in biomedical settings. *Sociology of Health & Illness* 27(1), pp. 20-43.

Mojon, P., Thomason, J. M. and Walls, A. W. G. 2004. The Impact of Falling Rates of Edentulism *International Journal of Prosthodontics* 17 (4), pp. 434 - 440

Monajem, S. 2006. Integration of Oral Health into Primary Health Care: the role of dental hygienists and the WHO stewardship. *International Journal of Dental Hygiene* 4(1), pp. 47-51.

Moore, R. 2000. The (Re)organisation Knowledge and Assessment for a Learning Society: the constraints on interdisciplinarity. *Studies in Continuing Education* 22(2), pp. 183 - 199.

Morais, A. 2002. Basil Bernstein at the Micro Level of the Classroom. *British Journal of Sociology of Education* 23(4), pp. 559 - 569.

Morais, A., Neves, I., Davies, B. and Daniels, H. eds. 2001. *Towards a Sociology of Pedagogy: The contributions of Basil Bernstein to research.* New York: Peter Lang.

Morais, A. M., Neves, I. P. and Fontinhas, F. 1999. Is There Any Change in Science Educational Reforms? A sociological study of theories of instruction. *British Journal of Sociology of Education* 20(1), pp. 37-53.

Moreno, J. P. 1991. The New Spanish Curriculum: reasons for change. *International Dental Journal* 41, pp. 309 - 312.

Morris, J. 2003. How Strong is the Case for the Adoption of Problem-based Learning in Physiotherapy Education in the United Kingdom? *Medical Teacher* 25(1), pp. 24 - 31.

Morris, S. 1992. What Kind of People Want to Become Dentists? General Dental Council Recruitment Working Party survey of first year undergraduate dental students. *British Dental Journal* 173(4), pp. 143 - 144.

Mossey, P. 2003. The First Five Years: Dawn of a new era? *British Dental Journal* 194, pp. 350 - 351.

Muhirwe, L. B. 2006. Oral Health in Uganda: the need for change in focus. *International Dental Journal* 56(1), pp. 3 - 6.

Murry, J. J. 2002. Pressures on Dental Education - a personal view. *British Dental Journal* 192(8), pp. 433 - 435.

Murry, J. J., Murry, I. D. and Hill, D. 1995. *Newcastle Dental School and Hospital: an illustrated history1895 - 1995*. Newcastle upon Tyne: Faculty of Medicine, University of Newcastle upon Tyne.

Myburgh, N. 2002. Oral Health Education in Africa. In: *WHO Consultative Meeting: New Approach to Oral Health Training, Research & Education* Cape Town, South Africa, Tuesday 23rd to Friday 26th April 2002 African Oral Health Association,

Nash, D. A. 1995. The Oral Physician... creating a new oral health professional for a new century. *Journal of Dental Education* 59, pp. 587-597.

Nash, D. A. 2006. Why Dentists Should Become Oral Physicians: A Response to Dr. Donald Giddon's "Why Dentists Should Be Called Oral Physicians Now". *Journal of Dental Education* 70(6), pp. 607-609.

Neumann, L. M. 2004. Trends in Dental and Allied Dental Education. *Journal of American Dental Association* 135(9), pp. 1253-1259.

Neves, I. P. and Morais, A. M. 2001a. Knowledge and Values in Science Syllabuses: a sociological study of educational reforms. *British Journal of Sociology of Education* 22(4), pp. 531 - 556.

Neves, I. P. and Morais, A. M. 2001b. Teacher's `Space of Change' in Educational Reforms: a model for analysis applied to a recent reform in Portgual. *Journal of Curriculum Studies* 33(4), pp. 451 - 476.

Neves, I. P. and Morais, A. M. 2001c. Teacher's `Space of Change' in Educational Reforms: a model for analysis applied to a recent reform in Portugal. *Journal of Curriculum Studies* 33 (4), pp. 451- 476.

NHS Education for Scotland 2002. *Competences for Dental Vocational Training and General Professional Training for Scotland.* Edinburgh: NES.

Nicolau, B., Marcenes, W., Bartley, M. and Sheiham, A. 2005. Associations between Socio-economic Circumstances at Two Stages of Life and Adolescents' Oral Health Status. *Journal of Public Health Dentistry* 65(1), pp. 14-20.

Noar, J. H. 1990. Project Teeth Relief: dental aid for rural Zambia. *British Dental Journal* 169(9), pp. 300 - 301.

Noar, J. H. and Portnoy, S. 1991. Dental Status of Children in a Primary and Secondary School in Rural Zambia. *International Dental Journal* 41(3), pp. 142 - 148.

Noble, H. W. 2000. The Struggle for Professionalism in Dentistry.*History of Dentistry Research Group.*

Noonan, A. S. and Evans, C. A. 2003. The Need for Diversity in the Health Professions. *Journal of Dental Education* 67(9), pp. 1030-1033.

Nuffield Foundation 1980. *Dental Education: the report of a committee of inquiry appointed by the Nuffield Foundation.* London: Nuffield Foundation.

Nunn, J., Morris, A. J., Pine, C. M., Pitts, N. B., Bradnock, G. and Steele, J. 2000. The Condition of Teeth in the UK in 1998 and Implications for the Future. *British Dental Journal* 189, pp. 639 - 644.

Nuttal, N. M., Bradnock, G., White, D., Morris, A. J. and Nunn, J. 2001. Dental Attendance in 1998 and Implications for the Future. *British Dental Journal* 190, pp. 177 - 182.

O'Brien, K. 1997. Undergraduate Orthodontic Education: what should we teach rather than what can we teach? *Journal of Orthodontics* 24(4), pp. 333 - 334.

O'Byrne, K. , Clark, R. E. and Malakuti, R. 1997. Expert and Novice Performance: implications for clinical training. *Educational Psychology Review* 9(4), pp. 321 - 332.

O'Neil, P. A. 1994. Competencies: meaning for the overall and clinical dental curriculum. *Journal of Dental Education* 58(5), pp. 349 - 350.

Obermeyer, C. M. 1997. Qualitative Methods: a key to a better understanding of demographic behaviour? . *Population and Development Review.* 23(4), pp. 813 - 818.

Odell, E. W., Farthing, P. M., High, A., Potts, J., Soames, J., Thakker, N., Toner, M. and Williams, H. K. 2004. British Society for Oral and Maxillofacial Pathology UK: minimum curriculum in oral pathology. *European Journal of Dental Education* 8(4), pp. 177 - 184.

Odendahl, T. and Shaw, A. M. 2001. Interviewing Elites. In: Gubrium, J.F. and Holstein, J.A. eds. *Handbook of Interview Research: Context and Method.* Thousand Oaks: Sage, pp. 299 - 316.

Odlum, O. 1995a. Changing the Curriculum can Change the Graduate: insights from a Canadian faculty program for aboriginal communities. In: Lopez, N. and Berthold, P. eds. *International Collaboration in Dental Education: Facing the Challenge of Providing Adequate Access to Oral Health Care.* Philadelphia: University of Pennsylvania., pp. 91 - 95.

Odlum, O. 1995b. A Cooperative Plan that will Address Educational Methods and their Implementation to Increase Access to Oral Health care. In: Lopez, N. and Berthold, P. eds. *International Collaboration in Dental Education: Facing the*

Challenge of Providing Adequate Access to Oral Health Care. Philadelphia: University of Pennsylvania., pp. 157 - 168.

Ogunbodede, E. O. 2004. HIV/AIDS Situation in Africa. *International Dental Journal* 54(6 & Supl 1), pp. 352 - 360.

Oliver, R., Kersten, H., Vinkka-Puhakka, H., Alpasan, G., Bearn, D., Cema, I., Delap, E., Dummer, P., Goulet, J. P., Gugushe, T., Jeniati, E., Jerolimov, V., Kotsanos, N., Krifka, S., Levy, G., Neway, M., Ogawa, T., Saag, M., Sidlauskas, A., Skaleric, U., Vervoorn, M. and White, D. 2008. Curriculum Structure: principles and strategy. *European Journal of Dental Education* 12(s1), pp. 74-84.

Oliver, R., Paganelli, C., Cerny, D., Gravert, C., Klinge, B., Kordass, B., Johnson, L., O'Keefe, J., Onisei, D., Podesta, M. T. C., Schleyer, T. and Spallek, H. 2002. 4.3 Towards a Global Superstore of Quality-assured Modularized Learning Programmes. *European Journal of Dental Education* 6(s3), pp. 147-151.

Ong, G. 2002. A Competency-based Curriculum for the Dental Undergraduate Programme. *CDTLink* 6(1).

Orenuga, O. O. and da Costa, O. O. 2006. Characteristics and Study Motivation of Clinical Dental Students in Nigerian Universities. *Journal of Dental Education* 70(9), pp. 996-1003.

Orpin, P. and Gabriel, M. 2005. Recruiting Undergraduates to Rural Practice: what the students can tell us. . *Rural and Remote Health* [Online] 5 Available at: http://www.rrh.org.au/publishedarticles/article_print_412.pdf [Accessed: 10/11/2008].

Orzack, L. H. 1981. New Profession by Fiat: Italian dentistry and the European common market. *Social Science & Medicine. Part A: Medical Sociology* 15(6), pp. 807-816.

Ostrander, S. A. 1995. "Surely You're Not in This Just to Be Helpful": Access, rapport, and interviews in three studies of elites. In: Hertz, R. and Imber, J.B. eds. *Studying Elites Using Qualitative Methods.* Thousand Oaks: Sage Publications, pp. 133 - 150.

Packer, M. E., Rogers, J. O., Coward, T. J., Newman, P. S. and Wakeley, R. 2001. A Comparison between Videotaped and Live Demonstrations, for the Teaching of Removable Partial Denture Procedures. *European Journal Of Dental Education* 5(1), pp. 17-22.

Patel, L. , Buck, P. , Dornan, T. and Sutton, A. 2002. Child Health and Obstetrics-Gynaecology in a Problem-Based Learning Curriculum: accepting the limits of integration and the need for differentiation. *Medical Education ;* 36, pp. 261-271.

Patel, V. L. , Arocha, J. F. , Branch, T. and Karlin, D. R. 2004. Relationship Between Small Group Problem-Solving Activity and Lectures in Health Science Curricula. *Journal of Dental Education* 68(10), pp. 1058-1080.

Patel, V. L., Arocha, J. F., Chaudhari, S., Karlin, D. R. and Briedis, D. J. 2005. Knowledge Integration and Reasoning as a Function of Instruction in a Hybrid Medical Curriculum. *Journal of Dental Education* 69(11), pp. 1186-1211.

Patel, V. L., Arocha, J. F. and Leccisi, M. S. 2001. Impact of Undergraduate Medical Training on Housestaff Problem-Solving Performance: implications for problem-based curricula. *Journal of Dental Education* 65(11), pp. 1199-1218.

Patton, M. Q. 2002. *Qualitative Research and Evaluation Methods*. 3rd ed. Thousand Oaks Calif.: Sage.

Petersen, P. E. 2004a. Challenges to Improvement of Oral Health in the 21st Century – the approach of the WHO Global Oral Health Programme. *International Dental Journal* 54(6 & Supl 1), pp. 329 - 343.

Petersen, P. E. 2004b. Improvement of Oral Health in Africa in the 21st Century – the role of the WHO Global Oral Health Programme. *Developing Dentistry* 5(1), pp. 9 - 20.

Petersen, P. E. 2006. Policy for Prevention of Oral Manifestations in HIV/AIDS: The Approach of the WHO Global Oral Health Program. *Advances in Dental Research* 19(1), pp. 17-20.

Philips, R. 1998. The Politics of History: some methodological and ethical dilemmas in elite-based research. *British Educational Research Journal* 24(1), pp. 5-19.

Pierce, J. L. 1995. Reflections on Fieldwork in a Complex Organization: lawyers, ethnographic authority, and lethal weapons. In: Hertz, R. and Imber, J.B. eds. *Studying Elites Using Qualitative Methods*. Thousand Oaks: Sage Publications, pp. 94 - 110.

Pine, C. M. and McGoldrick, P. M. 2000. Application of Behavioural Sciences Teaching by UK Dental Undergraduates. *European Journal of Dental Education* 4(2), pp. 49-56.

Plasschaert, A., Boyd, M., Andrieu, S., Basker, R., Beltran, R. J., Blasi, G., Chadwick, B., Chambers, D., Christersson, C., Haddock, F., Kerschbaum, T., Kogon, S., Kovesi, G., Ozer, F., Parkash, H., Villamil, J. E., Vogel, R. I. and Wolowski, A. 2002. 1.3 Development of Professional Competences. *European Journal Dental Education* 6(s3), pp. 33 - 44.

Plasschaert, A. J. M., Holbrook, W. P., Delap, E., Martinez, C. and Walmsley, A. D. 2004. *Profile and Competences for the European Dentist* [Online]. ADEE/DentEd. Available at: http://adee.dental.tcd.ie/ [Accessed: 18 March 2005].

Plasschaert, A. J. M., Lindh, C., McLoughlin, J., Manogue, M., Murtomaa, H., Nattestad, A. and Sanz, M. 2006. Curriculum Structure and the European Credit Transfer System for European Dental Schools: Part I. *European Journal of Dental Education* 10(3), pp. 123 - 130.

Poland, B. D. 2001. Transcription Quality. In: Holstein, J.A. and Gubrium, J.F. eds. *Handbook of Interview Research: Context and Methods.* Thousand Oaks CA: Sage, pp. 629 - 649.

Porter, B. A. and Carr, S. A. 1999. From Strategic Plan to Practical Reality: Developing and Implementing a Zero-Based Accounting Curriculum. *Issues in Accounting Education* 14(4), pp. 565 - 588.

Prescott, L. , Hurst, Y. and Rennie, J. S. 2003. Comprehensive Validation of Competencies for Dental Vocational Training and General Professional Training. *European Journal of Dental Education* 7(4), pp. 154 - 159.

Prince, K. J. A. H. and Boshuizen, H. P. A. 2007. From Theory to Practice in Medical Education: Effect on knowledge application, clinical reasoning and learning. In: Boshuizen, H.P.A. , Bromme, R. and Gruber, H. eds. *Professional Learning: Gaps and transitions on the way from novice to expert.* Vol. 2. Dordrecht: Kluwer Academic Publishers, pp. 121 - 139.

Prior, L. 2003. *Using Documents in Social Research.* London: Sage.

Puranwasi, R. 2006. *The Role of Traditional Healers in Oral Health Care in Kwa-Zulu Natal.* University of the Western Cape.

Quality Assurance Agency 2002. *Subject Benchmark Statements: Dentistry.* Gloucester: Quality Assurance Agency for Higher Education.

Quinn, F. M. 2000. *Principles and Practice of Nurse Education.* 4th ed. Cheltenham: Nelson Thornes.

Rapley, T. J. 2001. The Art(fulness) of Open-ended Interviewing: some considerations on analysing interviews. *Qualitative Research* 1(3), pp. 303-323.

Reddy, J. 2002. The African Context of Health Education and Training In: *WHO Consultative Meeting: New Approach to Oral Health Training, Research & Education* Cape Town, South Africa, Tuesday 23rd to Friday 26th April 2002 African Oral Health Association,

Reed, M. J. 1990. A View from the Field: substantial curriculum reform. *Journal of Dental Education* 54, pp. 560 - 563.

Rees, T. L. 2005a. *Fair and Flexible Funding: a Welsh model to promote quality and access in higher education: final report of an independent study into the devolution of the student support system and tuition fee regime in Wales (The Rees Review). Executive summary*. Cardiff: Department for Education and Training, Welsh Assembly Government.

Rees, T. L. 2005b. *Fair and Flexible Funding: a Welsh model to promote quality and access in higher education: final report of an independent study into the devolution of the student support system and tuition fee regime in Wales (The Rees Review). Main report*. Cardiff: Department for Education and Training, Welsh Assembly Government.

Reeves, J. A. and Francis, S.-A. 2001. A Comparison between Two Methods of Teaching Hospital Pharmacists about Adverse Drug Reactions: Problem-based learning versus a didactic lecture', . *Pharmacy Education, :* 1(1), pp. 25 - 35.

Reid, W. A. 1999. *Curriculum as Institution and Practice: Essays in the Deliberative Tradition*. Mahwah, N.J.: Lawrence Erlbaum.

Richards, D. 1996. Elite Interviewing: approaches and pitfalls. *Politics* 16(3), pp. 199–204.

Richards, D. N. 1979. Hesitant Beginnings: The establishment of the British Dental Association. In: BDA ed. *The Advances of the Dental Profession: A centenary history 1880 - 1980* Brighton: Southern Publishing.

Richards, L. 1990. *Nobody's Home: Dreams and Realities in a New Suburb.* Melbourne: Oxford University Press.

Richards, L. and Richards, T. 1994. From Filing Cabinet to Computer. In: Bryman, A. and Burgess, R.G. eds. *Analyzing Qualitative Data.* London: Routledge.

Riessman, C. K. 1990. *Divorce Talk: women and men make sense of personal relationships* New Brunswick: Rutgers University Press, pp. 695 - 710.

Riessman, C. K. 1993. *Narrative Analysis*. Newbury Park, CA: Sage.

Riessman, C. K. 2001. Analysis of Personal Narratives. In: Holstein, J.A. and Gubrium, J.F. eds. *Handbook of Interview Research: Context and Methods.* Thousand Oaks CA: Sage, pp. 695 - 710.

Robbins, A. 1972. Dental Education in and for Developing Countries. *Journal of Dental Education* 36(11), pp. 33 - 35.

Robins, L. S., White, C. B. and Fantone, J. C. 2000. The Difficulty of Sustaining Curricular Reforms: a Study of "Drift" at one School. *Academic Medicine.* 75(8), pp. 801-805.

Roger-Leroi, V. 2006. French Dental Students' Perception of a Period of Instruction in a Hospital Department. *Journal of Dental Education* 70(3), pp. 307 - 314.

Rogers, B. 1997. Informing the Shape of the Curriculum: new views of knowledge and its representation in schooling. *Journal of Curriculum Studies* 29(6), pp. 683 - 710.

Rohlin, M., Petersson, K. and Svensater, G. 1998. The Malmo Model: a problem-based learning curriculum in undergraduate dental education. *European Journal of Dental Education* 2, pp. 103 - 114.

Rohlin, M., Schaub, R. M. H., Holbrook, P., Leibur, E., Levy, G., Roubalikova, L., Nilner, M., Roger-Leroi, V., Danner, G., Iseri, H. and Feldman, C. 2002. 2.2 Continuous Quality Improvement. *European Journal of Dental Education* 6(s3), pp. 67-77.

Ron, N., Lipshitz, R. and Popper, M. 2006. How Organizations Learn: post-flight review in an F-16 fighter squadron. *Organization Studies* 27(8), pp. 1069 - 1086.

Royal Liverpool Children's Inquiry. 2001. *The Royal Liverpool Children's Inquiry Report* [Online]. London: HMSO. Available at: www.rlcinquiry.org.uk [Accessed: 7th March 2006].

Rubin, H. J. and Rubin, I. S. 1995. *Qualitative Interviewing : The art of hearing data* Thousand Oaks: Sage Publications.

Rubin, R. W. 2004. Developing Cultural Competence and Social Responsibility in Preclinical Dental Students. *Journal of Dental Education* 68(4), pp. 460-467.

Rubin, R. W., Rustveld, L. O. , Weyant, R. J. and Close, J. M. 2008. Exploring Dental Students' Perceptions of Cultural Competence and Social Responsibility. *Journal of Dental Education* 72(10), pp. 1114-1121.

Rudolph, M. J., Chikte, U. M. E., Brand, A. A., Lewis, H. A. and Gilbert, L. 1996. Promotion of Oral Health by the Department of Community Dentistry. *Journal of the Dental Association of South Africa.* 56(12), pp. 741 - 745.

Rymer, S. L. 1855. Necessity for a College of Dental Surgery. *Lancet* 66(1669), p. 181.

Rymer, S. L. 1858. The College of Dentists. *Lancet* 71(1795), p. 100.

Rymer, S. L. 1860. The College of Dentists and the Royal College of Surgeons. *Lancet* 75(1906).

Sadovnik, A. R. ed. 1995. K*nowledge and Pedagogy: the sociology of Basil Bernstein.* Westport, Conn.: Ablex.

Saffran, M. 1973. Biochemistry in the 3-Year Integrated Medical Curriculum at the Medical College of Ohio. *Biochemical Education* 1(3), pp. 50 - 52.

Salter, B. 2000. Changing the Governance of Medicine: The politics of self-regulation. In: Gladstone, D. ed. *Regulating Doctors*. Suffolk: Edmundsbury Press, pp. 8 - 27.

Samarawickrama, D. Y. D., Batchelor, P. A. and Hobdell, M. H. 1998. Developing Appropriate Dental Education Systems: the impact of changes in oral health status and oral health care systems. *International Dental Journal.* 48, pp. 412-416.

Saparamadu, K. D. 1984. Prevention of Oral Diseases in Developing Countries. *International Dental Journal* 34(3), pp. 166 - 169.

Saunders, M. and Machell, J. 2000. Understanding Emerging Trends in Higher Education Curricula and Work Connections. *Higher Education Policy* 13(3), pp. 287-302.

Saunders, T. R. and Dejbakhsh, S. 2007. Problem-based Learning in Undergraduate Dental Education: faculty development at the University of Southern California of Dentistry. *Journal of Prosthodont* 16, pp. 394-399.

Schwartz, M. 2006. For Whom Do We Write the Curriculum? *Journal of Curriculum Studies* 38(4), pp. 449-457.

Schwartz, P. L., Loten, E. G. and Miller, A. P. 1999. Curriculum Reform at the University of Otago Medical School. *Academic Medicine.* 74(6), pp. 675-679.

Scott, J. 1990. *A Matter of Record: Documentary Sources in Social Research.* Cambridge: Polity Press.

Seddon, T. 2001. National Curriculum in Australia? A Matter of Politics, Powerful Knowledge and the Regulation of Learning *Pedagogy, Culture and Society* 9 (3), pp. 307 - 331.

Seelinger, J. E. and Synman, W. D. 1996. A New Approach to Undergraduate Dental Education. *Journal of the Dental Association of South Africa.* 51(12), pp. 746 - 749.

Senior, W. G. 1948. The Development of Social Dental Service. *British Dental Journal* 85, pp. 200 - 204.

Shanley, D. and Nattestad, A. 2002. Introduction: A global congress in dental education. *European Journal of Dental Education* 6(s3), pp. 5-6.

Shaw, D. M. 1916. The Place of Prosthetics in the Dental Curriculum. *Lancet* 187(4818), pp. 46 - 47.

Shelley, P. Q., Johnson, B. R. and BeGole, E. A. 2007. Use of an Electronic Patient Record System to Evaluate Restorative Treatment Following Root Canal Therapy. *Journal of Dental Education* 71(10), pp. 1333-1339.

Shipman Inquiry. 2005. *The Shipman Inquiry: final report (Chair: Smith Janet)* [Online]. London: HMSO. Available at: www.the-shipman-inquiry.org.uk [Accessed: 4th November].

Shuval, J. T. 1995. Elitism and Professional Control in a Saturated Market: immigrant physicians in Israel. *Sociology of Health and Illness* 17(4), pp. 550-565.

Shuy, R. W. 2001. In-Person versus Telephone Interviewing. In: Holstein, J.A. and Gubrium, J.F. eds. *Handbook of Interview Research: Context and Methods.* Thousand Oaks CA: Sage, pp. 537 - 555.

Silverman, D. 2000. *Doing Qualitative Research: A Practical Handbook.* London: Sage.

Silverman, D. 2001. *Interpreting Qualitative Data: Methods for Analysing Talk, Text and Interaction.* Second ed. London: Sage.

Silversin, J. B. , Shafer, S. M. , Sheiham, A. and Smales, F. C. 1975. The Teaching and Practice of some Clinical Aspects of Endodontics in Great Britain. *Journal of Dentistry* 3(2), pp. 77-80.

Silversin, J. B., Shafer, S. M. , Smalesz, F. C. and Sheiham, A. 1978. Time and Methods used for Complete Denture Construction by Dental Students and General Dental Practitioners in Great Britain in 1972. *Journal of Dentistry* 6(3), pp. 196-200.

Simpson, J. G., Furnace, J., Crosby, J., Cumming, A. D., Evans, P. A., Friedman Ben David, M., Harden, R. M., Lloyd, D., McKenzie, H., McLachlan, J. C., McPhate, G. F., Percy-Robb, I. W. and MacPherson, S. G. 2002. The Scottish Doctor-Learning

Outcomes for the Medical Undergraduate in Scotland: a foundation for competent and reflective practitioners. *Medical Teacher* 24(2), pp. 136-143.

Sinclair, S. 1997. *Making Doctors : an institutional apprenticeship*. Oxford: Berg.

Sleeter, C. and Stillman, J. 2005. Standardizing Knowledge in a Multicultural Society *Curriculum Inquiry* 35(1), pp. 27 - 46.

Smith, E. and Cottell, B. 1997. *A History of the Royal Dental Hospital of London and School of Dental Surgery 1858 - 1995*. London: Athlone Press.

Smith, M., Lennon, M. A., Brook, A. H., Ritucci, L. and Robinson, P. G. 2006a. Student Perspectives on their Recent Dental Outreach Placement Experiences. *European Journal of Dental Education* 10, pp. 80 - 86.

Smith, M., Lennon, M. A. , Brook, A. H. and Robinson, P. G. 2006b. Perspectives of Staff on Student Outreach Placements. *European Journal of Dental Education* 10, pp. 44 - 51.

Smith, M. , Lennon, M. A. , Brook, A. H. and Robinson, P. G. 2006c. A Randomized Controlled Trial of Outreach Placement's Effect on Dental Students' Clinical Confidence. *Journal of Dental Education* 70(5), pp. 566-570.

Snyman, W. D. and Kroon, J. 2005. Vertical and Horizontal Integration of Knowledge and Skills - a working model. *European Journal of Dental Education* 9(1), pp. 26-31.

Sofola, O. O., Uti, O. G. and Akpene, O. I. 2008. Does Exposure to Dental Education Change the Perceptions of Nigerian Students to Dentistry as a Profession? *European Journal of Dental Education* 12, pp. 159-162.

Solomon, E., Murray, J., Dodge, W. W., Redding, S. W., Valenza, J. A., Flaitz, C. M., Cole, J. S. and Kalkwarf, K. L. 2006. Scope of Practice Comparison: a tool for curriculum decision making. *Journal of Dental Education* 70(3), pp. 231-245.

South Glamorgan Health Authority 1987. *The Dental School and Hospital at Cardiff.* Cardiff: South Glamorgan Health Authority.

Spielman, A. I., Fulmer, T., Eisenberg, E. S. and Alfano, M. C. 2005. Dentistry, Nursing, and Medicine: A comparison of core competencies. *Journal of Dental Education* 69(11), pp. 1257-1271.

Stacey, M. 2000. The General Medical Council and Professional Self-Regulation. In: Gladstone, D. ed. *Regulating Doctors.* Suffolk: St Edmundsbury Press, pp. 28-39.

Stake, R. E. 2000. Case Studies. In: Denzin, N.K. and Lincoln, Y.S. eds. *Handbook of Qualitative Research.* Thousand Oaks: Sage.

Stengel, B. S. 1997. `Academic Discipline' and `School Subject': contestable curricular concepts. *Journal of Curriculum Studies* 29(5), pp. 585 - 602.

Stenhouse, R. 1975. *An Introduction to Curriculum Research and development.* London: Heinemann.

Stephens, N. 2007. Collecting Data from Elites and Ultra Elites: telephone and face-to-face interviews with macroeconomists. *Qualitative Research* 7 (2), pp. 203-216.

Stirrup, D. and Murray, J. 2002. The General Dental Council Review of the First Five Years. In: *National Meeting of Dental Curriculum Coordinators/Educators* British Dental Association 64 Wimpole Street, London, 20 March 2005. Higher Education Academy,

Stjernquist, M. and Crang-Svalenius, E. 2007. Problem Based Learning and the Case Method-medical students change preferences during clerkship *Medical Teacher* 29(8), pp. 814 - 820.

Stone, D., H 2000. Public Health in the Undergraduate Curriculum - can we achieve integration? *Journal of Evaluation in Clinical Practice* 6(1), pp. 9 - 14.

Strauss, A. and Corbin, J. 1998. *Basics of Qualitative Research: techniques and procedures for developing grounded theory.* 2nd ed. Thousand Oaks: Sage.

Strauss, A. L. 1987. *Qualitative Analysis for Social Scientists.* Cambridge: Cambridge University Press.

Sturman, A. 1994. School Administrative Style and the Curriculum. *Journal of Education Management* 8(4), pp. 16 - 23.

Sweet, J. 2003. Curriculum. In: Sweet, J., Huttly, s. and Taylor, I. eds. *Effective Learning and teaching in Medical, Dental and Veterinary Education.* London: Kogan, pp. 51 - 70.

Sweet, J., Pugsley, L. and Wilson, J. 2008a. Stakeholder Perceptions of Chairside Teaching and Learning in one UK Dental School. *British Dental Journal* 205(9), pp. 499-503.

Sweet, J., Wilson, J. and Pugsley, L. 2008b. Chairside Teaching and the Perceptions of Dental Teachers in the UK. *British Dental Journal* 205 (10), pp. 565-569.

Tabari Khomeiran, R., Yekta, Z. P. , Kiger, A. M. and Ahmadi, F. 2006. Professional Competence: factors described by nurses as influencing their development. *International Nursing Review* 53, pp. 66 - 72.

Taleghani, M., Solomon, E. S. and Wathen, W. F. 2004. Non-Graded Clinical Evaluation of Dental Students in a Competency-Based Education Program. *Journal of Dental Education* 68(6), pp. 644-655.

Teasdale, T. A. and Shaikh, M. 2006. Efficacy of a Geriatric Oral Health CD as a Learning Tool. *Journal of Dental Education* 70(12), pp. 1366-1369.

Tedesco, L. A. 1990. Responding to Educational Challenge with Problem-Based Learning and Information Technology. *Journal of Dental Education* 54, pp. 544 - 547.

Tedesco, L. A. 1995. Issues in Dental Curriculum Development and Change. *Journal of Dental Education* 59(1), pp. 97-147.

Thikkurissy, S., Rowland, M. L., Bean, C. Y., Kumar, A., Levings, K. and Casamassimo, P. S. 2008. Rethinking the Role of Community-Based Clinical Education in Pediatric Dentistry. *Journal of Dental Education* 72(6), pp. 662-668.

Thind, A., Atchison, K. and Andersen, R. 2005. What Determines Positive Student Perceptions of Extramural Clinical Rotations? An Analysis Using 2003 ADEA Senior Survey Data. *Journal of Dental Education* 69(3), pp. 355-362.

Thomson, M. E., Önkal, D., Avcioğlu, A. and Goodwin, P. 2004. Aviation Risk Perception: A Comparison between Experts and Novices. *Risk Analysis* 24, pp. 1585-1595.

Thorpe, S. 2006. Oral Health Issues in the African Region: Current Situation and Future Perspectives. *Journal of Dental Education* 70(11_suppl), pp. 8-15.

Tosteson, D. C., Adelstein, J. S. and Carver, S. T. eds. 1994. *New Pathways to Medical Education: learning to learn at Harvard Medical School.* Cambridge, Mass: Harvard University Press.

Treasure, E. 2004. Dental Workforce Issues in the United Kingdom. *Journal of Dental Education* 68(7_suppl), pp. 23-25.

Tsatsaroni, A., Ravanis, K. and Falaga, A. 2003. Studying the Recontextualisation of Science in Pre-school Classrooms: drawing on Bernstein's insights into teaching and learning practices. *International Journal of Science and Mathematics Education* 1, pp. 385-417.

Tuisuva, J. 1995. Developing a Socially Responsive and Innovative Curriculum:The Fijian model. In: Lopez, N. and Berthold, P. eds. *International Collaboration in Dental Education: Facing the Challenge of Providing Adequate Access to Oral Health Care.* Philadelphia: University of Pennsylvania., pp. 97 - 104.

Tyler, R. 1949. *Basic Principles of Curriculum and Instruction.* Chicago: University of Chicago Press.

Undergraduate Working Party 1999. *Proposals for the Management of the New Curriculum* Cardiff . UWCM, Dental School.

University Grants Committee 1964. *Report of the Committee on University Teaching Methods.* London: Her Majesty's Stationery Office, pp. 1 - 173.

University of Southampton. 2005. *Universities Shortlisted to Establish first Dental School in South East* [Online]. Southampton: University of Southampton Media Centre Available at: http://www.soton.ac.uk/mediacentre/news/2005/jul/05_132.shtml [Accessed: 22 January].

University of Wales College of Medicine 2001. *University of Wales Bachelor of Dental Surgery Framework Document: introduction to a revised dental undergraduate curriculum from academic session 2001/2002* Cardiff UWCM.

University of Zambia 2000. *Strategic Plan-2001 - 2006.* Lusaka: University of Zambia.

University of Zambia School of Medicine. *School of Medicine* [Online]. Lusaka: University of Zambia Medical Library. Available at: http://www.medguide.org.zm/school.htm [Accessed: 08/06/07].

UWCM 1985. *Fifty-fourth Annual Report: 26 July 1984 - 31 July 1985* Cardiff: University of Wales College of Medicine.

UWCM 1986. *Fifty-fifth Annual Report: 1 August 1985 - 31 July 1986.* Cardiff: University of Wales College of Medicine.

UWCM 1987. *Fifty-sixth Annual Report: 1 August 1986 - 31 July 1987.* Cardiff University of Wales College of Medicine.

UWCM 1988. *Fifty-seventh Annual Report: 1 August 1987 - 31 July 1988.* Cardiff University of Wales College of Medicine.

UWCM 1991. *Sixtieth Annual Report: 1st August 1990 - 31st July 1991.* Cardiff University of Wales College of Medicine.

UWCM 1993. *Sixty-second Annual Report: 1st August 1992 - 31st July 1993.* Cardiff: University of Wales College of Medicine.

UWCM 1994a. *Sixty-third Annual Report: 1st August 1993 - 31st July 1994.* Cardiff University of Wales College of Medicine.

UWCM 1994b. *A Strategic Plan for the Dental School and Hospital: towards 2004* Cardiff UWCM Dental School.

UWCM 1995. *Annual Records: 1st August 1994 - 31st July 1995.* Cardiff University of Wales College of Medicine.

UWCM 1996. *Annual Records: 1st August 1995 - 31st July 1996.* Cardiff University of Wales College of Medicine.

UWCM 1997. *Annual Records: 1st August 1996 - 31st July 1997.* Cardiff University of Wales College of Medicine.

UWCM 1999. *Annual Records: 1st August 1998 - 31st July 1999.* Cardiff University of Wales College of Medicine.

UWCM 2001. *Annual Records: 1st August 2000 - 31st July 2001.* Cardiff University of Wales College of Medicine.

UWCM 2002. *Annual Records of the Departments: 1st August 2001 - 31st July 2002.* Cardiff University of Wales College of Medicine.

UWCM and Cardiff University 2003. *University of Wales Bachelor of Dental Surgery Year 1 Course-book 2003/2004.* Cardiff: University of Wales College of Medicine.

UWCM Dental School 2000. *DentEd Visitation Cardiff, 12 - 16 February 2000* Cardiff: UWCM, Dental School.

UWCM Dental School 2001a. *Bachelor of Dental Surgery: Appendix 5 Competency Statements* Cardiff University of Wales College of Medicine.

UWCM Dental School. 2001b. *Dental School and Service Group Strategic Plan 2003/5* [Online]. Cardiff University Dental School. Available at: http://www.cardiff.ac.uk/dentistry/news/StrategicPlan0308.pdf [Accessed: 16/06/05].

UWCM Dental School 2001c. *University of Wales Bachelor of Dental Surgery Appendices: Appendix 5 Competency Statements* Cardiff University of Wales College of Medicine.

UWCM Dental School 2003. *Role of Theme Leaders* Cardiff UWCM.

UWCM Dental School 2004. *Bachelor of Dental Surgery (Hons) Learning Outcomes.* Cardiff: University of Wales College of Medicine.

UWCM. Dental School 2001. *University of Wales College of Medicine Framework Document: introduction to a revised dental undergraduate curriculum from academic session 2001/2002* Cardiff University of Wales College of Medicine.

van der Waal, I. , Schulten, A. J. M. and Pindborg, J. J. 1991. Oral Manifestation of AIDS: an overview. *International Dental Journal* 41(1), pp. 3-8.

van Palenstein, H. W., Mikx, F., Begum, A., Adyatmaka, A., Bajracharya, M., Kikwilu, E., Rugarabamu, P., van Palenstein, H. W., Mikx, F., Begum, A., Adyatmaka, A., Bajracharya, M., Kikwilu, E. and Rugarabamu, P. 1999. Integrating Oral Health into Primary Health Care: experiences in Bangladesh, Indonesia, Nepal and Tanzania. *International Dental Journal* 49(4), pp. 240 - 248.

van Wyk, P. J. and van Wyk, C. 2004. Oral Health in South Africa. *International Dental Journal* 54(6 & Supl 1), pp. 373 - 377.

Varenne, B., Petersen, P. E. and Ouattara, S. 2004. Oral Health Status of Children and Adults in Urban and Rural Areas of Burkina Faso, Africa *International Dental Journal* 54(2), pp. 83 - 89.

Varenne, B., Petersen, P. E. and Ouattara, S. 2006. Oral Health Behaviour of Children and Adults in Urban and Rural Areas of Burkina Faso, Africa *International Dental Journal* 56(2), pp. 61 - 70.

Veitch, C., Underhill, A. and Hays, R. B. 2006. The Career Aspirations and Location Intentions of James Cook University's First Cohort of Medical Students: a longitudinal study at course entry and graduation *Rural and Remote Health* [Online] 6. Available at: http://www.rrh.org.au/articles/subviewnew.asp?ArticleID=537 [Accessed: 03/01/2009].

Venville, G., Rennie, L. and Wallace, J. 2003. Student Understanding and Application of Science Concepts in the Context of an Integrated Curriculum Setting. *International Journal of Science and Mathematics Education* 1, pp. 449-475.

Venville, G. J., Wallace, J., Rennie, L. J. and Malone, J. A. 2002. Curriculum Integration: eroding the high ground of science as a school subject? . *Studies in Science Education* :, 37(1), pp. 43 - 83.

Veres, E. M. and Ruck, P. L. 1996. Educating Oral Health Professionals: a Vision for the Future. *Journal of the Dental Association of South Africa.* 51(12), pp. 737-740.

Vigild, M. and Schwarz, E. 2001. Characteristics and Study Motivation of Danish Dental Students in a Longitudinal Perspective. *European Journal of Dental Education.* pp. 127-133.

Waks, L. J. 1992. The Responsibility Spiral: A Curriculum Framework for STS Education. *Theory into Practice* XXXI (1), pp. 13 - 19.

Walford, G. 1981. Classification and Framing in Postgraduate Education. *Studies in Higher Education* 6, pp. 147 - 158.

Walford, G. 1986. Ruling-Class Classification and Framing. *British Educational Research Journal* 12(2), pp. 183 - 195.

Walford, G. 1994. *Researching the Powerful in Education.* London: UCL Press.

Walford, G. 1995. Classification and Framing in English Public Boarding Schools. In: Atkinson, P., Davies, P. and Delamont, S. eds. *Discourse and Reproduction, Essays in honor of Basil Bernstein.* Cresskill, NJ: Hampton Press, pp. 191 - 207.

Walford, G. 2002. Classification and Framing of the Curriculum in Evangelical Christian and Muslim Schools in England and the Netherlands. *Educational Studies* 28(4), pp. 403 - 419.

Walzer, S. and Oles, T. P. 2003. Accounting for Divorce: gender and uncoupling narratives. *Qualitative Sociology* 26(3), pp. 331 - 349.

Warren, C. A. B. 2001. Qualitative Interviewing. In: Holstein, J.A. and Gubrium, J.F. eds. *Handbook of Interview Research: Context and Methods.* Thousand Oaks CA: Sage, pp. 83 - 101.

Watad, M. and Ospina, S. 1999. Integrated Managerial Training: a program for strategic management development. *Public Personnel Management* 28(2), pp. 185 - 196.

Waterman, H., Leatherbarrow, B., Slater, R. and Waterman, C. 1999. Post-operative pain, nausea and vomiting: qualitative perspectives from telephone interviews. *J Adv Nurs* 29(3), pp. 690-696.

Webb, C. 1981. Classification and Framing: a sociological analysis of task-centred nursing and nursing processing. *Journal of Advanced Nursing* 6, pp. 369 - 376.

Welch, C., Marschan-Piekkari, R. , Penttinen, H. and Tahvanainen, M. 2002. Corporate Elites as Informants in Qualitative International Business Research. *International Business Review* 11, pp. 611-628.

Welshman, J. 1998. Dental Health as a Neglected Issue in Medical History: The school dental service in England and Wales, 1900 - 40. *Medical History* 42, pp. 306 - 327

Werhane, P. H. 2006. Access, Responsibility, and Funding: A systems thinking approach to universal access to oral health. *Journal of Dental Education* 70(11), pp. 1184-1195.

Westwater, K. 1974. A Study of the Caries Prevalence in First Permanent Molars of Rural Zambian Schoolchildren. *Journal of Dentistry* 2(5), pp. 185-189.

Westwater, K. 1977. A Study of the Relative Caries Prevalence in First and Second Permanent Molars of Rural Zambian Schoolchildren. *Journal of Dentistry* 5(1), pp. 42-46.

Whipp, J. L., Ferguson, D. J., Wells, L. M. and Iacopino, A. M. 2000. Rethinking Knowledge and Pedagogy in Dental Education. *Journal of Dental Education* 64(12), pp. 860-866.

Whittaker, D. K. 1984. Reasons for Choice of Dentistry as a Career in Applicants to a British Dental School *British Dental Journal* 156(1), pp. 23 - 25.

WHO 1962. *Dental Education: Report of an expert committee on dental health.* Geneva: World Health Organization.

WHO 1990. *Educational Imperatives for Oral Health Personnel: change or decay?* Geneva: World Health Organization.

WHO 2002. *Global Review on Oral Health in Ageing Societies.* Kobe: WHO Kobe Centre for Health Development.

Wierinck, E., Puttemans, V. and van Steenberghe, D. 2006. Effect of Tutorial Input in Addition to Augmented Feedback on Manual Dexterity Training and its Retention. *European Journal of Dental Education* 10, pp. 24 - 31.

Wilkinson, D. 2003. Evidence-based Rural Workforce Policy: an enduring challenge. *Rural and Remote Health* [Online] 3. Available at: http://www.rrh.org.au/articles/subviewnew.asp?ArticleID=224 [Accessed: 03/10/2008].

Williams, R. G. and Klamen, D. L. 2006. See One, Do One, Teach One-exploring the core teaching beliefs of medical school faculty. *Medical Teacher* 28(5), pp. 418 - 424.

Wilson, K. 1985. *Story of Dentistry*. Ilfracombe: Arthur H. Stockwell.

Wilson, K. and Roe, B. 1998. Interviewing older people by telephone following initial contact by postal survey. *Journal of Advanced Nursing* 27(3), pp. 575-581.

Wilson, N. H. F. 2003. New Horizons in the Regulation of Dentistry. *British Dental Journal* 194, pp. 7 - 9.

WNSM 1966. *Thirty-Fifth Annual Report of the Council of the Welsh National School of Medicine to the Court of the University of Wales. August 1, 1965 to July 31, 1966* Cardiff: Welsh National School of Medicine.

WNSM 1967. *Thirty-Sixth Annual Report of the Council of the Welsh National School of Medicine to the Court of the University of Wales* Cardiff: Welsh National School of Medicine.

WNSM 1969. *Thirty-eighth Annual Report of the Council of the Welsh National School of Medicine* Cardiff: Welsh National School of Medicine.

WNSM 1970. *Thirty-ninth Annual Report of the Council of the Welsh National School of Medicine to the Court of the University of Wales* Cardiff: Welsh National School of Medicine.

WNSM 1971. *Fortieth Annual Report of the Council of the Welsh National School of Medicine to the Court of the University of Wales* Cardiff: Welsh National School of Medicine.

WNSM 1975. *Forty-fourth Annual Report: August 1st, 1974 to July 31st, 1975.* Cardiff: Welsh National School of Medicine.

WNSM 1980. *Forty-Ninth Annual Report of the Council of the Welsh National School of Medicine to the Court of the University of Wales. 1st August 1979 to 31st August 1980* Cardiff: Welsh National School of Medicine.

WNSM 1983. *Fifty-second Annual Report: 1st August 1982 - 31st July 1983.* Cardiff: Welsh National School of Medicine.

WNSM 1984. *Fifty-third Annual Report: 1st August 1983 - 25 July 1984.* Cardiff: Welsh National School of Medicine.

WNSM 1986. *Fifty-Fifth Annual Report of the Council of the Welsh National School of Medicine to the Court of the University of Wales. 1st August 1985 to 31st July 1986.* Cardiff: University Wales College of Medicine.

WNSM Dental School 1979. *Visit of the Dental Sub-Committee of the University Grants Committee to the Dental School of the Welsh National School of Medicine, 12th Jan. 1979 / a report* Cardiff WNSM Dental School.

World Bank 2006. *World Development Report 2006: Equity and Development.* Washington: World Bank.

World Health Organization. 2006. *The World Health Report 2006: Annex Table 4 Global distribution of health workers in WHO Member States* [Online]. Geneva: Available at: http://www.whocollab.od.mah.se/expl/06annex4en.pdf [Accessed: 20/09/2007].

World Health Organization. 2007. *The World Health Statistics: 2007* [Online]. Geneva: Available at: http://www.who.int/whosis/whostat2007.pdf [Accessed: 20/09/2007].

Yeager, A. L. 2004. 'Oversimplifying' Licensure? *Journal of American Dental Association* 135(6), pp. 703 - 705.

Yin, R. K. 2003. *Case Study Research: design and methods*. 3rd ed. Thousand Oaks, Calif.: Sage.

Yip, H.-K. and Smales, R. J. 2000. Review of Competency-based Education in Dentistry. *British Dental Journal* 189(6), pp. 324 - 326.

Yip, H.-K., Smales, R. J., Newsome, P. R. H., Chu, F. C. S. and Chow, T. W. 2001. Competency-based Education in a Clinical Course in Conservative Dentistry. *British Dental Journal* 191(9), pp. 517 - 522.

Zadik, D., Gilad, R. and Peretz, B. 1997. Choice of Dentistry as a Career and Perception of the Profession. *Journal of Dental Education* 61 pp. 813-816.

Zangwill, S. 2001. Onward the Toothbrush Brigade: George Cunningham, pioneer of preventive dentistry *History of Dentistry Research Group.*

Zarkowski, P., Gyenes, M., Last, K., Leous, P., Clarkson, J., McLoughlin, J., Murtomaa, H., Gibson, J., Gugushe, T., Edelstein, B., Matthews, R., Vervoorn, M. and van den Heuvel, J. L. M. 2002. 5.1 The Demography of Oral Diseases, Future Challenges and the Implications for Dental Education. *European Journal of Dental Education* 6(s3), pp. 162-166.

APPENDICES

Appendix A: Significant Dates in the History of Dental Education in the UK

1841 'Memorials' written to the Royal College of Surgeons (RCS) of England by prominent dentists requesting the institution of a diploma course in dentistry

1856 Odontological Society of London and College of Dentists founded

1858 Medical Act Passed

General Medical Council is established

Clause 48 of Medical Act empowers RCS to hold examinations in Licentiate in Dental Surgery (LDS) and to grant certificates of fitness to practice dentistry.

1859 Dental Hospital of London established in Soho Square

Metropolitan School of Dental Science founded at 5 Cavendish Square, London

College of Dentists institutes a diploma M.C.D.E.

1860 RCS holds first examination in Licentiate in Dental Surgery

London School of Dental Surgery and National Dental Hospital founded

1863 College of Dentists and M.C.D.E. dissolved

1865 Edinburgh Dental Dispensary opened

1866 LDS Edinburgh founded

1876 Dental Reform Committee formed

1878 First Dentist Act passed

1879 Edinburgh Dental Dispensary transformed into Edinburgh Dental School

1880 Dental Reform Committee becomes the Representative Board of the British Dental Association (B.D.A.)

1881 B.D.A. commence prosecutions against illicit dental practice

1884 B.D.A. wins first action against illicit dental practice

1886 Brighton Dental Hospital founded

National Dental Hospital admits women students

1892 Society of Extractors and Adapters of teeth formed by unqualified practitioners

1895 First woman dentist qualifies in Edinburgh

1899 School Dental Society founded

Appendix A: Significant Dates in the History of Dental Education in the UK

1901 Dental Hospital of London receives Royal Charter and becomes Royal Dental Hospital and School of Dental Surgery

1905 Manchester University institutes Bachelor of Dental Surgery (B.D.S.)

1906 Leeds institutes Bachelor of Surgery in Dentistry (B.Ch.D.)

1910 Society of Extractors and Adaptors of Teeth re-named as Incorporated Dental Society

1917 Departmental Committee appointed to report on evils of unqualified dental practice

1919 Departmental Committee reports advising amending dental registration

1921 Second Dentist Act passed

Dental Board of UK established under the General Medical Council (GMC)

1922 First Chair in Dentistry appointed at Liverpool University

1923 Dental Benefits under National Health Insurance Act (1911) introduced

7 269 unqualified practitioners admitted to Dentists Register under 1921 Act against 5 831 qualified registered practitioners

1929 Dental Benefits Regulations published

1935 First Chair in Dental Prosthetics appointed at London University

1946 All registered dentists become eligible for membership of the British Dental Association

1947 Fellowship in Dental Surgery (F.D.S.) instituted at the R.C.S. (Eng)

1956 Dentist Act establishes the General Dental Council (GDC). Dental Board of UK is abolished

1957 Consolidating Dentist Act passed

1963 The First GDC Recommendations Concerning the Dental Curriculum Published

1968 Todd Report recommends increase in the intake medical students

1980 Nuffield Report published

1983 Report of the Study Group on Dental Manpower recommends reduction of intake of dental schools by 10%

1984 Dentist Act 1984

Appendix A: Significant Dates in the History of Dental Education in the UK

1993 Tomorrow's Doctors published

1997 GDC First Five Years first edition published

2002 GDC First Five Years second edition published

Appendix B: Significant Dates in the History of the Welsh Dental School

Date	Event
1946	The report of the Inter-departmental Committee on Dentistry recommends the establishment of a dental school at the University of Wales at Cardiff
1961	o Department of dental surgery established at the Welsh National School of Medicine o Prof. Cooke appointed first dean of the new dental school
1964	First cohort of 23 dental students commence pre-clinical studies at the University College, Cardiff
1965	o Building of the new dental school and hospital completed in October o First intake of clinical dental students arrive at the new the dental school and hospital for clinical studies on 5th October 1965
1966	o Dental school officially opened by the Duke of Edinburgh, Prince Philip on 7th July o Department of dentistry replaced by two departments: Department of Dental Surgery and Department of Oral Medicine
1967	First 18 dental students successfully complete the BDS course.
1968	First graduation of dental students from the Welsh National School of Medicine
1969	o Two new departments established: Department of Restorative Dentistry and Department of Conservative Dentistry o Department of Dental Surgery renamed Department of Children's Dentistry
1970	Department of Orthodontics established
1975	Periodontology established as a separate department from the Department of Oral Medicine and Oral Pathology
1983	o GDC recommends extension of the BDS course by one year to overcome congestion of the introductory clinical period o Prof. J. miller appointed dean following retirement of Prof. Cooke, the first dean o Department of Oral and Maxillo-facial surgery and Department of Oral Biology established as separate departments from the Department of Oral Medicine and Oral Pathology bringing the total number of department to eight
1984	o Welsh National School of Medicine granted new charter under the name University of Wales College of Medicine (UWCM) by the Queen on 25 June o New charter and new name (UWCM) come into effect on 26 July
1986	o Department of Children's and Preventive Dentistry and Department

Orthodontics merge to form the Department of Child Dental Health
- Extension of the clinical course to 3 years one term approved by the University Grants Commission
- Teaching of oral medicine and oral pathology integrated

1987
- Paedodontics and orthodontic clinics physically merge
- Department of Restorative Dentistry changes name to Department of Prosthetic Dentistry

1988
- Department of Basic Dental Sciences created by merging the oral biology section of the Department of Oral Medicine and dental materials section of the Department of Prosthetic Dentistry
- Department of Oral and Maxillofacial Surgery amalgamate with the Department of Oral Medicine and Oral Pathology to form the Department of Oral Surgery, Oral Medicine and Oral Pathology (OSMP)

1990 New 5-year undergraduate curriculum implemented (October 1990) in line with the GDC recommendations

1993
- Prof. Norman Whitehouse appointed General Manager of the Dental Hospital and Dean of the Dental School leading to a seamless approach in the management of dental education and dental care to the community
- Joint school and hospital strategic consultative report prepared. The educational element of the report strongly recommends restructuring of the undergraduate curriculum

1994 Joint dental school and hospital strategic plan accepted by the College and South Glamorgan Health Authority

1995
- University Dental Hospital attains NHS Trust status: 1st April 1995
- Dual appointment of the Dean of the Dental school as Chief Executive of the University Dental Hospital NHS Trust leads to a seamless university NHS management

1995
- University Dental Hospital granted NHS Trust status on 1st April 1995
- Dean of the WDS is appointment Chief Executive of the Trust.
- UWCM dental departments and the Dental Hospital Trust clinical directorates combined under one head

1996 UWCM introduces a division management structure. The Dental School is Divided into 4 Divisions and the Medical School into 10.

1997
- Department of Restorative Dentistry renamed Division of Adult Dental Health (ADH)
- Department of Child Dental Health renamed Division of Dental Health and Development (DHD)

Appendix B: Significant Dates in the History of the Welsh Dental School

1999 Prof. Malcom Jones appointed Dean following retirement of Prof. Whitehouse (1st October 1999)

2000
- Visitation from DentEd at the invitation of the Dental School
- Divisions of Basic Dental Science and DHD merge to form the Division of Dental Health and Biological Sciences

2001 Restructured curriculum implemented (September 2001)

2002 Primary Dental Care Unit at St Davids Hospital officially opened (July 2002)

Appendix C: Correspondence with the GDC

I. Initial E-mail Contact with the GDC

From:	Allan Mbita <MbitaA@cardiff.ac.uk>	01/26/04 8:33 pm
To:	GDCeducation@gdc-uk.org	
Subject:	Research on Dental Curriculum	

Dear Sir/Madam.

I am a first year PhD Commonwealth scholar under the School of Postgraduate Medical and Dental Education at the University of Wales College of Medicine. My research interest is in dental curriculum reform in Wales and the General Dental Council curriculum policy. At the end of my research I hope to develop a curriculum model suitable for a newly established undergraduate dental program in Zambia.

I wonder if the council could be agreeable to put me in touch with members of the Working Party which formulated and revised the GDC policy document; The *First Five Years* I would like to seek the members' personal views on and their contribution in formulating/revising the policy document. I would also appreciate if I can be availed any other information that can be of some use me in my research.

Yours sincerely,

Allan K. Mbita.
PhD Student.
School of Postgraduate Medical and Dental Education,
University of Wales College of Medicine.

Appendix C: Correspondence with the GDC

II. Letter to the Director of Education in response to his email of 24/02/04

School of Postgraduate Medical and Dental Education.
University of Wales College of Medicine
Cardiff CF14 3XN

10th March 2004.

The Director of Education

The General Dental Council

37 Wimpole Street,

London W1G 8DQ

Dear Sir.

Research in Dental Curriculum Reforms

Reference is made to your email of 24th February 2004 in which you were asking for further information on my research project.

The tentative title of my research is *Contextualising Dental Curriculum: a case study of the 2001 Welsh Dental School curriculum restructuring: a curriculum planning model for Zambia.* The focus of my research is a case study of the curriculum reforms at a UK Dental School. I intend to investigate factors that informed reform, how the reform process was/is being managed, and the impact of the General Dental Council policy in informing curricula reforms in dental education. That is, how the GDC policy on undergraduate dental curriculum has informed the direction of reform at the Dental School. At the end of my research I hope to develop a curriculum model suitable for a newly established undergraduate dental program in Zambia.

Appendix C: Correspondence with the GDC

My research supervisors are Dr Lesley Pugsley, BSc (Econ), MSc (Econ), PhD (Wales); and Dr Sara Delamont, AcSS, BA (Cantab.), PhD (Edin). Dr Pugsley is Senior Lecturer at the School of Postgraduate Medical and Dental Education and is an elected member of ASME. She has published on a number of issues relating to policy reforms and is currently researching on 'Chair-side Teaching' in the Dental School as an LTSN funded research project. While Dr Delamont is a Reader in Sociology at Cardiff University and a member of the Board of Medical Studies; Medical Quality Committee; Medical Assessment Group; and has taught medical students for 25 years and has a strong programme of research with the Welsh School of Pharmacy.

I know that you will appreciate how invaluable it will be for my own undergraduate dental programme in Zambia to be able to learn from your experiences of undergraduate dental reforms. I do hope that the above information is sufficient for you to be able to grant me access to the various informants to assist with my research.

If you need any further information, do please contact my supervisor, Dr Lesley Pugsley by phone (phone number disclosed) who will be happy to answer any additional questions that you might have.

I look forward to hearing from you.

Yours truly,

Allan K. Mbita.

PhD Student, PGMED.

Email: MBITAA@cf.ac.uk

Appendix D: Loose Schedule of Interview Questions

Personal and Professional History

Professional qualifications and years of experience

- When and where did you qualify?
- How would you describe your experience of dental education during your time as a student?
- How does it compare with the education you are providing as a teacher?
- Where did you first come to the WDS?
- How would you describe your experience as a teacher at the WDS?
- What are responsibilities?

Role in Curriculum Restructuring

- How would you describe your role in the restructured curriculum?
- Would you describe what each of these responsibilities meant?
- Why did you restructure your curriculum?
- What were the sources of influence?
- Would you describe what curriculum restructuring meant to you personally?
- If you are to compare the old and the restructured curriculum, what would you say is different?

General Views and Opinions

Can you give me your views on the following...

- Sources of influence on the curriculum and restructuring process
- Management of the restructuring and Implementation process
- Content and Pedagogical approach (Learning/Teaching Approaches)
- Methods of assessment
- Mechanism(s) for evaluation (Quality assurance)

- If you look back, what would you rather have done differently in the new curriculum?
- Would you enlighten me on any other issues that you considered important in dental curriculum?
- For us who are contemplating establishing a dental faculty, what advice can you give us?

Appendix D: Loose Schedule of Interview Questions

Prompts

- I did not quiet understand what you mean when you said....
- Could you clarify a little more on the idea that....
- Are you saying that.....?
- That sounds very interesting. But what about....?
- How do you reconcile the idea that..... and ...?
- There is a general view that .... How does it fit in with....?
- Theory/literature on curriculum says... What is your view from your experience of....?

Appendix E: List of Documents Consulted

Main Documents

1. The *First Five Years: A Framework for Undergraduate Dental Education* (GDC, 2002)
2. *The First Five Years: The Undergraduate Dental Curriculum* (GDC, 1997)

Other Documents:

3. Profile and Competencies of the European Dentist (ADEE, 2004)
4. *Tomorrow's Doctors: Recommendations on Undergraduate Medical Education* (GMC, 2002)
5. Subject Benchmark Statements: Dentistry (QAA, 2002)
6. Recommendations Concerning the Dental Curriculum (GDC 1963; 1980; 1985; 1990)
7. Dental Education: the report of a commission of inquiry appointed by the Nuffield Foundation (Nuffield Foundation, 1980)
8. Implications for Dentistry of the Royal Commission on Medical Education and other Related Questions (GDC, 1972)
9. Royal Commission on Medical Education (Todd Report, 1968)
10. Inter-Departmental Committee on Dentistry (Teviot Report, 1946)
11. Report of the Committee on Recruitment to the Dental Profession (McNair Report, 1956).

Welsh Dental School Curriculum Documents

Main Documents:

12. University of Wales Bachelor of Surgery Framework Document: Introduction of a Revised Curriculum (2001)
13. Appendix 1: Assessment
14. Appendix 2: Relation of Proposed Dental Undergraduate Curriculum to UWCM Strategic Plan
15. Appendix 5: Competency Statements
16. Appendix 8: BDS Year 1 Details
17. Appendix 10: Projects
18. Appendix 11: Milestones en route to Competency
19. Bachelor of Dental Surgery (Hons): Learning Outcomes
20. Bachelor of Dental Surgery (Hons): Overview of Teaching
21. Proposal for the Management of the New Curriculum: undergraduate working party May 1999

Other Documents:

22. Minutes of the Transition Management Group (Nov. 2000 to Jan. 2004)
23. Dental Strategic Plan 2003/8
24. Strategic Plan for the Dental School and Hospital: Towards 2004
25. Higher Education Funding Council of Wales Teaching Quality Assessment: Dentistry Cardiff Self Assessment Report 1997

26. Higher Education Funding Council of Wales Quality Review Report: UWCM Dentistry (1997)
27. Academic Quality Assurance Manual (UWCM, 2004)
28. Assessment Guidance: Designing, Organising and Managing Assessment in the Medical Course (UWCM and Cardiff University, 2002).

Appendix F: An Example of Coding Interview Data

Coding for changes over time in dental education from an Interview Excerpt with Dr Bertha Fraser

AK: When you look back and compare your student days, are there any significant differences between the undergraduate dental programme you went through and what is prevailing now?	**Changes in dental education**
BF: I think there isn't a significant difference. There are some similarities, but a lot of the *technical work* that I was taught, we are not teaching students now. We need the students to have *new skills*; a broader range of skills; more *diagnostic skills* and more *technical skills* in some areas that were not even invented when I was a student. And these are challenges for us to try and teach those. I think it is important that we *put limits* on what we think we can achieve. If we try and teach too much, we teach nothing. I think we need to say, "We will teach this." Once we have taught that, that is as much as we can do. We need to constrain what we are teaching and try and teach the students basic skills very well and allow other groups, like vocational trainers and general professional training, to develop their development skills further. My view is that we are trying to *put the building blocks in place*: the building blocks of *basic technical skills*; *diagnostic skills*; *communication skills*. But also skills that I wasn't taught such as *library skills*, *audit skills* and *IT skills*, which are essential for a modern practitioner so that they can continue to develop themselves. These are things that I think we are doing and I think that these are important to make the student become a practitioner who is flexible and can develop with changes in technology and changes in dental health. I think there are changes and I don't think I was taught those skills. I was taught a technical course, which was fine, but I don't think we can do that any longer.	**Changes in technical work** **New skills** **Diagnostic** **Technical** **Curriculum overload** **Contrast: undergraduate education/ professional and vocational training** ***Metaphor: Putting building blocks in place*** **Basic technical skills** **Diagnostic skills** **Communication skills** **Library/audit/ IT skills** **Essential skills for modern dental practice** **Flexibility and adaptability:** **Advances in technology** **Changes in oral health** **Limits of a technical course**
AK: What would be your advice to people like us who are just starting a new dental programme?	**Requirements for a dental programme**
BF: There is an incentive to get *good candidates* to do dentistry. If there is an incentive to get good quality candidates then, I think that it is important to have *key stages* throughout the curriculum where they learn key things, and they have good *facilities* to practice those skills. I don't think they need a large *dental school hospital* to practice their clinical skills. We have, at the moment, one large *outreach clinic* and students get very good clinical skills there.	**Student Recruitment** **Defining learning outcomes** **Facilities for clinical training** **Dental hospital** **Community-based**

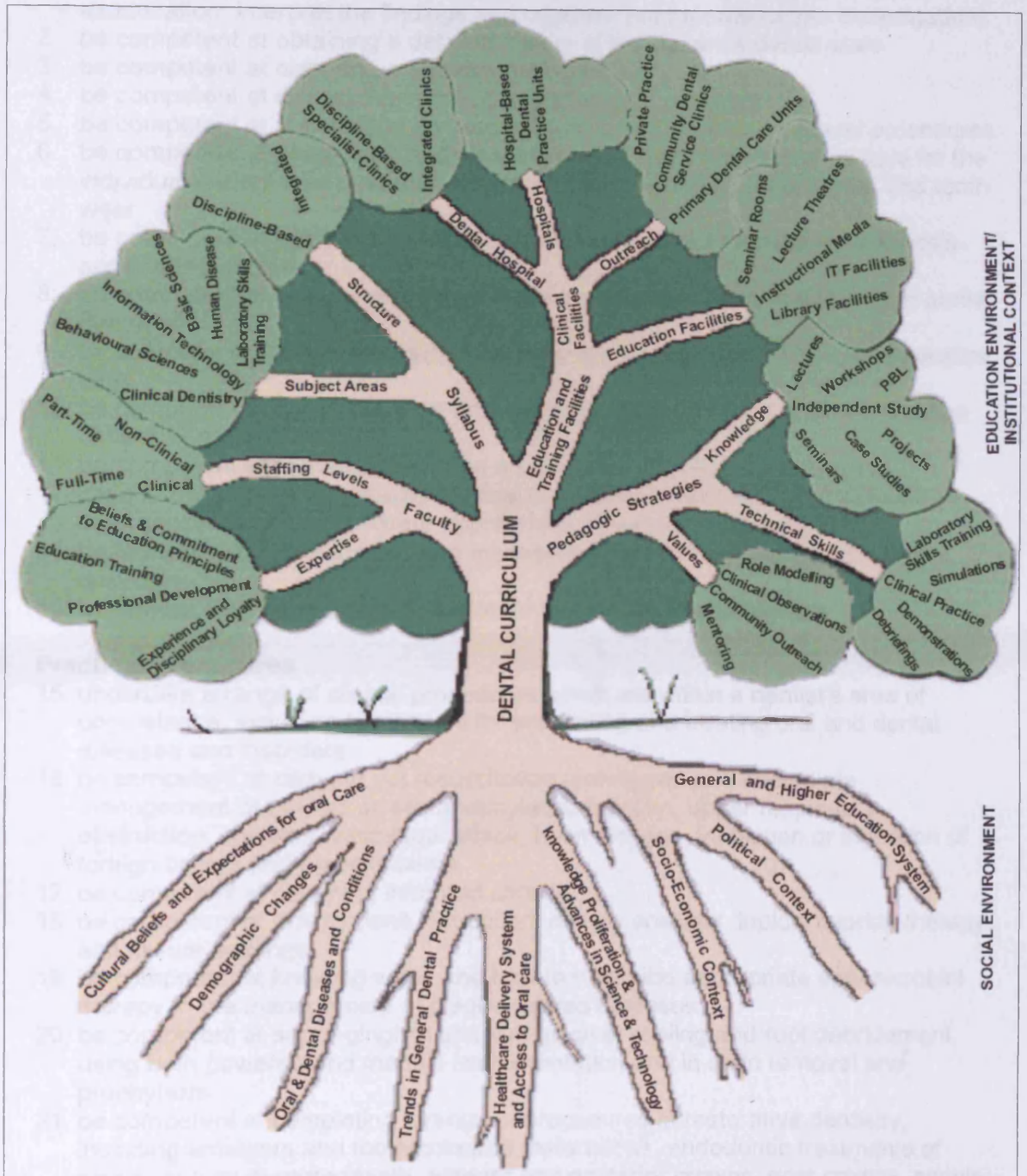
Appendix F: An Example of Coding Interview Data

But they do need to learn some of the other key skills: the diagnostic skills from *people like us*; library skills; the ability to read, understand and appraise literature of modern techniques, clinical techniques and epidemiology, so that they can understand where dentistry is going and how best they can help their communities.	**Key competencies** **Diagnostic skills** **Library skills** **Communication skills** **Technical skills** **Adapting to changes** **Service to communities**
So I think there is need to have a core dental curriculum with clinical skills being achieved.	**Content of dental curriculum**
Because building a dental school like this is extremely difficulty and it is not always necessary, you can have a university part and the clinical skills being done, perhaps, in large government run clinics under the supervision of a senior dentist there.	**Cost of dental Infrastructure** **Outreach clinical training** **Government clinics/Hospitals**
I think that would work well as long as the senior dentist in each of those areas understands some of the teaching that has gone on beforehand. Keeping everyone involved in the teaching programme would work very well.	**Part-time staff**

At a higher level of generality, themes identified in the initial coding for 'changes in dental education' may be regroup under the following more general themes:

Clinical skills Diagnostic skills Communication skills	**Content/ Subject Areas**	**Education Environment**
Hospital-Based Outreach training	**Clinical Teaching Sites**	
Full-time Part-time staff	**Staff**	
Changes in oral health	**Oral Disease Profile**	**Social Environment**
Clinical skills Diagnostic skills Communication skills	**General Dental Practice**	
Changes in technical work Library/IT skills Adaptability/ Flexibility	**Advances in Science and Technology**	
Cost of dental infrastructure Library facilities	**Economic Factors**	
Student recruitment	**Education System**	

Appendix G: The Dental Curriculum Tree



The dental curriculum is presented as a tree to capture the complex interrelationships and interactions between the different education and social factors. The branches and leaves represent the educational environment, while the roots represent the local social context in which the curriculum is embedded. The success or failure of the curriculum depends on the outcome of the complex interaction of the education and social forces.

Appendix H.I: The General Dental Council Dental Domains

What the Dentist is able to do

Clinical Skills

1. obtain and record a comprehensive history, perform an appropriate physical examination, interpret the findings and organise appropriate further investigations
2. be competent at obtaining a detailed history of the patient's dental state
3. be competent at obtaining a relevant medical history
4. be competent at clinical examination and treatment planning
5. be competent at maintaining an aseptic technique throughout surgical procedures
6. be competent at diagnosing and planning preventative non-operative care for the individual patient who presents with dental caries, periodontal diseases and tooth wear
7. be competent at completing a periodontal examination and charting, diagnosis and treatment plan
8. be competent at designing effective indirect restorations and complete and partial dentures
9. be competent at diagnosing active caries and planning appropriate non-operative care
10. be competent at carrying out an orthodontic assessment including an indication of treatment need
11. be competent at managing fear and anxiety with behavioural techniques
12. have knowledge of diagnosing medical emergencies and delivering suitable emergency drugs using, where appropriate, intravenous techniques
13. be familiar with the diagnosis and management of temporo-mandibular joint disorders
14. be familiar with contemporary treatment techniques in orthodontics

Practical Procedures

15. undertake a range of clinical procedures which are within a dentist's area of competence, including techniques for preventing and treating oral and dental diseases and disorders
16. be competent at carrying out resuscitation techniques and immediate management of cardiac arrest, anaphylactic reaction, upper respiratory obstruction, collapse, vasovagal attack, haemorrhage, inhalation or ingestion of foreign bodies and diabetic coma
17. be competent at obtaining informed consent
18. be competent at oral hygiene instruction, dietary analysis, topical fluoride therapy and fissure sealings
19. be competent at knowing when and how to prescribe appropriate anti-microbial therapy in the management of plaque-related diseases
20. be competent at supra-gingival and sub-gingival scaling and root debridement, using both powered and manual instrumentation and in stain removal and prophylaxis
21. be competent at completing a range of procedures in restorative dentistry, including amalgam and tooth-coloured restorations, endodontic treatments of single- and multi-rooted teeth, anterior and posterior crowns, post crowns, simple bridges and partial and complete dentures
22. be competent at designing effective indirect restorations and complete and partial dentures
23. be competent at fissure sealing, preventative resin restorations, and pit and fissure restoration
24. be competent in undertaking proximal and incisal tip restorations
25. be competent at managing appropriately all forms of orthodontic emergency including referral when necessary
26. be competent at undertaking the extraction of teeth and the removal of roots

Source: General Dental Council (2002).

where necessary
27. be competent at undertaking minor soft tissue surgery
28. be competent at taking and processing the various film views used in general dental practice
29. be competent at infiltration and block local anaesthesia in the oral cavity
30. have knowledge of the design and laboratory procedure used in the production of crowns, bridges, partial and complete dentures and be able to make appropriate chair-side adjustment to these restorations
31. have knowledge of preformed stainless steel crown and pulp therapy in primary molar teeth
32. have knowledge of the management of trauma in both dentitions
33. have the knowledge to be able to design, insert and adjust space maintainers
34. have the knowledge to design, insert and adjust active removable appliances to move a single tooth or correct a cross-bite
35. have knowledge of matters relating to infection control
36. have knowledge of inhalational and intravenous conscious sedation techniques
37. have knowledge of conscious sedation techniques in clinical practice

Patient Investigation
38. be competent at using laboratory and imaging facilities appropriately and efficiently
39. be competent at the principles of radiographic interpretation and be able to write an accurate radiographic report
40. have knowledge of appropriate special investigations and the interpretation of their results
41. have knowledge of the role of laboratory tests in diagnosis
42. be familiar with the principles which underlie dental radiographic techniques

Patient Management
43. share with patients provisional assessment of their problems and formulate plans for their further investigation and management
44. be competent in when, how and where to refer a patient for general anaesthesia
45. be competent at obtaining informed consent
46. be competent at making appropriate referrals based on assessment
47. have knowledge of managing patients from different social and ethnic backgrounds
48. have knowledge of the pharmacological properties of those drugs used in general practice including their unwanted effects
49. have knowledge of the role of sedation in the management of young patients
50. have knowledge of management of acute infection
51. have knowledge of the drugs commonly used in oral medicine and their side effects and drug interactions
52. have knowledge of the role of conscious sedation in dentistry
53. have knowledge of dental problems that may manifest themselves in older patients and of the principles involving the management of such problems
54. be familiar with the role of therapeutics in the management of patients receiving dental treatment
55. be familiar with the general aspects of medicine and surgery
56. be familiar with the main medical disorders that may impinge on dental treatment
57. be familiar with the principles of treatment of dento-facial anomalies including the common orthodontic/maxillofacial procedures involved
58. be familiar with the pathogenesis of common oral medical disorders and their treatment
59. be familiar with the pathogenesis and classification of oral diseases
60. be familiar with the principles of assessment and management of maxillofacial

Source: General Dental Council (2002).

trauma
61. be familiar with the diagnosis of oral concern and the principle of tumour management

Health Promotion and Disease Prevention
62. understand the principles of health promotion and disease prevention
63. have knowledge of the organisation and provision of healthcare in the community and in hospital
64. be familiar with the complex interactions between oral health, nutrition, general health, drugs and diseases that can have an impact on dental care and disease
65. be familiar with the prevalence of certain dental conditions in the UK
66. be familiar with the importance of community-based preventive measures
67. be familiar with the social, cultural and environmental factors which contribute to health or illness

How the Dentist Approaches Practice

Communication
68. have knowledge of behavioural sciences and communication
69. communicate effectively with patients, their families and associates, and with other health professionals involved in their care
70. be competent at communication with patients, other members of the dental team and other health professionals
71. be competent at working with other members of the dental team
72. have knowledge to be able to explain and discuss treatments with patients and their parents

Data and Information Handling Skills
73. use contemporary methods of electronic communication and information management
74. be competent at maintaining full and accurate clinical records
75. be competent at using information technology
76. be familiar with the principles of recording oral conditions and evaluation data

Understanding of Basic and Clinical Sciences and Underlying Principles
77. understand the scientific basis of dentistry, including the relevant biomedical sciences, the mechanisms of knowledge acquisition, scientific method and evaluation of evidence
78. disease processes such as infection, inflammation, disorders of the immune system, degeneration, neoplasia, metabolic disturbances and genetic disorders
79. have knowledge of anatomy, physiology and biomedical sciences relevant to dentistry
80. have knowledge of the aetiology and processes of oral diseases
81. have knowledge of the scientific principles of sterilisation, disinfection and antisepsis
82. have knowledge of the science that underpins the use of dental biomaterials
83. have knowledge of the limitations of dental materials
84. have knowledge and understanding of biomedical sciences, of oral physiology and craniofacial, oral and dental anatomy in the management of patients
85. have knowledge of the causes and effects of oral disease needed for their prevention, diagnosis and management
86. have knowledge of the hazards of ionising radiation and regulations relating to them, including radiation protection and dose reduction
87. be familiar with the pathological features and dental relevance of common disorders of the major organ systems

Source: General Dental Council (2002).

88. be familiar with those aspects of biomaterial safety that relate to dentistry

Appropriate Attitudes, Ethical Understanding and Legal Responsibilities

89. understand the broader issues of dental practice, including ethics, medico-legal considerations, management, and the maintenance of a safe working environment
90. an understanding of patients' rights, particularly with regard to confidentiality and informed consent, and of patients' obligations
91. an awareness of moral and ethical responsibilities involved in the provision of care to individual patients and to populations
92. an understanding of audit and clinical governance
93. an awareness that dentists should strive to provide the highest possible quality of patient care at all times
94. an awareness of the importance of his or her own health and its impact on the ability to practise as a dentist
95. be familiar with the legal and ethical obligations of registered dental practitioners
96. be familiar with the law as it applies to records
97. be familiar with social and psychological issues relevant to the care of patients

Appropriate Decision Making, Clinical Reasoning and Judgement

98. apply evidence-based treatment
99. an awareness of the need to limit interventions to the minimum necessary to achieve the desired outcomes
100. be competent at deciding whether severely broken down teeth are restorable and how missing teeth should be replaced, choosing between the alternatives of no replacements, bridges, dentures or implants
101. be competent at knowing when and how to prescribe appropriate anti microbial therapy in the management of plaque-related disease
102. have knowledge of how missing teeth should be replaced, choosing between the alternatives of no replacements, bridges, dentures or implants
103. have knowledge of providing a comprehensive approach to oral care
104. have knowledge of when periodontal surgery might be advised
105. be familiar with dental implants as an option in replacing missing teeth
106. be familiar with the limitations of orthodontic treatment
107. be familiar with an evidence-based approach to treatment

The Dentist as a Professional

Professional Development

108. possess a wide range of skills, including research, investigative, analytical, problem-solving, planning, communication, presentation and team skills
109. respect for patients and colleagues that encompasses, without prejudice, diversity of background and opportunity, language and culture
110. integrity, honesty and trustworthiness
111. an awareness of the need for continuing professional development allied to the process of their continuing education, in order to ensure that high levels of clinical competence and knowledge are maintained
112. have knowledge of the permitted activities of PCD's
113. have knowledge of the regulatory functions of the General Dental Council
114. be familiar with the work of healthcare workers
115. be familiar with the place of dentistry in the provision of healthcare

Personal Development

116. approaches to teaching and learning that are based on curiosity and exploration of knowledge rather than its passive acquisition

Source: General Dental Council (2002).

Appendix H.I: The General Dental Council Dental Domains

117. a desire for intellectual rigour, a capacity for self-audit and an appreciation of the need to participate in peer review
118. an awareness of personal limitations, a willingness to seek help as necessary, and an ability to work effectively as a member of a team
119. be competent at working with members of the dental team
120. have knowledge of working as part of the dental team
121. be familiar with the need for lifelong learning and professional development
122. be familiar with the obligation to practice in the best interest of the patient at all times

Source: General Dental Council (2002).

Appendix H.II: The QAA Benchmark Statements for Dentistry

Skills and attributes of the graduating dentist

Key skills

In addition to the subject-specific skills itemised in the following sections, the undergraduate programme in dentistry encourages the development of key transferable skills, which underpin the lifelong educational and training process. Graduating dentists should, therefore, have the ability to:

Transferable skills

1. Exercise initiative and personal responsibility;
2. Communicate effectively at all levels in both the scientific and professional contexts using verbal, non-verbal and written means;
3. Work effectively as members of a team;
4. Use information technology as a means of communication, for data collection and analysis, and for self-directed learning;
5. Analyse and resolve problems, and deal with uncertainty;
6. Manage time, set priorities and work to prescribed time limits;
7. Make decisions based on sound ethical, moral and scientific principles;
8. Manage their learning in the context of establishing a philosophy of continuing professional development;
9. Acquire, analyse, process and communicate information in a scientific manner to solve problems and to guide clinical decision-making;
10. Evaluate the evidence published in refereed scientific journals and other publications for sound experimental design and statistical analysis;
11. Evaluate the validity of claims related to products or techniques.

Professionalism

Professional behaviour and clinical governance

Graduating dentists should be able to:

12. Understand the role and function of the GDC in regulating the dental profession, and be familiar with its issued guidelines;
13. Understand the role, function and obligations of the National Health Service;
14. Manage the ethical issues that may arise in dental practice;
15. Apply jurisprudence to the practice of dentistry;
16. Understand the implications of and obtain informed consent;
17. Understand the ethical and legal basis of confidentiality, including the need to maintain accurate and complete patient records in a confidential manner;
18. Provide empathetic care for all patients, including members of diverse and vulnerable populations, and respect the principle of patient autonomy;
19. Provide and receive constructive criticism;
20. Recognise and take appropriate action to help incompetent, impaired or unethical colleagues and their patients

Behavioural science and communication

Graduating dentists should base their care of patients on a sound knowledge and experience of the psychological aspects of human behaviour. They should be able to:

21. Agree dental treatment plans with patients of all ages and, where necessary, through the intermediate consent of a parent, guardian or carer;
22. Display appropriate behaviour towards all members of the dental team;
23. Understand the role of psychological development in the management and treatment of the child patient;
24. Apply the principles of dental anxiety management (behavioural and pharmacological) to

Source: QAA (2002, par. 3)

the treatment of the anxious dental patient;
25. Appreciate the importance of psychological and social factors in the delivery and acceptance of dental care by patients;
26. Recognise the responsibility and demonstrate the ability to share information and professional knowledge verbally and in writing;
27. Understand the principles of occupational stress and its management.

Becoming a reflective dentist

Graduating dentists should be dedicated to the principle of lifelong learning and continued professional development. They should be able to:
28. Identify and use sources of continuing professional development and apply critical thought to a continually expanding knowledge base such that professional competence is maintained;
29. Discharge the obligations incumbent upon every professional person including contributions to, and support for, the profession's collective initiatives in self-regulation, maintenance of standards, and the advancement of knowledge and expertise;
30. Assess personal progress, including the identification of strengths and weaknesses;
31. Evaluate all treatment outcomes, including the unexpected, and undertake remedial action where appropriate;
32. Recognise and fulfil their responsibilities both as adult learners and as teachers;
33. Use the principles of peer review and quality assurance in dental practice.

Dental health and society

Dental public health

34. Evaluate social and economic trends and their impact on oral health care;
35. Recognise their role in and responsibility for improving the general and oral health of the community through treatment strategy, education and service;
36. Describe and understand the prevalence of oral disease in the UK adult and child populations;

Oral health promotion

37. Recognise predisposing and aetiological factors that require intervention to promote oral health;
38. Understand the pattern of oral disease in society and be able to contribute to health promotion;
39. Assess the need for, and provide, preventive procedures and instruction in oral health methods that incorporate sound biological principles in order to preserve oral hard and soft tissues, and to prevent disease;
40. Use and provide appropriate therapeutic agents and treatment modalities.

Assessment of the Patient and Oral Environment

Biomedical science

41. Apply their knowledge and understanding of biomedical sciences, oral biology and bio-molecular sciences to the management of their patients;
42. Recognise the changes that occur with normal growth and ageing and apply their knowledge in the management of the oral environment;
43. apply their knowledge of the aetiology and processes of oral diseases in prevention, diagnosis and treatment;

History, examination and diagnosis

44. Obtain and record a relevant medical history which identifies both the possible effects of

Source: QAA (2002, par. 3)

oral disease on medical well-being and the medical conditions that affect oral health or dental treatment;
45. Assess and appraise contemporary information on the significance and effect of drugs and other medicaments, taken by the patient, on dental management;
46. Obtain a detailed dental history to include chief complaint and history of present illness;
47. Make a general evaluation of a patient's appearance, including the identification of abnormalities in their physical, emotional or mental status;
48. Recognise signs of physical, emotional and substance abuse and seek advice from appropriate authorities;
49. Perform a physical and oral examination to include head and neck, oral hard and soft tissues, vital signs, and recognise disease states and abnormalities including detrimental oral habits:
50. Establish and maintain accurate patient records;

Oral radiology

51. Prescribe, take and process appropriate intra-oral and dental panoramic radiographs;
52. Derive diagnoses by interpreting and relating findings from the history, clinical and radiographic examinations and other diagnostic tests;

Treatment planning

53. Identify patient expectations and goals for oral care;
54. Develop, present and discuss prioritised individual treatment options for patients of all ages, including the integrated treatment by PCDs and the need for referral to a specialist;
55. Explain and discuss the patient's responsibilities and time requirements;
56. Use their knowledge of the properties of modern dental materials to select and use appropriate materials for treatment;
57. Manage circumstances where the patient's wishes are considered by the dental team not to be in his/her best interests.

Establishment and Maintenance of a Healthy Oral Environment

Anxiety, pain control and sedation

58. Recognise the common signs and symptoms of oro-facial pain, anxiety and apprehension;
59. Assess the level of anxiety in adult and child patients and have experience of using recognised psychological inventories;
60. Use local analgesia for pain management and recognise and manage potential complications relating to its use;
61. Assess patients for and inform patients or guardians of the indications, contraindications, limitations, risks and benefits of conscious sedation and general anaesthesia;
62. Manage fear and anxiety with behavioural techniques and, when appropriate, with conscious sedation techniques;

Dental emergencies

63. Identify and manage dental emergencies and appropriately refer those that are beyond the scope of management by a primary care dentist;

Dental caries and tooth surface loss - the restoration of teeth

64. Assess patient risk for dental caries and non-bacterial tooth surface loss and be able to provide dietary counselling and nutritional education for the patient relevant to oral health and disease, based upon knowledge of disease patterns and aetiology;
65. Restore teeth to form, function and appearance with appropriate materials, using techniques that preserve the health of the pulp and avoid the unnecessary loss of tooth tissues;

Appendix H.II: The QAA Benchmark Statements for Dentistry

Endodontics

66. Manage diseases and conditions involving the pulpal and periradicular tissues in both primary and permanent teeth;

Prosthodontics

67. Manage and integrate the procedures necessary to provide biocompatible, functional and aesthetic dental prostheses (fixed and removable) in sympathy with patient requirements or needs;

Occlusion

68. Apply their knowledge of functional occlusion in health and disease to manage the aetiological factors associated with the disordered occlusion;

Oral medicine, oral pathology and oral surgery

69. Manage patients with facial pain, disease and disorders of the oral cavity and associated structures, including a recognition of when it is appropriate to refer for specialist help and advice;
70. Manage basic dento-alveolar surgical procedures, including intra- and post-operative complications and recognise when it is appropriate to refer for specialist help and advice;
71. Understand the importance of and procedures for submitting specimens for laboratory diagnosis and demonstrate the ability to interpret diagnostic reports;

Orthodontics

72. Recognise abnormalities of facial growth and development in dental patients and arrange appropriate management of such disorders either within the dental practice or by referral to the relevant specialist;

Paediatric dentistry

73. Manage the oral health of children and adolescents and perform treatment for them in a manner that incorporates consideration for their expected growth and development, involving parents or guardians as required;

Periodontics

74. Manage the health and care of the supporting structures of the teeth;

Therapeutics

75. Recommend and prescribe appropriately pharmaco-therapeutic agents, monitor their effectiveness and safety, and be aware of drug interactions;

Special needs

76. Recognise their duty of care to manage the oral health of the patient with special needs (including the additional considerations for the dental team) and involve the patient's carer where appropriate;
77. Manage the dental health care needs of those who may be considered to be socially excluded.

Working environment

Health and safety/infection control

78. Adhere to health and safety legislation as it affects dental practice;
79. Understand the legal basis of radiographic practice;
80. Implement and perform satisfactory infection control and prevent physical, chemical or microbiological contamination in the practice of dentistry;

Source: QAA (2002, par. 3)

81. Arrange and use the working practice environment in the most safe and efficient manner for all staff and patients;

Medical conditions and emergencies

82. Evaluate patients for fitness to undergo routine dental care, modify treatment plans to take account of general medical status, and recognise those patients who are beyond the scope of their management;
83. Provide basic life support for medical emergencies.

Source: QAA (2002, par. 3)

Appendix H.III: The Welsh Dental School Competence Statements

Professionalism

Professional Behaviour & Relationships, Behavioural Science & Communication

1 Practice with personal and professional integrity
2 Communicate effectively with patients, colleagues and staff using verbal, written and non-verbal skills including being able to negotiate and give and receive constructive criticism
3 Display appropriate caring behaviour towards patients
4 Display appropriate professional behaviour towards all members of the dental team
5 Describe the role of psychological development in patient management and utilise behavioural factors that facilitate the delivery of dental care
6 Recognise the responsibility and demonstrate the ability to share information and professional knowledge verbally and in writing
7 Apply principles of stress management to their own behaviour and their patients, as appropriate.

Ethics, Law and Forensic Dentistry

8 Manage the ethical issues that arise in dental practice
9 Provide empathetic care for all patients, including members of diverse and vulnerable populations respecting the principle of patient autonomy
10 Recognise and take appropriate action to help the incompetent, impaired or unethical colleague and their patients
11 Apply the principles of jurisprudence to the practice of dentistry. Understand the needs and principles of forensic dentistry
12 Understand the implications of and be able to obtain informed consent
13 Understand the ethical and legal basis of confidentiality including the need to maintain accurate and complete patient records in a confidential manner, understanding their importance for forensic dentistry
14 Understand the role, functions and guidance issued by the GDC and dental defence organisations for the legal and ethical practice of dentistry

Information Appraisal and Technology – Critical Skills

15 Acquire, analyse, evaluate and communicate information derived from primary written and electronic sources in a scientific, critical and effective manner and attempt to solve relevant problems and enhance patient wellbeing
16 Evaluate the validity of claims related to products and techniques
17 Use information technology that supports the practice of dentistry

Becoming a Reflective Dental Practitioner

18 Identify the role of lifelong learning and critical thinking in maintaining competency recognising the importance of professional development and knowledge base, and seek additional information to correct deficiencies
19 Discharge obligations incumbent upon every professional including personal contributions to and support for the profession's collective initiatives in self-regulation, maintenance of standards, and advancement of professional knowledge and expertise
20 Regularly assess personal progress, including the identification of strengths and deficiencies
21 Evaluate all treatment outcomes including the unexpected and provide remedial action where appropriate
22 Recognise and fulfil their responsibilities both as adult learners and as teachers
23 Describe principles of peer review and quality assurance in dental practice

Source: UWCM Dental School (2001).

Appendix H.III: The Welsh Dental School Competence Statements

Health Promotion

24 Evaluate social and economic trends and their impact on oral health care
25 Describe their role in and responsibilities for improving the health of the community through treatment, education, strategies and services
26 Understand the health care system in which they will work
27 Understand the pattern of oral disease in society and how disease may be prevented and treated at a population level.

Assessment of the Patient and Oral Environment

Dental Bioscience

28 Demonstrate a knowledge and understanding of structures and function of normal relevant human anatomy, craniofacial anatomy, oral and dental anatomy
29 Recognise and describe the changes that occur with normal growth and ageing, and the age changes that occur in the oral environment
30 Demonstrate knowledge and understanding of the principles of oral physiology
31 Demonstrate knowledge and understanding of aetiology and principles of molecular, biological and metabolic processes, pathogenesis, and genetic disturbance in understanding oral and dental diseases
32 Demonstrate knowledge and understanding of the form and structure of the teeth, their occlusal and functional relations and associated tissues

History, Examination, Records & Investigation

33 Obtain and record an accurate medical history, which identifies both the possible effects of dental disease on medical well-being and the medical conditions that affect dental care
34 Access and appraise contemporary information on the significance and effect on dental management of drugs and other medicaments taken by the patient
35 Obtain and record an accurate dental history to include chief complaint and history of present illness
36 Make a general evaluation of a patient's appearance including the identification of any abnormality of their physical, emotional or mental status
37 Recognise signs of physical, emotional and substance abuse and/or neglect, and seek help and advice from the appropriate authorities
38 Perform a physical and oral examination to include head and neck, oral hard and soft tissues, vital signs, and recognise disease states and abnormalities or deviations from normal including detrimental oral habits
39 Establish and maintain accurate dental records
40 Prescribe and perform (including exposing and processing) appropriate simple intra- and extra-oral radiographic examinations
41 Derive diagnoses by interpreting and relating findings from the history, clinical and radiographic examination and other appropriate diagnostic tests and developing a problem list of conditions and disorders requiring management

Establishment and Maintenance of a Healthy Oral Environment

Treatment Planning

42 Identify patient expectations and goals for oral care
43 Using all relevant diagnostic data, develop, present, and discuss appropriate prioritised individual treatment options for patients of all ages, including the integration of specialist practitioners and of professionals complementary to dentistry (PCDs)
44 Explain and discuss the patient's responsibilities and timer requirements

Source: UWCM Dental School (2001).

45 Modify treatment plans if indicated
46 Manage circumstances where the patient's wishes are not in their best interest
47 Recognise their limitations of expertise and to refer patients appropriately and to communicate with peers, specialists practitioners, consultants and PCDs

Anxiety, Pain Control & Sedation

48 Recognise common signs and symptoms of oro-facial pain, anxiety and apprehension
49 Use local analgesia for pain management and recognise and manage potential complications relating to its use
50 Assess patients for and inform patients/guardians of the indications , contraindications, limitations, risks and benefits of conscious sedation and general anaesthesia
51 Manage fear and anxiety with behavioural techniques, and when appropriate, with sedation techniques

Cariology

52 Assess patient risk for caries and be able to provide dietary counselling and nutritional education relevant to oral health and disease for the patient, based upon knowledge of caries aetiology and disease patterns.
53 Remove or treat carious tooth structure using appropriate techniques that maintain pulp vitality, avoid unnecessary destruction of tissue and restore the tooth to form, function and aesthetics with appropriate materials

Dental Emergencies

54 Identify and manage dental emergencies and promptly and appropriately refer those that are beyond the scope of management by a general dentist

Endodontics

55 Mange diseases and conditions (including dental trauma) of pulpal and periradicular origin in deciduous and permanent teeth.

Fixed and Removable Prosthodontics (FARP)

56 Manage and integrate the process necessary to provide biocompatible, functional and aesthetic dental restorations and prostheses in sympathy with patient requirements or needs.

Gnathology

57 Demonstrate an understanding of the role of functional occlusion in health and disease and be able to manage the aetiological factors associated with disordered occlusion.

Oral Medicine

58 Manage patients with facial, orofacial mucosal disorders and pain, and recognise the need for appropriate referral.

Oral Surgery and Maxillofacial Surgery

59 Manage basic dento-alveolar surgical procedures including intra- and post-operative complications.

Orthodontics

60 Recognise patients exhibiting abnormalities of growth and development, and manage those requiring orthodontic treatment, or appropriate onward referral.

Source: UWCM Dental School (2001).

Appendix H.III: The Welsh Dental School Competence Statements

Paediatric Dentistry

61 Manage the oral health of children and adolescents who need assistance with oral care and perform treatment for children in a manner that incorporates consideration of their expected growth and development, involving parent and guardians as required.

Periodontology

62 Manage the health and care of the supporting structures of the teeth.

Pharmacology

63 Recognise and prescribe appropriately pharmaco-therapeutic agents and monitor their effectiveness.

Prevention

64 Recognise predisposing and aetiologic factors that require intervention to prevent disease

65 Assess the need for and provide appropriate preventive procedures that incorporate sound biological principles in order to preserve hard/soft tissues, prevent disease and promote health, including topical and systemic therapeutic agents and modalities as well as instruction in mechanical oral health methods.

Special Needs

66 Recognise their duty of care to manage the oral health of the patient with special needs, (including the additional considerations for the dental team) and involving the patient's carer where appropriate

Working Environment

Health & Safety, Cross Infection

67 Be aware of Health and Safety legislation as it may affect the practice of dentistry

68 Understanding the legal basis of radiological practice, including POPUMET principles

69 Perform satisfactory cross infection control and prevention of physical, chemical or microbiological contamination in the practice of dentistry and explain and demonstrate these to staff and patients

70 Arrange and utilise working environments in the most ergonomically effective and efficient manner to maximum advantage for dentist, professionals complementary to dentistry and patient.

Team Approach

71 Work as part of a dental team, taking responsibility, where appropriate, for management, motivation and leadership

Medical Conditions, Medical Emergencies, CPR & First Aid

72 Provide effective basic life support for medical emergencies, including the ability to establish a patent airway, implement cardiopulmonary resuscitation and control bleeding when indicated and identify and promptly refer those that are beyond the scope of management by a general dentist.

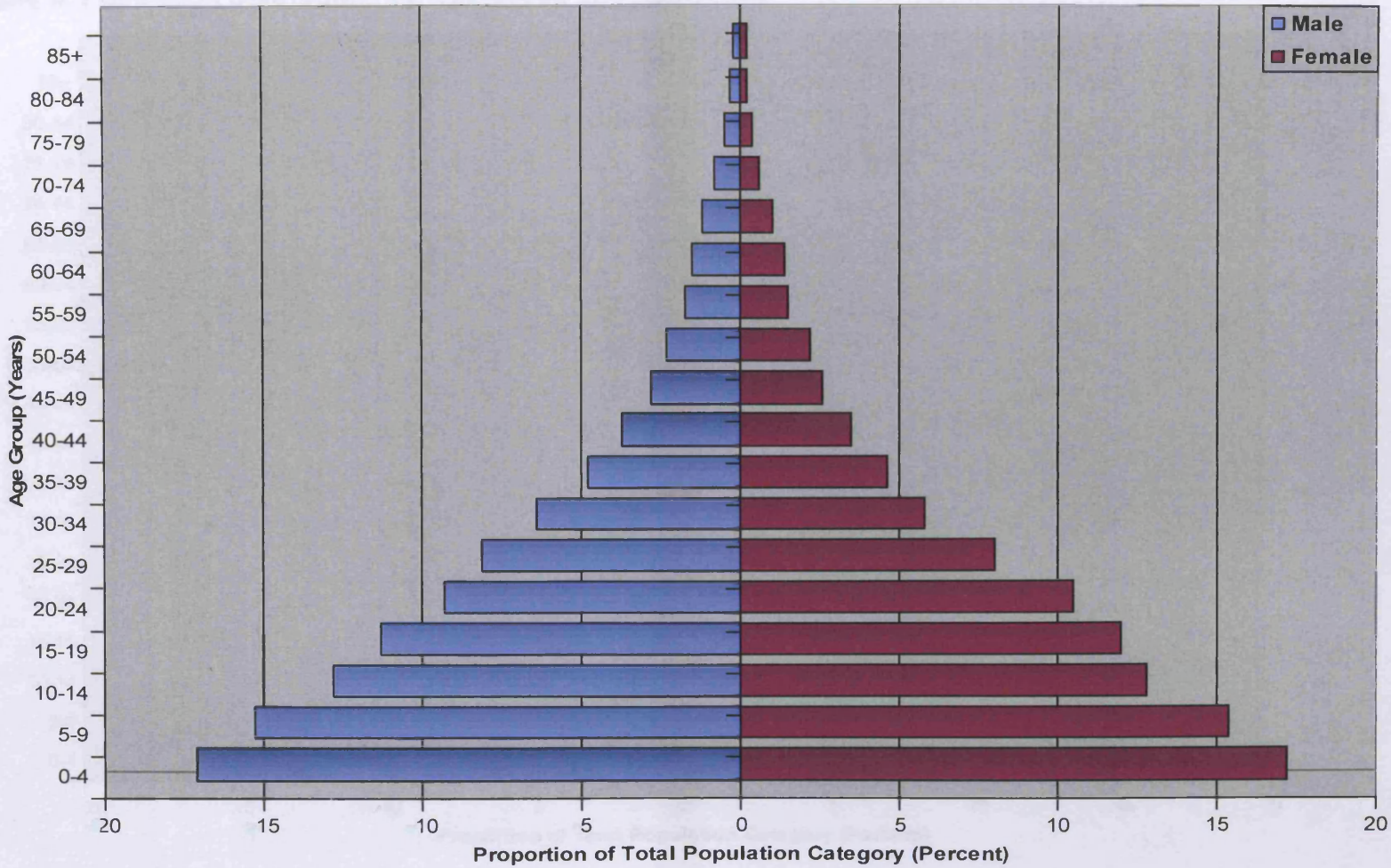
Source: UWCM Dental School (2001).

Appendix I: Welsh Dental School Outreach Teaching Sites

	Location	Number of Surgeries
Cardiff City	St David's Community Hospital – Primary Dental Care Unit	14 chairs
	Pontypridd Community Dental Service (CDS) Centre	3 surgeries
	Roath CDS Centre	2 surgeries
	Park View CDS Centre, Ely	2 surgeries
	Splott CDS Centre	2 surgeries
	Tonypandy CDS Centre	2 surgeries
	Broad St CDS Centre, Barry	2 surgeries
	Llanedeyrn CDS Centre	1 surgery
	Grangetown CDS Centre	1 surgery
Merthyr Tydfil	The Hollies Community Dental Surgery	6 surgeries
	Prince Charles Hospital	4 chairs
North Wales	Wrexham CDS Centre	7 surgeries

Appendix J: Zambia Population Distribution, 2000

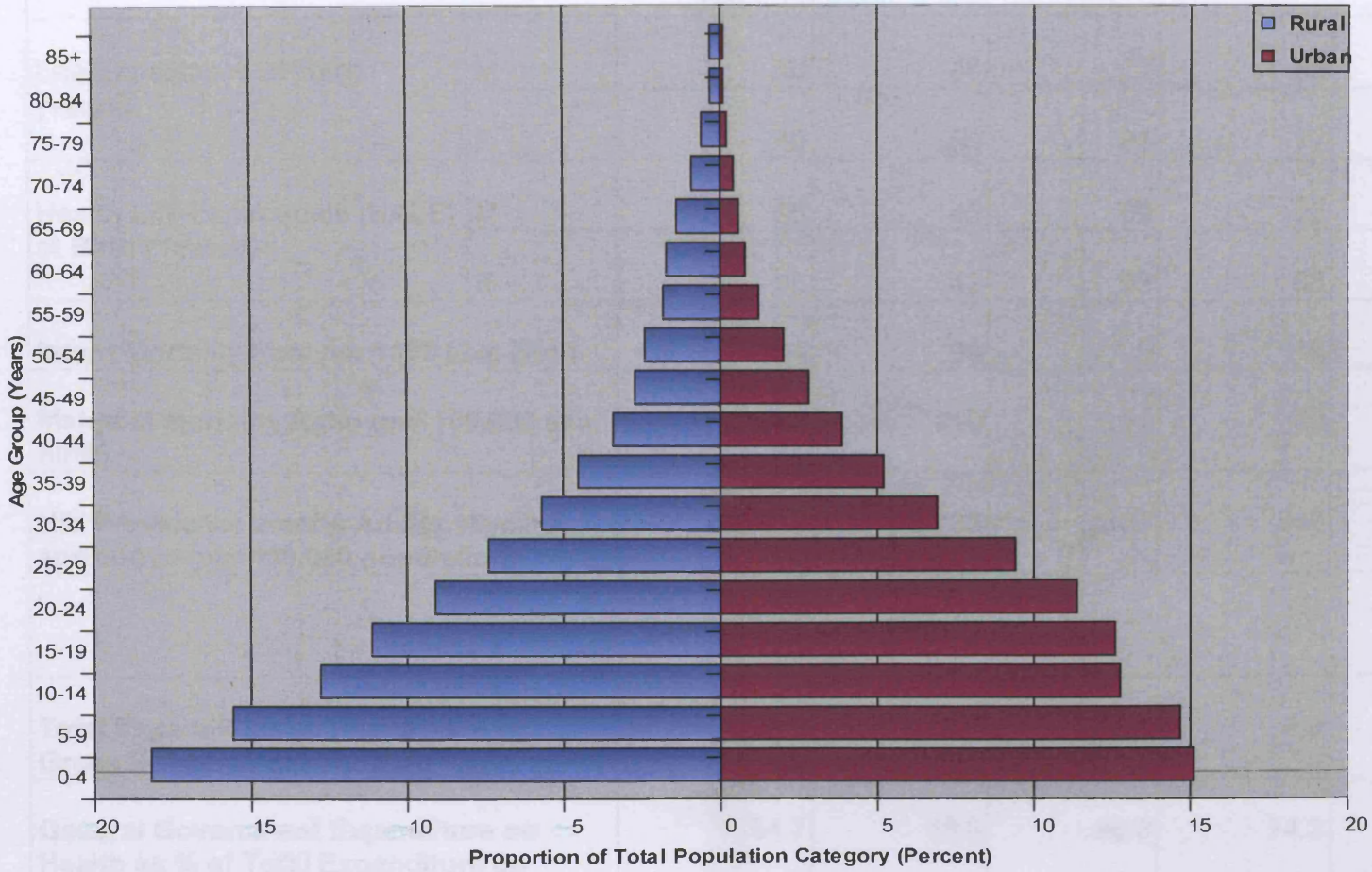
Figure I: Population Distribution by Age –Group and Sex



Source: Central Statistics Office, 2000 Censuses of Population and Housing

Appendix J: Zambia Population Distribution, 2000

Figure II: Population Distribution by Age-Group and Residence



Source: Central Statistics Office, 2000 Censuses of Population and Housing

Appendix K: Zambia Basic Indicators

Indicator		Zambia	Africa	UK	Europe	Global
I. Health Status						
Life Expectance at Birth (Years)	M	40	48	77	69	64
	F	40	50	81	77	68
Health Life Expectance (HALE) at Birth (Years)	M	35	40	69	62	56
	F	35	42	72	68	59
Infant Mortality Rate per 1000 Live Birth		104	99	5	16	51
Maternal Mortality Ratio (per 100,000 live birth)		750	910	11	39	400
HIV Prevalence among Adults 15years and above (per 100,000 population)		15,819	5,736	137	347	803
II. Expenditure on Health						
Total Expenditure on Health as % of Gross Domestic Expenditure		6.3	6.0	8.1	8.6	8.7
General Government Expenditure on Health as % of Total Expenditure on Health		54.7	43.9	86.3	74.2	55.9

Appendix K: Zambia Basic Indicators

Indicator		Zambia	Africa	UK	Europe	Global
General Government Expenditure on Health as % of Total Government Expenditure		12.8	8.8	15.9	14.3	14.3
External Resource for Health as % of Total Expenditure on Health		36.3	9.2	0.0	0.1	--
Per capita Total Expenditure on Health at International Dollar Rate		63	108	2,560	1,564	--
Per capita Government Expenditure on Health at International Dollar rate		34	47	2,209	1,161	
III. Human Resource for Health						
Physicians	(Number)	1,264	150,708	133,641	2,810,063	7,682,990
	(Density/1,000 pop.)	0.12	0.21	2.30	3.20	1.23
Dentists	(Number)	44[a]	23,964	58,729	450,624	1,809,901
	(Density/1,000 pop.)	0.00	0.03	1.01	0.52	0.29
Nurses	(Number)	16,990	663,942	704,332	6,529,455	16,037,307
	(Density/1,000 pop.)	1.56	0.93	12.12	7.43	2.56

Appendix K: Zambia Basic Indicators

Indicator	Zambia	Africa	UK	Europe	Global
IV. Demographic and Socioeconomic Indicators					
Total Population ('000) 2005	11,668	738,083	59,668	893,200	6,463,605
Population in Urban Areas (% of Pop)	35	36	90	69	49
Gross National Income per capita (PPP Int $)	950	2,231	32,690	18,887	9,420
Population Living Below Poverty Line (% Living on less than US$ 1 per day)	75.8	--	--	--	--

Source: World Health Statistics at: http://www.who.int/whosis/whostat2007.pdf