University of KwaZulu-Natal

Pedagogical practices of lecturers in pharmacy education

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Declaration

I, Vanessa Singh declare that

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Dedication

This thesis is dedicated to my loving sister, Sandy!

You no longer walk this earth in the physical form we knew but you will live in our hearts and minds forever!

In loving memory

Sandhaya Singh

(9 December 1971 – 19 June 2015)

Hope and courage were only words till I met you! You had unbelievable strength, an amazing fighting spirit and bravery beyond human imagination. Despite your battle with cancer, you always greeted the world with a smiley face and positive attitude, which shone through the darkest of times. We will always remember you, my sister, for your heart, compassion and love.

We will forever miss you!
More than all the stars that stretch across the sky,
More than all the drops of water that covers the ocean and the earth!
We have loved you all the days of your life and
Will love you all the days of ours!

To my family

You have inspired me through life, sacrificed for me & always rescued me!
For your endless love, belief & support, I am eternally grateful!

My parents: Ishwar and Jenny
More than giving me life, you have given me everything in life.
If men are grains of sand, then my parents you are grains of gold!

To my brothers: Sandesh and Akash
Thank you for your endless support and assistance.

To my Aryanna
Thank you for being our angel, for the laughs and smiles and for being our sunshine through the rain.

Cujo, Bruno and Joey:
You have been beside me every step or paw of this journey, I am ever so grateful for your bright eyes, endless love and affection.

In loving memory of my children

Gino (1998-2012) and Joey (2005-2015)
I use to carry you in my arms, now I can only carry you in my heart!

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Abstract

The roles and responsibilities of pharmacists have evolved to become more clinical and professional which has implications for pharmacy education and academics' pedagogical practices. This study explores the pedagogical practices of academics across the undergraduate pharmacy curricula at the University of KwaZulu-Natal (UKZN), observing, exploring and describing practices with the aim of understanding the rationale for their use. Pedagogical practices are shaped by influences emanating within and beyond pharmacy education at UKZN, from regulatory boards to chalk boards, with the emphasis on the latter in this study. This qualitative research, viewed through the lense of social realism and interpretivism, focuses on pedagogical practices within the pharmacy majors: pharmacology, pharmaceutics, pharmaceutical chemistry and pharmacy care. The study reveals pedagogical similarities and differences amongst and between pharmacy majors and academic years of study and how disciplines, content, knowledge, skills, competencies, values, personal attributes and the profession are inextricably linked.

Case-based learning (CBL) is used within several third and fourth year pharmacy majors, and a move towards integration and interprofessional learning (IPL) also emerges. This research contributes to an understanding of pharmacy academics' practices within a developing context, exploring the underlying structure of pharmacy knowledge, curricula, teaching approaches and strategies and assessment. Pharmacy academics play a crucial role in the process of developing students through education and training to become professional pharmacists and are therefore the focus of this enquiry. Future research endeavours can explore the structure, sequencing and integration of interdisciplinary knowledge and pedagogical approaches, expanding and deepening the understanding of academics' pedagogical practices within professional curricula.

Abbreviations and Acronyms

AACP	**American Association of Colleges of Pharmacy**
ACPE	**Accreditation Council for Pharmacy Education**
AICTE	**All India Council for Technical Education**
B. Pharm	**Bachelor of Pharmacy degree**
C	**Classification**
CanMeds	**Canadian Medical Education Directions for Specialists**
CBL	**Case-based learning**
CCFOs	**Critical cross-field outcomes**
CHE	**Council on Higher Education**
CNS	**Central nervous system**
DoH	**Department of Health**
DoHET	**Department of Higher Education and Training**
ENT	**Ears, nose and throat**
ETQA	**Educationa and Training Quality Assurer**
F	**Framing**
FIP	**International Pharmaceutical Federation**
FIPEd	**International Pharmaceutical Federation Education Initiative**
GIT	**Gastrointestinal tract**
IPE	**Interprofessional education**
IPL	**Interprofessional learning**
IPPE	**Introductory Pharmacy Practice Experiences**
LCT	**Legitimation Code Theory**
OHP	**Overhead projector**
PBL	**Problem-based learning**
PCI	**Pharmacy Council of India**
PET	**Pharmacy Education Taskforce**
PHRM	**Pharmacology**
PLT	**Principle laboratory technician**
SAPC	**South African Pharmacy Council**
SAQA	**South African Qualifications Authority**

SD	**Semantic density**
SG	**Semantic gravity**
SGB	**Standards Generating Body**
SMU	**Sefako Makgatho Health Sciences University**
SOAPE	**Subjective/Objective/Assessment/Plan/Education**
TBL	**Team-based learning**
TUT	**Tshwane University of Technology**
UKZN	**University of KwaZulu-Natal**
UN	**United Nations**
UNESCO	**United Nations Educational Scientific and Cultural Organisation**
NMMU	**Nelson Mandela Metropolitan University**
UWC	**University of Western Cape**
WHO	**World Health Organisation**
WITS	**University of Witwatersrand**

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Chapter 1
Introduction and background

1.1 Introduction

> *The nature of professional knowledge has escaped scholarly notice, and when spoken about at all, is spoken about in terms of professional expert judgment, and what professionals can do with the knowledge. What the knowledge is that professionals have had to acquire to be experts has, by and large, eluded scholarly attention.*
>
> (Young & Muller, 2014, p. 5)

Health professions serve society by addressing the needs of society and individual patients throughout the world (Fitzgerald, Pinto & Kos, 2007). Historically professionalism was characterised by the demonstration of esoteric knowledge and expertise but also encompassed commitment to moral, ethical and social codes of conduct. Professions were viewed as fulfilling a calling with professionalism depicting a way of life rather just simply serving as employment (Grace, 2014). Several decades ago, Barnett, Becher and Cork (1987) described pharmacy as one of the caring professions. The role of professional pharmacists extends beyond the design, development and production of pharmaceutical products to patient care (Fitzgerald et al., 2007). Today the clinical role of pharmacists places an emphasis on direct patient care and their involvement in issues of drug therapy reiterates this. In order for pharmacists to advance science and improve patients' lives, they require sound education and training (Anderson et al., 2012). Waterfield (2010) highlighted how knowledge and professionalism are inaccessible without the appropriate training and experience. The professional orientation of pharmacy places an obligation on pharmacy education to react to professional and social change in terms of the graduates it produces and the learning objectives within the curriculum[1] in the face of pharmacists' evolving roles and responsibilities (Fitzgerald et al., 2007). A similar point was raised by Grace (2014) regarding the commitment of professions and their broader macro-social function.

[1] Curriculum in higher education is defined as per Hubball and Gold (2007) as a contextually-bound and coherent programme of study (e.g. a B. Pharm degree), which is comprised of multiple integrated and progressively challenging course learning experiences which are carefully designed to develop students' knowledge, abilities and skills.

As Young and Muller (2014) pointed out, little attention is paid to the aspect of scholarly knowledge itself, therefore warranting a study of this nature, which explores the knowledge within Pharmacy. It also explores the pedagogical practices academics employ in the process of making this knowledge accessible and understandable. Maton and Moore (2010) pointed out that research and policy in education neglects the role knowledge plays, with Maton (2013) going so far as describing this phenomenon as "knowledge-blindness" in educational contexts (Matruglio, Maton & Martin, 2013, p. 39). In this study the knowledge analysed, described and categorised in the latter years (years three and four) of the pharmacy curriculum can be described as ''pedagogized knowledge'' on the basis of it being acquired in educational contexts (Bennett & Maton, 2010, p. 327). This type of knowledge demonstrates features of being selected and re-arranged into a particular sequence within a curriculum that is recontextualised[2] within teaching and learning contexts (Bennett & Maton, 2010). Bernstein (1975) referred to this knowledge as educational knowledge (Shay, 2011), while Young (2010) referred to knowledge selected in the curriculum and based on specialised knowledge, as curriculum re-contextualisation.

On the issue of understanding knowledge in the context of developing professions and with regard to specialised knowledge, Young and Muller (2010) pointed out that understanding why certain forms of knowledge move towards specialisation, while others tend towards diversification and variation, will be one of the most crucial points about knowledge in the future. They went on to make the point that these:

> *Different tendencies in the development of knowledge have critical implications for the curriculum and education more generally. The first tendency poses questions about sequence, pace, and hierarchical organisation, whereas the latter poses questions predominantly of choice, what to include in the curriculum and at its extremes, of the absence of any objective criteria at all.*
>
> (Young & Muller 2010, p. 20)

[2] Recontextualisation in this context is as per Bernstein (2000). In essence recontextualisation refers to the ways in which theoretical knowledge changes as it is used and understood in different contexts by different people or groups of people. Although Bernstein's (2000) reference pertained largely to a schooling context, this concept is also relevant to higher education as numerous studies have used his work in Higher Education.

With regard to the first tendency of the effect on sequencing, pace and hierarchical organisation, the use of Bernstein's (2000) work in this study contributes to an understanding of pharmacy academics' pedagogical practices. While Bernstein's theories were originally widely applied to schooling, there are growing trends of its use in higher institutions across the world, filtering through different disciplinary areas such as history (Shay, 2011), sociology (Luckett, 2009), design (Carvalho, Dong & Maton, 2009), engineering (Case, 2011) and medicine (Sommerville 2012).

Case (2011) distinguished between curriculum knowledge and disciplinary knowledge, which are often mistaken as one in and the same. Bernstein's (2000) pedagogic device serves to clear this misconception by highlighting the different knowledge forms that exist and the fields in which they are located within the device (Case 2011). Disciplinary knowledge is in the field of production and takes the form of research and scholarship, whereas curriculum knowledge functions in the field of recontextualisation. According to Luckett (2009), in the process of creating a curriculum for students[3], knowledge in the field of recontextualisation gets relocated from the field of knowledge production. Curriculum knowledge is therefore subjected to selection and repackaging processes but is not a replication of disciplinary knowledge. Bernstein (1975) defined curriculum as what counts as valid knowledge. Pedagogy[4], which functions in the field of reproduction, is defined as what counts as the valid transmission of knowledge (Shay, 2011). Allan and Smith (2010, p. 476) defined pedagogy as ''the educational or instructional approach used to develop knowledge which can occur in many different settings''. Evaluation, which also takes place in the field of reproduction, is defined as what counts as valid realisation of this knowledge on the part of the student (Bernstein, 1975, as cited in Shay, 2011, p. 85). Therefore, according to Bernstein (1975), educational knowledge takes place through three message systems: curriculum, pedagogy and evaluation. These occur in the fields of recontextualisation and reproduction. Each of the above mentioned fields are guided by a set of rules which inform the journey that knowledge takes, in terms of what is privileged and what happens to this knowledge as it undergoes

[3]The term "students" are generally used in the dissertation, however, the term "learners" also appears, particularly as part of direct quotations from other authors, data sources such as the College of Health Sciences Handbook or student lecture notes, and in the mention of life-long learners.
[4] Pedagogy is not restricted to the process of transmission of knowledge but includes knowledge as well.

recontextualisation into curriculum and is transmitted through pedagogy and assessment (Shay, 2011). Bernstein's (2000) pedagogic device, therefore, provides a theoretical tool for understanding how knowledge is transformed into pedagogy and is therefore extremely valuable in understanding pharmacy curriculum knowledge and its subsequent transformation into pedagogy, which characterises this research.

On the issue of what to include in the curriculum, Guile (2014) highlighted that in professional curricula, once consensus is reached regarding what knowledge is, this knowledge and the concepts take on a new role as emphasis is placed on developing the professional rather than immersing students in the discipline itself. In developing the professional through education and training, there is no escaping a discussion about the theoretical knowledge and practical application that make up the professional curriculum and the relationship or form it takes. This opens up conversations about how the parts of the professional curriculum come together as a whole. Durkheim (1983) and Young (2008) argued that "differentiating between knowledge and experience and between theoretical and everyday knowledge are the most fundamental conditions for acquiring and producing new knowledge" Young, 2010, p. 30).

Young and Muller (2014), however, pointed out that there is no clear resolution to distinguishing between terminology such as knowledge and expertise in the context of professionals. They believed that both are essential components of professional development: specialised knowledge (commonly referred to as "know what") and practical expertise ("know how"). These are also often referred to in terms of abstract or theoretical knowledge and applied knowledge, or by some as theory and practice (Young & Muller, 2014). The relationship between these two, the emphasis or value placed on each, and how learning takes place in each and between them, has long been debated. Often they have been thought of as separate entities where knowledge is transferred or applied from one context to the next.

Allan and Smith (2010), however, argued against knowledge being viewed as transferred, believing this to be an outdated concept. Instead they argued for emphasis on how knowledge learnt in one context (academia) is being recontextualised in another (world of work). Guile (2014) expanded on the notion of recontextualisation

and the relationship between theoretical and practical forms of knowledge. While they can be seen as analytically separate, they demonstrate what he called a "mediated relationship" which he referred to as "commingling" instead of the moving between separate conceptual and practical spheres (Guile, 2014, p. 81). Guile's (2014) work is in the field of pharmacy, but in illustrating how professionals diagnose patients in work-place settings, he describes the process using a medical example:

> *My preferred way of expressing this process is to say that doctors are making conceptually-structured professional (i.e., practical) judgments in context-specific circumstances, rather than applying their theoretical knowledge practically or taking practical decisions that lack any conceptual content.*
>
> (Guile, 2014, p. 81)

Abbott (1988) described diagnosis and treatment as a two-way process where diagnosis takes information into the professional knowledge system and treatment brings information back into the system. Shulman (1998) also spoke about a movement between theoretical knowledge and practical clinical knowledge, highlighting that professional development goes beyond simply an issue of content or practice but is much deeper. He stated that:

> *The responsibility of the developing professional is not simply to apply what he or she has learned to practice but to transform, adapt, merge and synthesise, criticise, and invent in order to move from the theoretical and research-based knowledge of the academy to the kind of practical clinical knowledge needed to engage in professional work.*
>
> (Shulman, 1998, p. 519)

Understanding knowledge and its structures are important because it has implications for how the curriculum is designed, the pedagogies used and assessments implemented. In designing a professional curriculum, Winch (2014) called for the inclusion of both internal aims of the professions (such as skills, knowledge, transversal abilities[5], virtues and project-management) as well as external aims (civic dimensions, awareness and commitment that the profession embodies).

[5] Transversal abilities, as defined by Winch (2014) where he differentiated between skills and abilities, is a distinction which is not made easily in the English language, thus he used German concepts to therefore distinguish between them. Abilities speak independently to skill in this context, whereas ability is intrinsic.

Young (2010, p. 25) distinguished between curriculum and pedagogy, stating that "curriculum should exclude the everyday knowledge of students, whereas that knowledge is a resource for the pedagogic work of teachers. Students do not come to school to learn what they already know". Case (2011) distinguished between pedagogies which allow students to make the link between professional disciplinary knowledge such as in engineering and the "real world", however made it clear that it is not the same as using the real world as an organising frame for the curriculum. Maton's (2013) contribution to semantics speaks to this pedagogic process at times when everyday knowledge is used in the process of explaining abstract and theoretical knowledge, offering insights into this study. Maton (2013) highlighted the interaction between theoretical and everyday knowledge and the implications these have in terms of cumulative[6] and segmented[7] learning. Understanding semantic profiles and waves[8] can provide the tools for understanding knowledge structures and pedagogy, moving towards extending knowledge beyond contexts and fostering cumulative learning.

Pharmacy academics in their role as educators[9] stand between past contexts and future contexts as they relate current learning to prior learning and future learning (Bennett & Maton, 2010). Shulman (1987) highlighted knowledge academics or educators need, which includes knowledge about learning, and how to think about learning, the various forms of material for different purposes, and how to select which kinds of learning are most suitable in a particular context. In addition academics need to find optimal ways of enhancing the acquisition and development of this knowledge and presenting and communicating it to students (Shulman, 1986). At an institutional level, academics are required to prepare pharmacy students to deal with the changing world, yet Shulman's (1998) work on signature pedagogies indicates that a mode of teaching is inextricably linked with preparing people for a specific profession. Signature pedagogies are not unchanging and while they may appear to be static, they are subjected to change as circumstances in the practice of the profession and in institutions that cater for these professional services undergo larger societal change

[6] Cumulative learning allows for learning beyond the everyday and is not context dependent.
[7] In cases of segmented learning, knowledge is typically locked in its context, and meaning beyond this everyday context is restricted.
[8] Semantic waves are the movements of semantic gravity and density (Macnaught, Maton, Martin & Matruglio, 2013).
[9] Educators refers to Pharmacy academics in their teaching role and does not pertain to formal training as educators.

(Shulman, 2005b). Such changes are reflected in the FIP Education Global Report 2013, which calls for undergraduate pharmacy students to be taught with new methodologies in order to prepare them for dealing with everyday problems in a multi-disciplinary approach. An understanding of the knowledge structures and pedagogies implemented within pharmacy education is therefore necessary to avoid any risks of a mismatch between curriculum knowledge and pedagogy.

1.2 Aims and objectives of the study

This study aims to contribute to an understanding of pharmacy academics' pedagogical practices in observing years three and four of the professional qualification (B. Pharm degree). The study also aims to describe knowledge structures encountered as well as explore the pedagogical practices of pharmacy academics that make this knowledge accessible. As knowledge in the field of pharmacy and pharmaceuticals changes with time, this drives academics to explore and expand their pedagogical practices (Asiri, 2011). An understanding of the pharmacy curriculum and pharmacy academics' pedagogical practices is therefore extremely crucial for preparing future pharmacists. It is hoped that this research will advance the gaze on professional knowledge, contributing to the gap that has previously escaped scholarly notice (Young & Muller, 2014). This research is guided by the following critical questions:

Critical Questions

1. What are the pedagogical practices of pharmacy academics[10] at UKZN?
2. Why do pharmacy academics use the pedagogical practices that they do?

1.3 Origins of the study

This PhD was founded in my passion to understand more about teaching and learning in a higher education context, in which I have worked for numerous years. Health sciences, pharmacy in particular, was selected as my area of investigation because as an academic and a scholar in the sciences and humanities, I found the study of a professional qualification encompassing both applied and social sciences through an educational lens fascinating. Teaching and learning in a professional programme, such

[10] Academics and lecturers will be used interchangeably throughout the dissertation. 'Lecturer' is also intended for the purpose of the profession and includes all academic positions, from lecturer to professor and is not indicative of academic status or position within the institution.

as pharmacy, is a field of great intrigue, a place of conversion and diversion, of complexity and a series of webs of relationships and interactions. It is a place where science and humanities coexist in the curricula in preparing professionals for their roles in patient care and in society. This study uses a humanities lens and takes a closer look at the sciences, applied sciences and human and behavioural components that make up pharmacy education. My background is not in pharmacy but my foundations in education and postgraduate studies in biology, along with my passion for teaching and learning, led me to this new and exciting field.

In the process of teaching and learning and the commercial venture it has become, focus is generally placed on the product in the form of the students and what they should "possess" when they leave their academic institutions and take their place in the working environment. As an academic, I wanted to contribute to this area of research, which seeks to understand knowledge within the professional curriculum and its process of transformation where academics mediate knowledge from one field to another, making it accessible in numerous ways.

1.4 Context: Pharmacy education in South Africa and at UKZN

The South African Pharmacy Council (SAPC) is a statutory, regulating body tasked with the mandate of inter alia the quality of pharmaceutical services and education and training in South Africa. It was established in terms of the Pharmacy Act of 1974 (Act 53 of 1974) and its role includes ensuring universally acceptable educational standards, professional ethics and conduct, on-going competence and pharmaceutical care as well as accrediting service providers[11]. The SAPC oversees various educational and training programmes, however, this research focuses solely on the Bachelor of Pharmacy (B. Pharm) degree, which is the educational requirements for pharmacists in South Africa, followed by a year of internship. The B. Pharm is designed to train and develop future pharmacists within higher education institutions and is offered across nine pharmacy schools. The following accredited institutions offer pharmacy training: Nelson Mandela Metropolitan University (NMMU), North-West University (Potchefstroom Campus), Rhodes University, Sefako Makgatho Health Sciences University (SMU) previously University of Limpopo: Medunsa

[11] Service providers refer to institutions accredited by the SAPC to offer the B. Pharm qualification. These are namely the eight institutions in South Africa mentioned in section 5.2.1.

Campus) in collaboration with Tshwane University of Technology, Tshwane University of Technology (TUT), the University of Limpopo (Turfloop Campus), the University of KwaZulu-Natal (Westville Campus), the University of the Western Cape (UWC) and the University of Witwatersrand (Wits) (Pharmcouncil, 2015). Together these institutions produce on average 476 graduates annually (Bradley & Osman, 2012).

The SAPC's intention is to train generalist pharmacists, which explains the similar curricula trends found in South African institutions. Specialisation exists largely at a postgraduate level and the Masters programmes currently have two specialities: radio-pharmacy and clinical pharmacokinetics (Pharmcouncil, n.d.). The SAPC's 2012 Annual Report, however, outlined three broad areas for further development which comprise of the following specialisations: clinical pharmacy (which will include the two current specialities mentioned above), industrial pharmacy and pharmaceutical services in the area of public health. Postgraduate specialisation is beyond the scope of the present study, which focuses only on the undergraduate programme. The format of the B. Pharm curriculum involves a basic science first year followed by three years of professional academic studies (Bradley & Osman, 2012; Summers, Haavik, Summers, Moola, Lowes & Enslin, 2001). Successful completion of the degree leads to a one year structured internship and thereafter a year of remunerated community service. This is followed by a pre-registration examination, the successful completion of which allows registration as an independent pharmacist practitioner. The pre-registration component is designed to expose students to practical settings and students have the opportunity to serve this time in various sectors - community pharmacies, hospitals/institutions, industrial pharmacies or wholesale pharmacies - on the explicit approval of the facility by the Council for such training (Pharmcouncil, n.d.).

Once qualified, the greatest numbers of pharmacists work in community and hospital environments (43% and 35% respectively), with a small percentage (12 %) working in industry, wholesale and professional administration settings (Bradley & Osman, 2012). Only one percent of pharmacists work in academia. Age profiles for the majority of pharmacists in South Africa place them below 55 years of age, with 60%

under 35 years in some parts of the country. Gender trends, in line with international patterns, show that most (60%) pharmacists are female (Bradley & Osman, 2012).

At the University of KwaZulu-Natal (UKZN), the discipline of pharmacy falls within the College of Health Sciences. This study focuses on the third and fourth year major disciplines within the curriculum. Majors for the purpose of the study are defined as subjects that generally extend over years two to four of the curriculum and are core to the programme. The above mentioned majors are common across all South African institutions offering the undergraduate B. Pharm qualification and the South African Pharmacy Council makes particular reference for the inclusion of these majors across all undergraduate programmes in South Africa.

These disciplines have been developed since their introductory appearances in the second year curricula. The B. Pharm qualification recently underwent a curriculum revision based on the new qualification registered by the SAPC with the South African Qualifications Authority (SAQA) in 2009. The decision affected all South African pharmacy schools resulting in the re-alignment of curricula with the implementation occurring, no later than 2013 (Oltmann, 2012).

1.5 Introducing the participants: Pharmacy academics

This research is comprised of a study sample of seven academic members[12] of staff, all of whom were interviewed and six of whom were followed through observation sessions. The following participants: Alben, Ami, Midra, Nardil, Zeta, and Zodone[13] teach "the major subjects" in years three and four of the B. Pharm qualification. This brief introduction serves to introduce the participants who so richly contributed to the study and to share their reasons for choosing academia as a profession. Further information on the participants' profiles is provided in Chapter 4.

[12] Not all Pharmacy academics teaching years three and four participated. Several academics teach within Pharmacy modules, not all of whom participated.
[13] These names are not the actual names of the participants and chapter four outlines how these selections were made.

Table 1.1: Academic participants sharing their reasons for selecting academia

Academics	Reasons for choosing Academia and lecturing	Reference
Alben	*I think being a lecturer will you know satisfy my, you know, my desire to transfer knowledge to people and teach people.*	A/I/p1p6L1
Ami	*I love the academic part of it I really do, so I find it very rewarding….*	A/I/p18p8L1
Midra	*Oh! I chose to become a lecturer after going out and experiencing the other avenues of pharmacy because I realised that there weren't many people coming back to academia, and teaching and research was something I enjoyed and learnt about it during my masters. So after going out and experiencing what it was like to work in a community, what it was like to work in a rural area, I now in lecturing use that as examples in experiential learning in my teaching.*	M/I/p1p3L2
Nardil	*I decided to stay in academia because there is also a shortage of lecturers to train pharmacists. There is a huge shortage…and especially in my field of pharmacology there is not many lecturers in South Africa. So those I guess are the two most important reasons why I decided to study that. I think it can make a valuable contribution to primary healthcare in South Africa because most of your patients who go and see a pharmacist, especially in the rural areas, before they go to a facility, e.g. where there is a health care provider or somebody higher up like a GP or a or a specialist.*	N/I/p1p1L4
Riza	*Like I said I always wanted to become a teacher. ...inner self, they say, congruency with your inner self. So finally I became a pharmacist, but the inside desire to be a teacher must have always been there. So when I had an opportunity to lecture, I just took it.*	R/I/p1p4L1
Zeta	*I always wanted to go into academia, so that was just a given. I never wanted to study pharmacy to become a pharmacist. I always thought I, I wanted to go into academia and then it just worked out that I had the opportunity to do a masters and a PhD. I was lucky that I was one of the last groups before the community service came in so it's not like I had to go back and do a year's community service and then come back.*	Z/I/p1p2L2
Zodone	*I chose pharmacy because I love to be able to help people… A teacher of mine said to me there are other professions that you can do if you are really interested in health sciences, there are other professions not just medicine. There is pharmacy and there is medicine. So I was introduced to pharmacy and eventually I preferred pharmacy to medicine. So that's how I ended up doing pharmacy.*	Z/I/p32p2pL2

1.6 Structure of the dissertation

Chapter 1 serves to introduce and motivate the need for this particular study, as well as provide contextual and background information. It gives an overview of the field of pharmacy education, taking into account both external and internal factors which shape pharmacy education in a higher educational setting. Chapter 2 reviews the educational trends in pharmacy education from an international and national perspective, covering themes of knowledge in pharmacy curricula and academics' pedagogical practices. Chapter 3 provides the lens and theoretical framing for analysing the data produced in this research. It highlights the paradigmatic stance taken and the rationale behind it. Chapter 4 outlines the methodological decisions taken and describes the research design. It captures insights about the researcher's role in the study and provides more insight into the participants who made the study possible. Chapters 5 to 9 explore the data involving a combination of descriptive and subsequent deeper level analyses, using the theoretical frame and thematic analysis. Due to the volume of data surrounding each major (accumulated across a range of data sources) and the fact that the study extended over years three and four of the professional academic qualification, analyses have been divided into several chapters. Chapter 5 provides the background and recontextualisation of pharmacy knowledge in the field of pharmacy education. Chapters 6 and 7 analyse majors located within years three and four of the B. Pharm degree respectively, extending across issues of knowledge structures, curricula and pedagogy. Chapters 8 and 9 illuminate emerging themes and issues that are beyond the theoretical frame imposed and together with analysis from the frame bring together deductive and inductive approaches. Chapter 10 concludes the dissertation and summarises the research findings and its contribution to advancing an understanding of pharmacy academics' pedagogical practices in a South African context. This chapter also highlights future research endeavours which could emanate from this present body of research.

1.7 Summary

As a professional qualification, pharmacy stands in the space between academia and the working world which has implications for pharmacy education, the structure of the curriculum, the selection of knowledge included into the curriculum, pedagogy and assessment. This chapter served to introduce the research field, and highlighted issues around knowledge and its acquisition in the context of developing professionals for serving society's needs. The recontextualisation of knowledge, curriculum and pedagogical matters were also highlighted. The researcher, origins and motivation for the study were introduced, along with a brief introduction to the participants. The following chapter will characterise the literary field in pharmacy education, focusing on curriculum and pedagogical trends and covering debates from local and global perspectives.

Chapter 2
Literature Review

> *Pharmacists through their education and training can consider (and conceptualise) a drug molecule, together with its formulation and delivery as medicine. They have an in-depth knowledge of pharmacology and therapeutics, physiochemical properties of drugs and excipients, biopharmacy and pharmacokinetics, adverse drug reactions and drug interactions. It is this complex, varied and integrated expert knowledge that qualifies them, and them alone, to make professional judgments relating to medicines.*
>
> (Harding & Taylor, 2004, in Waterfield, 2010, p. 1)

2.1 Introduction

The literature reviewed highlights trends in pharmacy education[14], starting with a brief historical perspective of the emergence of pharmacy as a profession and its educational evolution from a dispensing to a clinical orientation (Waterfield, 2010). Competency frameworks, policies and governing bodies are explored as they guide the education, training and development of professional pharmacists. The implications of this clinical paradigm shift on knowledge, competencies, skills, values and attributes are also considered. This chapter also further explores global and local trends in pharmacy education, curricula (with a closer look at the undergraduate Pharmacy degree) and pedagogical practices that commonly feature in these programmes.

2.2 Historical perspective and professional nature of pharmacy

Pharmacy only emerged as a professional entity in the mid-19th century in the United States (Khan, Deimling & Philip, 2011). Prior to this pharmacy was viewed more as an art of preparing and dispensing medicine which required both knowledge and skill. Barnett, Becher and Cork (1987) made an interesting point when they described how pharmacy shifted from an apprentice model to an academic model. Originally pharmacy was composed of a hierarchy, comprising of the master pharmacists and the

[14] The definition of pharmacy education is as outlined in the FIP Global Pharmacy Workforce Report (2009), where the term refers to the educational design and capacity to develop the workforce for a diversity of settings (hospital, community, research and development academia) across varying levels of service provision and competence and scopes of learning (undergraduate, post-graduate and life-long learning).

technicians, where the norm was to complete five years of training in a pharmacy prior to attending an academic institution. Now, however, the opposite is seen, where an academic qualification precedes a year's training in a professional setting. Khan et al. (2011) presented a historical view of the evolution of pharmacy, tracing the relationship from drug discovery and development through the 1800s and 1900s where changes were made to the academic curriculum. They also highlighted the next paradigm shift in the profession of pharmacy which took place in the early 1900s and saw the move away from drug production and dispensing to pharmaceutical care (Khan et al., 2011). Wiedenmayer, Summers, Mackie, Gous and Everard (2006) placed the responsibility for this change on the shoulders of pharmacists, making them accountable for patient care, highlighting their academic training and the professional nature of their work as driving forces.

> *Pharmacists should move from behind the counter and start serving the public by providing care instead of pills only. There is no future in the mere act of dispensing. That activity can and will be taken over by the internet, machines, and/or hardly trained technicians. The fact that pharmacists have an academic training and act as health care professionals puts a burden upon them to better serve the community than they currently do.*
>
> (Wiedenmayer et al., 2006, p. vii)

Pharmacists have unique expertise because of their ability to work between pure, applied and social science fields. They act as a link between these two worlds, making them invaluable to society (Bakker, 1996). Professionals are also often awarded high positions in society based on the contribution made and the application of their unique specialised knowledge and skills in serving society's needs. DiPiro (2011), however, believed that despite the paradigm shift[15], society still clings to an outdated perception of the profession, associating pharmacists with filling drugs in bottles. This previous technical role of only dispensing medication left pharmacists feeling over-trained and under-utilised and was the catalyst for what Babar, Scahill, Akhlaq and Garg (2013, p. 219) termed "reprofessionalization", which places pharmacists as members of health expert teams contributing towards clinical services and patient welfare. The redefined role of pharmacists is one that incorporates an educator and counselor dimension and a health care team member working in collaboration with other health-care

[15] Paradigm shift refers to the move away from pharmacists dispensing medication to a more clinical and holistic role involving patient care.

practitioners. With the emphasis on patient care, professional pharmacy practice includes encouraging the use of medication as intended, to identify and assist in resolving the misuse of drugs and promoting general health through education and patient focused therapy (Toklu & Hussain, 2013). Over the last four decades, this focus on holistic patient care has continued across the globe and is highlighted in many studies (Asiri, 2011; Babar et al., 2013; Toklu & Hussain, 2013; Wiedenmayer et al., 2006).

2.3 Pharmacy education

2.3.1 International and national perspectives

There are numerous perspectives on the roles and responsibilities of higher education in preparing future pharmacists. The American College of Clinical Pharmacy report in 2002 suggested that academics need to place more emphasis on preparing students for life-long, self-directed learning, problem solving and critical thinking and clinical reasoning. This was based on the belief that a discrepancy between pharmacy education and the actual environment in which they would practice was likely to exist (Cisneros, Salisbury-Glennon & Anderson-Harper, 2002). Anderson et al. (2008) focused on the shift towards preparing life-long learners with greater emphasis being placed on "knowing how" rather than "knowing all". Noble, O'Brien, Coombes, Shaw and Nissen (2011, p. 1), meanwhile, described the role of pharmacy education in terms of providing "students with the knowledge and skill they require to practice as a pharmacist". Nemire and Meyer (2006) focused on the professional role of pharmacists, believing that they should emerge from their education able to meet the needs of the profession and those served by the profession. The World Health Organisation (WHO) presents an all-encompassing approach, stating that future pharmacists need to possess knowledge, skills and behaviours that support their roles (Azhar et al., 2009).

The International Pharmaceutical Federation (FIP), the global federation representing pharmacists and pharmaceutical scientists worldwide, views pharmacy education as an important aspect of the profession (Anderson et al., 2008; Anderson et al., 2012), and includes all of the issues raised above as being necessary for developing the professional pharmacist. The FIP is responsible for setting global pharmacy standards through scientific and professional guidelines, policy statements and declarations, in

partnership with the other international organisations such as the World Health Organisation and other United Nations (UN) agencies (FIP, n.d.).

One such collaboration between the WHO and the FIP in 2000 saw the development of the concept of the seven-star pharmacist. The seven-star pharmacist's roles and functions of being a leader, life-long learner, caregiver, teacher, communicator, decision-maker and manager are included in the FIP's policy statement regarding Good Pharmacy Education Practice. In South Africa, higher education graduates are also required to demonstrate critical cross-field outcomes which include life-long learning, critical thinking abilities, effective and professional communication and integration of knowledge (Suleman, 2012). These outcomes are similar to those outlined for the seven-star pharmacists. Weidenmayer et al. (2006) extended the seven-star concept to include researchers as well, which is also reflected in the South African scope of practice for pharmacists, that includes active engagement and conducting of pharmaceutical research (South African Pharmacy Council, 2010). Yanchick (2008) also highlighted the importance of research components featuring in the curriculum, and stated that students needed to develop a scholarly approach to inform their clinical practice. This research-driven approach will provide students with the ability to identify problems and address these with best evidence-based practices, thereby ensuring the safe and effective use of medication in patient treatment.

Global competency frameworks also guide education by providing general and specific professional competencies. Originally global competency frameworks were developed in a medical context, but have since extended to other fields in global education serving in developing, training and accrediting healthcare professionals (Bruno, Bates, Brock & Anderson, 2010). The Canadian Medical Education Directions for Specialists' (CanMEDs) framework outlines knowledge and describes a comprehensive set of generic competencies required by physicians (Frank, Snell & Sherbino, 2015). The framework includes a combination of competency constructs from theory, best practices and practical daily practice and describes seven roles for physicians, with medical expertise at the centre, accompanied by roles of communicator, collaborator, leader, scholar, advocate and professional (Frank et al., 2015).

The FIP Global Competency Framework is driven by the belief that a foundation of competencies[16] is necessary for developing professional pharmacists, improving clinical care and serving the needs of society, as well as for advancing science and research. Several defining competencies are grouped under the four major competency categories: pharmaceutical public health competencies; pharmaceutical care competencies; organisation and management competencies and professional and personal competencies. Located within these major categories are detailed competencies and abilities such as patient care falling within pharmaceutical care competencies (FIP's Global Competency Framework, 2010).

The Pharmacy Education Task Force (PET), which was developed by major stakeholders (FIP, WHO and UNESCO) is tasked with overseeing development and training within higher education and the workforce. The FIP-PET relies on the cooperation, partnership and consultations within institutional stakeholders and within countries. The Global Pharmacy Education Action Plan 2008–2010, similarly addressed the role of all stakeholders working together in serving local needs and developing a qualified and competent workforce. The action plan covered four priority domains: vision for pharmacy education; academic and institutional capacity; quality assurance and competence framework. In addition, the FIP Education Initiative is a new directorate tasked with strengthening all of the FIP's educational projects and actions in partnership with the WHO and the United Nations Educational Scientific and Cultural Organisation (UNESCO).

While global frameworks work to develop competencies that are applicable and relevant to the profession, they serve as guidelines and are not intended to be prescriptive for all countries as it is acknowledged that health care systems and demands vary widely between and within countries (Anderson et al., 2009). Anderson et al. (2009) acknowledged the benefits of general frameworks from a macro perspective, but pointed out that universal systems are unrealistic and unsustainable at a micro level. They therefore advocated for a needs-based approach allowing for flexibility and adaptability within local contexts and environments, which the FIP-

[16] Competencies refer ''to the knowledge, skills, attitudes and behaviours that an individual develops through education, training and work experience'' as defined by the FIP's Global Competency Framework (2012, p. 2).

PET promotes in developing pharmacy education globally. Needs assessments are conducted within communities with the purpose of assessing the needs of its community and then developing or adapting educational systems accordingly to address these specific needs (Anderson et al., 2009; Anderson et al., 2012; Zeitoun, 2011). Along the lines of a needs-based approach, Alsharif (2012) argued against following western education as a norm for learning, saying that local needs should be the driving force. Both of these are taken into account in the design of the undergraduate pharmacy qualification in South Africa. SAQA describes the Bachelor of Pharmacy as being designed to take local needs into consideration, as well as embed the standards and guidelines of the FIP and international organisations in their learning programmes (SAQA, n.d.). Although the SAPC fairly recently voluntarily joined the International Pharmaceutical Federation (FIP), they continue to largely operate independently while keeping international standards and guidelines in mind.

2.3.2 Regulation and changes to pharmacy education

There is a need for a constant revision of curricula globally in light of the rapid changes in health care with new knowledge and technological advances (Asiri, 2011). Over the last 20 years, emphasis has also been placed on changing pharmacy curricula taking into account problem-solving, critical thinking and self-directed learning in order for pharmacists to practice in the modern pharmaceutical environment (Williams, Brown & Etherington, 2013). Yet Blouin, Joyner and Pollack (2008) described curricular change in higher education as a typically passive endeavour, usually resulting from academics or faculties responding to a call for change. In most cases the call for change comes from regulatory boards. Most pharmacy programmes, world-wide, have governing bodies that regulate or exert some influence over how educational programmes are implemented or revised. For example in the United States, two organisational and regulatory bodies are responsible for the change of curricula over time. These are the Accreditation Council for Pharmacy Education (ACPE) and the American Association of Colleges of Pharmacy (AACP) (Nemire & Meyer, 2006). A similar trend is evident in India, where the Pharmacy Act of 1948 led to the regulation of the minimum standard of educational qualification for pharmacy education, the practice and the profession. The Act has been implemented through two regulatory bodies operating in India: The Pharmacy Council of India (PCI) and the All India Council for Technical Education (AICTE).

In South Africa, similar roles and responsibilities of pharmacists with an emphasis on patient care are dictated by the scope of practice of the pharmacy profession, as prescribed in terms of Section 35A of the Pharmacy Act, of 1974, as amended ("the Pharmacy Act") (SAPC, 2015). The Pharmacy Act places responsibility on the SAPC for establishing, developing and maintaining control over pharmaceutical education and training. The SAPC introduced curriculum changes to the B. Pharm qualification and higher institutions of learning responded to calls from the SAPC and the White Paper on Post Secondary Education and Training. The previous curriculum guided by unit standards was replaced with exit level outcomes (covered in greater detail in Chapter 5) to guide the B. Pharm curriculum to ensure graduates have greater scope across sectors (Suleman, 2012). Various institutions in South Africa (Boschmans, 2014; Danckwerts, 2014; Malan, 2014; Walker, 2014) have presented their accounts of implementing these curricula changes and accompanying pedagogical changes.

2.4 Pharmacy curricula

The focus on clinical patient care has impacted on educational systems, leading to the training of more clinically oriented pharmacists. Anderson and Futter (2009, p.1) attributed the move to a more clinical degree to the "magnitude of medication-related problems", the arrival of more complex drugs on the market and an increase in aging populations with medical conditions. These have impacted on pharmacists' roles and functions, where hospital pharmacy has also changed, moving pharmacists into wards and clinics and out of dispensaries (Anderson & Futter, 2009). This change has impacted on pharmacy education and Asiri (2011) described patient-focus as an essential component of pharmacy education in the 21st century, especially for developed countries such as the United States of America (USA) and the United Kingdom (UK). Various studies compare pharmacy education in developed countries with developing countries (Babar et al., 2013; Ghayur, 2008; Shah, Savage & Kapadia, 2005). Babar et al., (2013) went into more detail about how trends of a more patient-focused curriculum are more prevalent in high income or developed countries (such as the UK, USA, Canada and New Zealand). Ghayur (2008) described differing roles of pharmacists in different parts of the world with developed countries such as Britain, Scotland and Canada already allowing pharmacists limited power in prescribing and altering existing prescriptions due to their training. In developed countries, academics also place emphasis on preparing students for future specialised

fields in pharmacy whereas developing countries curricula are more patient focused and based on developing generalist pharmacists rather than specialists (Anderson et al., 2012).

Babar et al.'s (2013) bibliometric review of pharmacy education in low to middle income countries reveals that the majority of country-specific publications are about Greater Asia, and the Middle East. Eastern Europe and Central, South America and Africa are less represented. The literature on developing countries and knowledge about the status of pharmacy education is also not as widely reported (Babar et al., 2013). Curricula in many pharmacy schools in India and South Asian countries, such as Pakistan, do not have a clinical focus[17], with clinical experiential learning components being absent due to a lack of hospitals for training and a shortage of academic clinical expertise (Ghayur, 2008). In Africa, only Ghana is included because its relationship with a university in Scotland is viewed as an example of remaining current with trends in pharmacy education (Babar et al., 2013).

In Zimbabwe, the pharmacy curriculum has not been reviewed for the past 12 years due to a lack of funding and senior academic expertise. The Zimbabwean Regulatory Pharmacist Council has called for a review of the curriculum in order to align pharmacy training with global trends. In Zimbabwe, the introduction of an undergraduate degree in Pharmaceutical Sciences is also being planned (FIP Education Global Report, 2013).

Shah et al. (2005) cited numerous undergraduate pharmacy programmes in developing countries which had inadequate application of knowledge to patient care. Programmes in developing countries are also depicted as being heavily reliant on traditional pharmaceutical sciences. Babar et al. (2013), also raised concern about some developing countries implementing or changing educational systems to become more clinical based on western models, with little application for the context in which they are adopted. However, this is not always the case; the B. Pharm programme in Tanzania, with the assistance of the University of California's San Francisco School

[17] Clinical focus refers to pharmacists moving away from their traditional role of only dispensing medication to a more patient-focussed role involving aspects of medical diagnosis, treatment and patient education.

of Pharmacy, revised their curricula and pedagogy in 2011, offering a more clinical and integrated curriculum (Youmans, Ngassapa & Chambuso, 2012) in addition to taking local needs into consideration. Anderson et al. (2009) also highlighted pharmacy education, partnerships and international collaborations being combined with local needs in Kenya (University of Nairobi School of Pharmacy) and the United States (Purdue University of School of Pharmacy). Anderson et al. (2009) described training pharmacists in developing countries to internalise their role of helping poor communities in less urbanised areas as being crucial. Many new and innovative education ventures have evolved to address this gap. In South Africa, for example, Rhodes University pharmacy students work with patients in their homes with translators to address patients' medicine-related needs, in addition to providing patient education (Anderson et al., 2009).

2.4.1 The B. Pharm qualification

The knowledge selected and the curriculum, duration and pedagogy of Bachelor degrees in pharmacy education vary between countries (Appendix 1) and within countries. While many studies (Babar et al., 2013; Yousif et al., 2013) may reveal pharmacy schools adopting a more clinical oriented type of education, these need to be examined carefully as not all studies refer to the undergraduate curriculum and many pertain to the postgraduate curriculum (Masters and Doctorates in Pharmacy). For the purposes of this study, only undergraduate, Bachelor's qualifications (B. Pharm) were considered. Postgraduate qualifications, when mentioned at times, are only done so to elucidate the diversity that exists in different contexts or to highlight the evolving curriculum.

The total length of degree completion is generally four years for the Bachelor of Pharmacy. Pharmacy education in the USA and Europe has moved to a more clinically driven curriculum, with revisions made to the Bachelors qualification or the addition of post-graduate specialisations. Some countries in the Middle East, India and parts of Africa are designed on models borrowed from the UK or the USA and changes towards a more clinical approach have taken various forms (Babar et al., 2013).

The focus or emphasis placed on the B. Pharm curriculum varies depending on context. Most countries in the west have a patient-focused or clinical focused curriculum based on training generalist pharmacists, with some eastern countries demonstrating a different emphasis. Pharmacy programmes in 13 Middle Eastern countries[18] reveal a focus on traditional "knowledge-based" curricula, with little emphasis on clinical sciences (Kheir et al., 2008). Considerable curricular revision is moving towards the development of competencies and knowledge required for competent patient care (Kheir et al., 2008). According to Berg (2001), successful clinical pharmacy programmes were developed in India with assistance from Australia, however, studies of pharmacy programmes in India show a deviation from other countries with a strong focus on industry training rather than clinical or generalist training (Basak & Sathyanarayana, 2010). This trend towards an industry and product-oriented profession with a focus on the basic sciences is noted at Bachelors and Masters level (Basak & Sathyanarayana, 2010). Sachan, Sachan and Gangwar (2012) also described pharmacy education in India, Bangladesh and Pakistan as having an industry and product focused B. Pharm curriculum, with emphasis on the basic sciences rather than clinical sciences. Several studies (Basak & Sathyanarayana, 2010; Sachan et al., 2012) recommended a workforce study to be undertaken for comparative purposes with international roles, with the aim of designing two streams for pharmacy education: one geared towards developing industrial pharmacists and the other with a more clinical or patient-focus (Basak & Sathyanarayana, 2010).

The B. Pharm qualifications in South Africa, Australia and New Zealand are similar to the UK programme (Anderson & Futter, 2009). According to the South African Qualifications Authority (SAQA), the South African B. Pharm curricula was designed based on best practices from several international countries, such as Australia, Egypt, India, the USA and the UK (SAQA, n.d.). In South Africa, while there is some degree of variation in pharmacy subject content within the B. Pharm offered amongst the different institutions, the trend of training generalists is common and outlined by the SAPC (See Chapters 1 and 5). The B. Pharm degree has been designed to ensure that

[18] The 13 middle-eastern countries are Bahrain, Egypt, Iraq, Jordon, Kuwait, Lebanon, Oman, Palestine, Qatar, Saudi Arabia, Syria, Yemen, and United Arab Emirates (Kheir et al., 2008).

the graduates have the necessary knowledge, skills and values required to meet the ethical and legal obligations of the profession (SAQA, n.d.), with the development of specific specialised competencies at a later stage in particular work settings and experiences. DiPiro (2011), however, warned against curricula that rely solely on preparing students to fit the generalist role, stating that this will lead to pharmacists being capable of many traditional functions but restricting them from making a valuable contribution to health care in the future.

2.4.2 The structure of B. Pharm curricula

Pharmacy is an interdisciplinary field of science comprising almost every aspect of drug discovery, synthesis, manufacturing, distribution, and patient care (Asiri, 2011). Waterfield (2010, p.1) described the pharmacy curriculum as a "full and comprehensive menu of subjects that span both the traditional pharmaceutical sciences and practice-related studies". Knowledge of pure sciences (such as chemistry, biology, physics and mathematics) is necessary and forms the basis of the curriculum, combined with general education in the humanities, behavioural and social sciences. The balance of the curriculum (professional years) includes coursework in the biomedical, pharmaceutical and clinical sciences, behavioural, social, and administrative pharmacy sciences (Kheir et al., 2008). Several researchers (Basak & Sathyanarayana, 2010; Ghilzai, 2008; Ryan, Shao & Yang, 2008) advocated a more revolutionary approach to clinical care, with a focus on socio-behavioural aspects of medicine utilisation and call for the inclusion of psychology and patient behaviour into the curriculum (Babar et al., 2013; Hassali et al., 2011).

South Africa's undergraduate programme is similar to the UK's and the USA's curricula, as well as those parts of Africa which contains a blend of theoretical and practical science, followed by a year of clinical professional practice (Sosabowski & Gard, 2008; Youmans et al., 2012). The SAPC outlined that within the pharmaceutical sciences, an adequate emphasis on the action and uses of medicines needs to be incorporated, along with appropriate introductions to diseases. Social and behavioural sciences, along with communication skills development, feature for inclusion in the curriculum (SAPC Good Pharmacy Practice in South Africa, 2010). In revising their curricula, the North-West University (Potchefstroom Campus) removed some of the foundational basic sciences (physics, botany and zoology) and replaced these with

social and behavioural sciences geared towards patient needs and communication (van Dyk, 2014).

2.4.3 Experiential learning and integration

Pharmacy education in the USA evolved from an apprenticeship model to a professional curriculum and encompasses both theoretical and experiential learning. The duration and sequencing of experiential learning or clinical professional practice in the undergraduate curricula varies between and within countries, along with its execution (Appendix 2).

Karimi et al. (2010) described these two major components of pharmacy education as didactic and experiential components. Depending on the context, the former is referred to in the literature as coursework or theory and the latter as clinical training, internship or practical training. While Sosabowski and Gard (2008) focus on the debate of science versus practice and whether science skills currently taught are a requirement for effective pharmacy practice, other studies focus on how best to integrate both components (Husband et al., 2014; Karimi et al., 2010; Pearson & Hubball, 2012).

Curricula integration is described as being composed of horizontal and vertical components. In pharmacy programmes horizontal integration refers to integration across science disciplines such as medicinal chemistry, pharmacology and pharmaceutics (Pearson & Hubball, 2012). In South Africa, NMMU exhibits horizontal integration as they have adopted an integrated B. Pharm curriculum which incorporates the four major disciplines (pharmacology[19], pharmaceutics, pharmaceutical chemistry and pharmaceutical care) into three streams (Clinical Pharmacy, The Molecule and Pharmacy, People and Systems) during first year (Boschmans, 2014). At Rhodes University the four major disciplines are also taught in a more horizontally integrated manner but this occurs later in the curriculum (in third year) (Walker, 2014).

[19] Pharmacology and other majors are capitalised, as these refer to modules in the analysis chapters, where the module code 301 or 401 does not always feature.

Vertical integration, on the other hand, refers to the integration of basic sciences and clinical science disciplines (Pearson & Hubball, 2012) where the basic sciences continue into the later years of the curriculum. The Muhimbili University of Health and Allied Sciences School of Pharmacy (MUHAS) in Tanzania, moved to an integrated curriculum, aligning an antibiotic course with a clinical microbiology course. These modules were redesigned and re-sequenced allowing for reinforcement of content and concepts without duplication (Youmans, et al., 2012).

However confusion could arise as the term horizontal in pharmacy education is also used to describe the combination of basic and clinical sciences within a year of study or period of study. Vertical integration is also used to refer to spiral curricula where the structure allows for a topic to be revisited as content becomes increasingly complex with subsequent years (Pearson & Hubball, 2012). The use of vertical integration to link a topic between academic years is also believed to foster the transition from novice learner to master of the topic (Nelson et al., 2013).

"Integration" takes on yet another meaning when described by Summers et al. (2001), who use it to refer to the way in which course material is arranged and presented in thematic modules. Integration in pharmacy education can also see the content between different disciplines integrated into theme-based teaching. According to Enslin (2008), the theme-based, integrated, problem based, (PBL), experiential teaching and learning methodology adopted in South Africa in response to professional and educational demands has been successful and is more patient focused. NMMU uses thematic integration of disease states and associated management in the later years of the curriculum (Boschmans, 2014).

From the literature there appear to be different types of functional models of pharmacy curricula based on the link between the content driven syllabus and the experiential learning component. Zlatic's (2000, p. 10) view on the construction of knowledge within the professional curriculum is based on the belief that "abilities are developed gradually, in an incremental fashion, over the years of a curriculum". Modules that appear earlier in the curriculum operates at a more basic level, whereas later modules require students to perform at a professional entry level. Pearson and Hubball, (2012) shared a similar view, stating that the traditional structure of

pharmacy curricula resembles a front-loaded curriculum, with basic sciences covered in earlier years and clinical experiences featuring towards the end of the curriculum.

An alternate approach to the traditional structure is described by Pearson and Hubball (2012, p. 2) as "inverted triangles" and this is an approach where clinical experience is introduced at the beginning of the curriculum and becomes increasingly prevalent with the basic sciences throughout the programme. This approach is believed to foster a greater link between theory and practice. In the integrated approach, experiential learning is introduced as early as year one or two into the curriculum and is threaded throughout the curriculum; it is referred to as "sandwiched within the curriculum". The Pacific University School of Pharmacy[20] is an example of this approach, where they even use a block curriculum system, where one block is taught at a time (Karimi et al., 2010, p. 2). Students are assigned to pharmacies in their first year and engage in a learning bridge process. This approach is believed to allow students to apply a didactic curriculum with practice throughout the first year. In South Africa, pharmacy students at the University of Western Cape are also exposed to experiential learning from first year and work in a variety of community (pharmacies, old age homes and schools) and clinical environments with the aim of developing social responsiveness and producing socially accountable practitioners (Malan, 2014).

Yanchick (2008) stated that students taught in discipline silos, even operating in the best practical sites, are faced with not truly experiencing training in an interprofessional environment, highlighting the need for integration. Integration into the curriculum, however, requires carefully consideration by educators (Karimi et al., 2010) and they should avoid the "danger for integration for integration's sake rather than for sound educational purposes" as pointed out by Pearson and Hubball (2012, p. 1). Decisions regarding where and how experiential learning takes place are also influenced by regulatory bodies. For example in the United States, the ACPE calls for practical experiences to start early in the curriculum and be interfaced with didactic coursework (Karimi et al., 2010). Williams et al. (2013) shared a similar view, believing that early placement and exposure will develop person-centered skills and help produce a well-balanced graduate. It is believed that this approach will expose

[20] The Pacific University School of Pharmacy is located in the United States of America.

students to the profession and will continue throughout the degree, resulting in a smooth transition into pharmacy practice in work settings.

In other countries, circumstances and context-related issues may impact on when and how experiential learning features in the curriculum. For example in India, the lack of site training (or experiential training) occurs because most of the universities or institutions (colleges) offering pharmacy in India are located far from practice sites and there is no compulsory training in a practice sites. Pharmacists in India are also unique compared to other countries as they are not required to undergo further development - either in terms of education or training to maintain their license to practice once they have been obtained. In South African institutions offering the B. Pharm degree, experiential learning is threaded throughout the curriculum. At UKZN, experiential learning usually takes place early in the curriculum, combined with an intensive training programme in fourth year which includes ward-rounds at various public hospitals, community pharmacies, rural clinics and the commercial and industrial pharmaceutical sectors (Anon, 2008). Pharmacy students at other South African institutions such as NMMU also gain experiential training in fourth year through their institute's links with the Pharmaceutical industry (Aspen Pharmacare) and the Academic Hospital complex, located in the same area of Port Elizabeth (Anon, 2008).

2.5 Pedagogy in pharmacy education

Higher education is confronted with issues of knowledge explosion and knowledge complexity. The rapid increase of information and ease of accessibility has implications for the role universities and other learning institutions play and the pedagogical practices that academics employ (Frenk et al., 2010). Debates around pedagogy and the impact of instructional guidance have ensued for decades (Kirschner, Sweller & Clark, 2006). Placing the debates on pedagogical practices on a continuum, on one side are those who argue for direct instructional guidance (lectures and didactic teaching fall into this category) and on the other are those who advocate that people learn best in an unguided or minimally guided space. The approach with minimal guidance has been called by many names including discovery learning, inquiry-based learning (Aditomo, Goodyear, Bliuc & Ellis, 2013), problem-based learning, experiential learning or constructivist learning (Kirschner et al., 2006).

Along the spaces in between is room for hybrid models (Azer, 2009), broken lectures (Nayak, 2006) and technologically driven innovative practices (Cain & Fox, 2009).

While Savery (2006) argued against a hybrid curriculum, stating that problem-based learning should not be part of a didactic curriculum but rather the pedagogic base in the curriculum, Carter, Wesley and Larson (2006) and Azer (2009) concluded that strategically timed lectures have the potential to enforce educational values of other teaching activities. Lectures featuring in a PBL course should focus on integrating knowledge, developing critical skills, encouraging students to pursue further research and stimulating deeper understanding (Azer, 2009).

The purpose here is not to cover all the pedagogical debates as they are both expansive and extensive, but rather to highlight some of the pedagogical practices in pharmacy education, the rationale behind their implementation or some of the underlying learning theories upon which they are based.

2.5.1 Direct instructional guidance

Blouin et al. (2008) raised the issue of increasing frustration with pedagogy in pharmacy education occurring from the perspectives of student and academics. Students view traditional lecture-based approaches or didactic teaching as a waste of valuable time, considering the potential of technology to offer a multitude of efficient options. Academics also experience frustration due to the confines of large class sizes, complex lecture dynamics and the large amount of factual content that needs to be covered. Covering large amounts of content is seen as an opportunity cost of engaging students in meaningful discussions and higher order learning (Blouin et al., 2008). Oblinger (2003) argued that the lecture tradition of universities may not meet the expectations of students growing up with the internet.

The question of whether lectures have a place in higher education or not still exists. The term “lectures”, however, are often used loosely in pedagogic studies and is sometimes misconstrued or taken to mean didactic teaching. Penson (2012) argued that there is still a place and purpose for lecturing in university education. His view is that lecturing promotes learning when incorporated as an overall strategy and that the predominant style should be aligned to learning objectives rather than compared to

other approaches. Lecturing has long been viewed as a deficit in light of newer or more innovative approaches, but there still remains a place for lecturing in pharmacy education (Penson, 2012). He also raised the point that not all traditional lecture-based learning is bad, but rather that bad lecturing does occur. So the argument for an approach that lends itself to the objective and purpose of the lecture remains most important and that a mixture of approaches can be used to address the menu of subjects in the pharmacy curriculum (Penson, 2012).

Blouin et al. (2008), on the other hand, felt that pedagogy in higher education, especially for modules dominated with highly factual knowledge and which forms the basis for further knowledge, has not been altered for decades. The so-called 'traditional' approach is described as focusing on transmission and repetition of factual content and has been accused of being insufficient in terms of fostering critical thought and assessing information for the purpose of solving problems (Blouin et al., 2008). Blouin et al. (2008) argued that content to be mastered in a professional qualification should be covered outside lecture time, given the time constraints of lectures and the high volume of factual knowledge that needs to be covered. Yet Penson (2012) disagreed, believing that lectures are effective for teaching in science and clinical degree programmes based on the volume and content that has to be covered. Stewart, Brown, Clavier and Wyatt (2011), however, presented the increased use of active learning techniques, which can be used in lectures, to address the increasing knowledge issue by preparing students to drive their learning in locating, processing and applying new information to clinical settings and patient care.

Blouin et al. (2008) argued that lectures should be dedicated to higher thought processes, problem-solving and critical skills instead of merely communicating factual content. Yet supporters of guided lectures, however argue that self-directed learning is not an innate characteristic and that our thinking will be distorted, biased, or prejudiced if we are left to our own devices and that learning how to think critically is something that can be taught (Pearson & Huball, 2012). If critical thinking is viewed as a set of tools that can be used to guide the student, then thinking and problem solving can be improved by instruction.

Charlton (2006) attributed the negative view of lectures to be based on a lack of theoretical rationale underpinning lectures. Kirschner et al. (2006) provided some theoretical rationale for why minimal guidance is likely to be ineffective based on human cognitive architecture saying that the purpose of all instruction is to change long-term memory and minimal guidance does not achieve this (Kirschner et al., 2006). Research on chess experts by Chase and Simon (1973) indicated that expert problem solvers access their extensive stored skills from long-term memory and use this to select and apply the best procedure for problem-solving. Kirschner et al. (2006) also distinguished between novice and expert learners and the impact pedagogical approaches have on them. They stated that while minimal instruction and guidance may benefit expert learners, its value diminishes with novice students who lack a sufficiently high prior knowledge to provide the internal guidance required for self-directed and enquiry learning strategies.

Gallagher (2011) offered a similar argument on using lectures to teach modules such as Pharmacy Law, where students are required to have knowledge of the law prior to achieving the outcomes designed for the module. Studies conducted by McKeachie (1990) highlighted the effectiveness of the lecture method and didactic teaching to assist students to acquire a foundational knowledge. This approach can be enhanced and reinforced by law seminars which operate at higher levels of Bloom's taxonomy.

Gleason et al. (2011) made the point that active learning should not be viewed as a single teaching method but rather as an approach with multiple possible methods, where they can feature in lectures as well. Stewart's et al. (2011) work on active learning in pharmacy education in the USA also changed the way traditional lectures are viewed. Their work revealed the use of active learning techniques in the majority of pharmacy schools' lecture rooms, with higher active learning techniques being implemented in modules with heavier teaching loads. Perhaps this can be linked to the increasing knowledge base in the health care professions, where it is not possible to increase semester length or class time proportionately to accommodate all that is required.

In Nigeria, where lecture or didactic teaching is common, Osinubi and Ailjoe-Ibru (2014) discussed the advantages and attractiveness of using the lecture method,

especially in poor countries with limited economic resources. They do, however, believe that lectures are inadequate to prepare students for the professional situations that await them in the various complex and dynamic pharmacy practices. There is thus an urgent need to search and include complementary pedagogical approaches to those currently in use (Osinubi & Ailjoe-Ibru, 2014).

2.5.2 Active learning and problem-based learning (PBL)

Active learning is well established as an instructional method and is implemented in pharmacy and medical education around the world (Rivkin & Gim, 2013). Aditomo et al. (2013) presented a range of active learning or inquiry-based tasks classified by academics in higher education in an Australian context. Problem-based learning (PBL) and team-based learning (TBL) feature as two common strategies employed in pharmacy education (Ofstad & Brunner, 2013). PBL was originally introduced in the 1960s at McMaster University in Canada and was an alternative approach to didactic, lecture style teaching (Galvao, Silva, Neiva, Ribeiro & Pereira, 2014; Gleason et al., 2011). PBL is based on the concept of small, student-driven groups, where the goals of PBL are knowledge-based and process-based (Savery, 2006).

According to Seifer (1998), PBL is best described as learning achieved through the process of working towards the resolution of a problem. The problem serves as a stimulus and is encountered first in the learning process; students have to apply problem-solving or reasoning skills, in addition to searching for information and knowledge, to understand how the problem works and then figure out how it may be resolved. In PBL, however, the nature of the problem matters. Several authors (Hmelo-Silver, 2004; Nkosi & Thupayagale-Tshweneagae, 2013; Savery, 2006; Stewart et al., 2011), cited the unstructured problem as a defining characteristic of PBL as it allowed for inquiry and engagement. If a case is too structured and contains guided questions, it will not encourage self-directed learning. A concern expressed by Camp (1996) regarding issues of control and the risk of PBL losing its defining features is still valid today. Academics are often reluctant to give up control and PBL is then implemented in a way where academics control what is being learnt but the content is packaged into cases and small definitions. This exposes the debates on the complications of research where so many variations of PBL exist and the implications that different variations have on assessment.

Since PBL's introduction, its growing popularity in higher education practice has seen it expand across a wide variety of disciplines worldwide (Loyens, Gijbels, Coertjens, & Côtě, 2013). Camp (1996) believed that one of the reasons for a PBL explosion is that many academics were disappointed with the traditional format in achieving learning and application of knowledge. In the traditional method, students were largely criticised for memorising, forgetting or being unable to apply knowledge learnt. Similar arguments have been made by Gleason et al. (2011), where traditional lectures and passive learning are described by Zorek, Sprague and Popovich (2010, p. 2) as "bulimic learning", characterised by students binging on information which is only retained for examination purposes. PBL gained popularity because of its fit with adult learning theory when it is used in its pure form. Adult learning covers a set of assumptions about how learning takes place in adults, with emphasis placed on the process of learning (Kenner & Weinerman, 2011). Adult learning theory views learning as self-directed. Kenner and Weinerman (2011) also include willingness to actively engage in the learning, internally and task driven learning as well as extensive depth of experience of the learner as key principles of the theory. Adult learning uses PBL and collaboration rather than didactic approaches.

PBL is also consistent with human learning theories, constructivism in particular, and is known for encouraging application and facilitating learning in adults. PBL is widely used in teaching young adults in professional qualifications such as medicine and health sciences (Loyens et al., 2013).

Other alluring features of PBL include claims that it can increase knowledge retention, builds on previous knowledge, enhances integration and application of pure sciences and promotes deep approaches to learning as opposed to surface learning (Loyens et al., 2013). According to Kwan (2002), despite PBL's existence for over 30 years, its effectiveness as a pedagogic philosophy still remains elusive. Inadequate experimental evidence from controlled studies, the lack of measuring tools and the difficulty around defining PBL contribute to the ambiguity of research findings (Kwan, 2002). Strobel and van Barneveld's (2009) meta-analyses studies comparing PBL to traditional classrooms also reported inconclusive trends in PBL's effectiveness. Most studies in the review were also limited to the medical field, warranting further investigation in other disciplines. PBL has been implemented in

Pharmaceutical education modules and numerous studies describe the experiences of this educational approach, but the benefits at graduate and undergraduate levels continue to remain inconclusive (Galvao et al., 2014). While Galvao et al.'s (2014) systematic review and meta-analysis concluded that PBL appears to improve performance compared to traditional methods, their study was based on a small sample size, with the majority of studies included being dated (more than five years old). Rivkin and Gim (2013) added that while there are benefits to active learning, student resistance to teaching approaches that increase self-study time should also be noted, with students only appreciating these approaches later in their academic curricula.

Norman and Schmidt (1992), after reviewing experimental evidence regarding differences in learning, concluded that there was not yet evidence that PBL curricula results in an improvement in general or in problem solving skills. They did, however, claim that PBL students were capable of retaining knowledge for longer periods of time than traditionally taught students, especially with regard to integrating the pure sciences and clinical knowledge (Camp, 1996). While PBL has benefits, particularly in the clinical settings, Stewart et al., (2011) distinguished how this may vary from science modules, where performances in science examinations based on PBL modules resulted in lower scores.

Decades ago, but still relevant today, Barrow's (1986) warned against the generic use of "PBL", highlighting the various taxonomies of PBL. He also pointed out the importance of academics considering the educational objectives of PBL and then implementing the most appropriate method. The type of problem, the sequence of teaching-learning, the roles and responsibilities of students in the learning process and the choice of assessment methods are all important when considering PBL.

2.5.3 Case-based curricula

The relationship between PBL and cases studies is not always clear. At times, case studies are included as a strategy within commonly described PBL approaches, especially if the case is unstructured and student-centered, at other times not. Herreid (2011) highlighted this difficulty stating that often the terms "cases" and "case studies" are used without a definition and meanings can therefore vary depending on

the context. This also creates difficulties in terms of evaluation as many different approaches can be grouped together. Herreid (2007) simply defined case studies as stories with an educational message.

Using this definition of case studies, Herreid (2011) acknowledged that cases can be presented in a variety of ways, ranging from use in lectures to discussion groups, PBL or large classes using clickers[21] (Herreid, 2011; Wolter, Lundeberg, Kang & Herreid, 2011). Herreid's (2011) taxonomy of case study methods provides some clarity and distinguishes between the various options available, such as lecture methods, discussion methods, small group methods, individual cases and computer simulation cases. Le Roux and Khanyile (2012) defined case-based learning (CBL) in terms of active participation in a real or hypothetical problem, which is reflective of specific experiences to the discipline being studied. Nkosi and Thupayagale-Tshweneagae (2013), described the case-based method within a nursing context as problem-based, student-centered and small group driven. They believed that the use of situation specific cases promoted critical thinking skills and learning strategies.

Several case study approaches feature in a lecture setting and depending on the approach, academics and students take on different roles. In the lecture method, academics take the role of story teller and students are passive recipients when cases are presented. The whole classroom discussion of case studies, however, has been described as the classical case. In this format, case studies can be presented in a variety of forms such as debates, symposia, public hearing or trials (Herreid, 2011) and increased student participation can result. The clicker cases involving case studies offer interactive participation despite huge class sizes and features cases studies presented in Power-Point, where students can respond to multiple choice questions pertaining to the case using clickers. Clickers' benefits include their ability to relate to real time assessment, allowing academics to provide instant feedback on learning.

While some comparative studies between lectures and clickers yielded clickers as being favourable (Wolter et al., 2011), Morgan (2008) reported no differences in

[21] Clickers are known by several names: student response systems, classroom response systems, audience response systems or personal response systems. Clickers are used to refer to the handheld transmitters which work on radio frequencies, allowing students to answer questions posed by academics. These results are then illustrated on the academics' computers (Bruff, n.d).

learning when clickers were used. Morgan (2008) made the point that class size plays a crucial role in determining the effectiveness of clickers, while Wolter et al. (2011) believed that students' perceptions of using response systems with cases also matters. While different studies have indicated preferences for a particular case study approach (Herreid, 2011; Johnson & Johnson, 1989), there are no conclusive findings on which method promotes better learning or assists in developing critical skills. Kim et al.'s (2006) meta-analysis of 100 case articles revealed little evidence that the use of cases improved critical thinking skills.

Many studies have, however, been conducted to measure the impact that different teaching methods have in pharmacy education (Khan, Hassali & Rasool, 2013). While the chalkboard method can be replaced with innovative multimedia approaches, the authors (Khan et al., 2013) acknowledged that lecture room learning is still beneficial and should not be discounted, as electronic teaching materials run the risk of contributing towards short term memory retention (Hossein & Abdus, 2005; Yousif et al., 2013). Pearson and Hubball (2012) also made the point that there is little evidence or substantive improvement in learning outcomes or other parameters when an integrated curriculum is compared to traditional curricula. While claims are made regarding the benefits of CBL in fostering problem solving, decision making, critical thinking skills and independent learning and motivation (Jesus, Gomes & Cruz, 2012; Yoo, Park & Lee, 2010), very few studies have provided empirical evidence of their effectiveness over other pedagogical approaches (Thistlethwaite et al., 2012).

Numerous studies have been conducted on pharmacy students' feelings or preferences regarding pedagogy. For example, a study of pharmacy education instruction based on preference and practices in Saudi Arabian colleges revealed that from the 300 students sampled, the dominant (53.7%) approach was direct lecturing (Yousif et al., 2013), however, students preferred a mixture of traditional lecture delivery and electronic aids (68%).

Professional education has also been affected by situated or "authentic" learning, where it is believed that in order for students to transfer their knowledge to contexts beyond education, they need learning tasks that mirror the realities of practice (Maton 2009). Dolmans and Snellen-Balendong (1997), in their seven principles of how to

design effective cases for a problem-based curriculum, discussed how cases should be presented in a context that is relevant to the future profession. Situated knowledge is believed to provide easier access for later use. Research on human memory indicates that information is better recalled if there is a link between the context in which the information is learned and that where it is applied (Dolmans & Snellen-Balendong, 1997). Research in professional education has been largely influenced by "authentic or situated learning" which claims to enable cumulative learning (Maton, 2009, p. 47). Authentic learning is often related to case-based, problem-based and project-based pedagogies providing students with examples of real-life practices, building on prior experience and preparing them for the world of work. Case-based teaching at UKZN mimic cases students would be faced with in the work environment, involving complex, unstructured problems (Suleman, 2012).

2.5.4 Team-based learning and inter-professional teams

Team-based learning (TBL) has gained popularity as an instructional strategy in health care education and occurs in a variety of ways at numerous pharmacy schools, with implementation ranging from single lessons to entire modules (Conway, Johnson & Ripley, 2010; Haidet et al., 2012; Letassy, Fugate, Medina, Stroup & Britton, 2008; Nelson et al., 2013; Ofstad & Brunner, 2013). TBL is described as a cooperative form of learning that provides an environment for students to develop higher levels of learning (Farland, et al., 2013). Students work in teams, composed of five to seven members and are responsible for learning concepts and content prior to class, freeing up class time for the application of pre-class learning to solve problems and to develop team work skills (Nelson et al., 2013). Ofstad and Brunner (2013) believed that a choice to use TBL requires a major change to teaching and learning on both the part of academics and students and they outlined four fundamental principles when adopting TBL which include: the formation and management of teams; individual and team accountability; frequent and timely feedback from academics and the exercises designed for TBL must foster learning and promote team building and development.

While TBL may include students studying in their disciplinary or professional fields, the growing trend of students working with other professionals is proving very favourable. Commonly known as interprofessional education (IPE) or interprofessional learning (IPL), this approach refers to occasions when two or more

professions learn from, with and about each other to improve collaboration and the quality of patient care (Thistlethwaite, 2012). Gilbert, Yan and Hoffman (2010)[22] summarised the key features of the WHO's framework for action of IPE and collaborative practice, which covers a global perspective, as well as the value offered in taking local contexts and needs into consideration when implementing IPE as detailed hereunder.

Part of the rationale behind IPE is to expose students to the dynamics of working with an array of professionals, allowing them to gain insight into the respective roles of other professionals in the healthcare system. IPE is also based on the aim of maintaining effective working relationships prior to occupying clinical positions in the working world (Thistlethwaite, 2012). Yanchick (2008) and Gilligan, Outram, and Levett-Jones (2014) pointed out that most health care professional training occurs in discipline silos, where competencies can be taught but does not provide students with the opportunity or realities of being a part of and working within interprofessional teams.

IPE faces tension in maintaining boundaries between traditional professions and generating new roles within the teams. Thistlethwaite (2012) also called for more research into IPE relationships among teamwork, IPE and collaborative practice, exploring IPE in terms of where it is developed (lecture room or clinical setting). Gilligan et al. (2014) believed that clinical settings offer memorable IPE experiences provided that they are structured, while Yanchick (2008) argued that higher education and academics are responsible for teaching students to work as members of health care teams. In South Africa, academic institutions also take responsibility for developing interprofessional team players with pharmacy students from the University of Witwaterstrand participating in cross professional case studies within a range of students from medicine, nursing and health sciences such as Physiotherapy, Occupational Therapy and Speech and Hearing (Malan, 2014). The North-West University (Potchefstroom campus), in line with the SAPC exit level outcomes (which focus on clinical skills), incorporates an integrated interdisciplinary training in their clinical pharmacy modules so students are trained and can function in health care teams (van Dyk, 2014).

[22] Gilbert is the co-chair of the WHO group working on IPE

Issues pertaining to when, how and why IPE should be used also need further research (Thistlethwaite, 2012). Ratka (2012, p. 1) claimed that IPE needs to also involve adequate pedagogical skills where innovative teaching approaches, "novel learning environments" and diverse active learning tasks feature. The IPE curriculum should also include discipline integration and self-directed and active learning (PBL and CBL), affecting pharmacy academics' current pedagogical practices.

2.6 Technology and the future of pharmacy education

Grindrod, Forgione, Tsuyuki, Gavura and Giustini, (2014) highlighted the impact technology is having on medical information and pharmacy. With the advent and advance of social and communication technologies, medical and pharmaceutical information no longer lies only in the hands of experts; non experts are now in the position of accessing, interpreting and generating medical and pharmaceutical information for themselves (Grindrod et al., 2014). This shift of control of medical knowledge from health professionals to the larger community has implications for pharmacists and pharmacy students alike.

Tensions exist as evidence-based pharmacy requires clinical knowledge and application in patient diagnosis and de-emphasises anecdotes, while social platforms present medical knowledge mixed with patients' accounts and stories (Grindrod et al., 2014). The role of social media in pharmacy teaching also arises, with several authors indicating the benefits of social media in engaging students in the teaching and learning process. Blouin et al. (2008) advocated the use of a technology driven approach to assist students in acquiring factual knowledge outside the classroom. They viewed the use of technology as a solution to dealing with some of the frustrations and addressing higher education's goal of producing "expert" learners. Blouin et al. (2008) listed a range of attractive benefits this approach offers such as interactive, self-paced, immediate feedback and the approach catering for a variety of learning styles and preferences. It further frees up space in lecture time to address higher order intellectual activities such as practical implementation of knowledge, concept integration and critical problem-solving skills (Blouin et al., 2008).

Cain and Fox (2009) and Cain, Scott, Tiemeier, Akers and Metzger (2013) illustrated the extent of some of the newer types of social internet applications (often referred to

as Web 2.0), which are becoming increasingly popular within higher education environments and can be adapted for the teaching and learning environment such as pharmacy education. Although developed primarily for entertainment and social communication within the general population, higher education institutions for teaching and learning purposes are adopting applications such as blogs, social video sites, and virtual worlds (Cain et al., 2013). These can be used as teaching tools, as well as a means for educators to stay informed about relevant issues. Numerous "opinion" blogs maintained by practitioners also exist, providing perspectives into the day-to-day professional lives of pharmacists (Cain & Fox, 2009). Camp (1996) predicted the emergence of apprentice learning using computers in the field of virtual reality and Grindrod et al.'s (2014) scoping review of social media use in pharmacy highlights these virtual worlds in stimulating real-life experiences. One such creation is the development of Pharmatopia, a virtual island which allows students to develop pharmaceutical skills such as compounding. Sophisticated technological advancement applied to medical training would also bring the obvious application of virtual patients. Srinivasan, Keenan and Yager (2006) also explored virtual realities or highly technological innovations and their potential influence on medicine in the future. Studies have highlighted how patients can use virtual reality technologies to predict their health in the future based on current data of life-style choices (Grindrod et al., 2014; Nuffer, Smith & Trinkley, 2013).

Another innovative approach for clinical training is computer-based virtual groups of students who come together despite geographic separation. This approach offers benefits over PBL groups as it creates a space for individual mentoring, observation and feedback, which are deemed more important for the developmental process than small group facilitation (Camp, 1996). Pereira, McNamara, Sorge and Arya (2013) in Grindrod et al. (2014) introduced the concept of health avatars or computerised representations of individuals using a variety of data sources (such as biographical data, insurance and primary care). Health avatars would carry out a range of services, providing education, health monitoring and ordering prescriptions. While technological advancements have resulted in academics reconsidering previous traditional methodology (Romanelli, Bird & Ryan, 2009), technological innovation is not necessarily the answer to all and does possess the ability to be a distraction, rather than an enhancement if it is not properly implemented.

2.7 The role of pharmacy academics

At an institutional level, academics appear at the forefront and are required to prepare pharmacy students to deal with the changing world. Studies in Lebanon have highlighted the challenges faced by academics and higher education in the paradigm shift, amidst the technological age and resource constraints (Zeitoun, 2011). Upon entering the second decade of the 21st century, pharmacy academics continue to face a number of challenges that impact on the quality of pharmacy education. Zeitoun (2011) believed that in order to improve patient focused services, strong educational systems are necessary to equip both present and future pharmacists. At an institutional level, academics need support to be creative and develop pharmacy students who are equipped to deal with the changing world (Anderson et al., 2009).

Debates continue with regard to whether academics should serve the role of guides and facilitators or occupy centre stage in the teaching and learning process (Penson, 2012). Neither role should be seen as exclusive to the pedagogy implemented. Penson (2012) described the role of the academic as follows:

> *The job of the lecturer is therefore to bring together an array of materials from different sources, and to synthesise this information in a way that is accessible to students and that encourages and inspire them to construct their own learning and understanding in ways that best suit their individual learning style.*
>
> (Penson, 2012, p. 75)

Azer (2009) described some of these teaching materials and highlighted the value of visual aids in explaining difficult concepts (diagrams, illustrations, three-dimensional models, a mini-video, an analogy or an animation). This resonates with Shulman's (1986) concept of pedagogic content knowledge. Shulman (1986) believed that to facilitate learning, teachers require several kinds of knowledge about learning; they need to think about learning different kinds of material for different purposes and how to decide which kinds of learning are most necessary in different contexts. In addition they need to find optimal ways of enhancing the acquisition and development of such knowledge and representing and communicating it to students.

> *From being able to comprehend subject matter for themselves, to becoming able to elucidate subject matter in new ways, reorganise and partition it, clothe it in activities and emotions, in metaphors and exercises, and in examples and demonstrations, so that it can be grasped by students.*
>
> (Shulman, 1987, p. 13)

Shulman (1986) argued that research on how subject matter is transformed from the knowledge of the teacher into the content of instruction, or how that content was expressed in ways that students understood or misconstrued, was neglected. The idea of pedagogic content knowledge has since been developed by several other researchers (Ball, 1993; Lampert, 1990; Grossman, 1990; Gudmundsdottir, 1991; Shulman & Sherin, 2004; Wilson, 1992; Wineburg, 1991) across disciplinary fields, although none focus on pharmacy. This body of work emphasises that one of the most significant factors influencing the effectiveness of teaching is the teacher's own subject matter knowledge and pedagogic content knowledge (Shulman & Sherin, 2004). The study of pharmacy academics is therefore particularly important considering the role of the academic in professional educational settings.

As the world becomes more complex and uncertain, the question of whether knowledge and skills will be sufficient arises. Tension and power struggles arise amongst players in the field (such as governing bodies, institutions and academics) as there are pedagogical implications regarding the way knowledge is constructed, the selection of the material, pacing and assessment practices. Tension also exists between open access to information and continuous development on one hand and the need for specialisations or professions to resist change on the other hand, holding on to their traditions and conventions. Academics are faced with numerous questions pertaining to future students, such as what sort of professionals are they developing and how does students' curricular experiences shape them professionally (Noble et al., 2011). Theories that take a cognitive approach to teaching and learning view the curriculum based on the acquisition of knowledge and skills and ignore the type of people that students are becoming (their graduate attributes) as a result of their exposure. The debate on skills and competencies thus also includes graduate attributes, especially in a context of professional development (Noble et al., 2011).

The way in which pharmacy students are educated, the paradigm and the focus, all have implications for the new knowledge and competency acquisition required for their new role. This has implications for educational institutions, and academics in particular, considering the mutual linkage that exists between the profession of pharmacy and the schools of pharmacy that prepare pharmacists (Asiri, 2011). It is therefore important to have a deep understanding of how pharmacy academics teach what they know, as this plays a key role in preparing future graduates for the profession.

While cultural and technological shifts disrupt educational comfort zones, they simultaneously provoke new and exciting opportunities. Pharmacy education faces a similar fate to the quickly evolving global trends and work place pressures seen in medical education (Srinivasan et al., 2006). In order to prepare for future trends, it is important to understand the present ones. While the quest for the most effective teaching method continues, it is worth noting that no one approach may be exclusively superior and Gleason et al. (2011) pointed out that some strategies may work better with certain academic personalities and teaching styles.

2.8 Summary

The paradigm shift of pharmacists to a more clinically driven profession signaled changes for academics and higher education institutions. Global pharmacy and pharmaceutical education trends indicate curricula changes, which vary from one context to the next. Similarities and differences are noted between and within developed and developing countries in terms of the structure of pharmacy curricula, integration and the B. Pharm programmes implemented. While global competency frameworks, policies and guidelines provide broad brush strokes on the pharmaceutical education landscape, finer detail is dependent on unique circumstances and a need-based approach ensuring adaptability and sustainability within local contexts. Academics are perceived to be at the forefront of changes and are responsible for developing domains of knowledge, skills and competencies, values and behaviour through revisiting or engaging with the curriculum, pedagogy and technology.

Chapter 3
Theoretical and Conceptual Frameworks

3.1 Introduction

This chapter presents the theoretical framing for understanding knowledge and pedagogy in pharmacy education. It covers knowledge types and structures and their translations into the curriculum and pedagogy in a higher education context. The educational framework developed for this study is based on conceptual and analytical tools from the works of Bernstein (1990; 1996; 2000) and Maton (2005a; 2005b; 2007; 2008; 2009; 2013). The framework provides the lens and structure through which pharmacy education and academics' pedagogical practices are viewed and better understood. Bernstein's Code Theory and pedagogic discourse provides a clear language of description, with Maton's Legitimation Code Theory (LCT) offering a deeper analysis. Semantics, in particular from LCT, provides a deeper understanding of the structure and complexity of disciplinary knowledge construction and the semantic wave sheds light on knowledge structures and its relationship with pedagogy. The study draws on the interpretive and social realism paradigms.

3.2 Paradigms

3.2.1 Interpretive paradigm

The study is located within the interpretive paradigm, which emphasises a concern for an individual and searches to understand the subjective world of human experience (Cohen, Manion & Morrison, 2011). Cohen et al. (2011) outlined the relationship between theory and interpretive researchers, saying that theory arises and emerges from particular situations and is based on data generated through the research process, paying attention to the sequence of theory coming before the research. While the theoretical frame imposed in this study is used to understand knowledge and pedagogy, it does not guide the entire research process but rather the first research question where a description and understanding of academic pedagogical practices are mapped. Cohen et al. (2011, p. 18) also characterised interpretive research as researchers "working directly with experience and understanding to build their theory" which is the case in this study where I work with

pharmacy academics seeking to explore their understanding of knowledge and pedagogy and the reasons for the way they teach (which focuses on research question two). It is from their accounts through personal interviews and from observations of their practices that thematic analysis is undertaken towards generating a theory.

3.2.2 Social realism

Social realism views knowledge as both social and objective (Corbel, 2011) and is built on the premise that knowledge is both socially produced and real (Maton, 2013). Young (2010) believed that although the production of new knowledge by research and acquisition through formal education is a relatively recent phenomenon, it can be traced back to the French sociologist, Emile Durkheim. Durkheim's distinction between different types of knowledge (theoretical and everyday knowledge) and between knowledge and experience is believed to be critical for the production of new knowledge and its acquisition (Young, 2010). Wheelahan (2008) shared a similar position crediting Durkheim and Bernstein for the contributions made in advancing social realism by distinguishing between knowledge types (abstract from everyday) and their subsequent roles in society.

The social context in which knowledge is produced matters in social realism, which rejects claims of knowledge being timeless, universal or independent of the social context where knowledge was produced (Wheelahan, 2008). Young's view of social realism is that knowledge and the social basis of knowledge are real. The sociology of education is not restricted to only theorising the context of education, but also includes its content and the relationship between context and content (Wheelahan, 2008).

Knowledge, in the social realism paradigm, is viewed as being produced socially by communities of knowledge producers amidst competing interests and power struggles (Wheelahan, 2008). Social realism builds on the critical realist perspective in science which provides a post-positivist view of knowledge production (Corbel, 2011). Knowledge is not described as absolute truth, but rather lends itself to being fallible and can be challenged on the grounds of "relevant knowledge" and based on "epistemic

values" (Morrow, 2009, p. 36 in Corbel, 2011). Knowledge can therefore change as new evidence and findings reject, replace or reshape previous knowledge and beliefs (Wheelahan, 2008). This study therefore seeks to gain a deep understanding of the phenomenon using both a strong existing analytical framework (code theory, pedagogic device and LCT) and an interpretive paradigm to uncover emergent patterns that cannot be predicted or explained using an analytical frame only.

Bourdieu's (1984; 1990) concept of field has not been used as an analytical lens but is included for providing a background into understanding the complex, dynamic and interconnected nature of pharmacy academics, students, knowledge, curriculum, amongst other players in the pharmacy field. While Wenger's (2011) communities of practice is valuable in understanding players in the field and professional development, it has not been included as it does not offer a wide angle view on the pharmacy educational terrain that field provides. The concept of field, with its specific language of description to education, has therefore been used to inform the way we view pharmacy in higher education where external and internal factors at play influence pedagogical practices.

Bourdieu's (1984) concept of "field" explores how structure, agency, power and agency interact in the social world, with his concept of field highlighting how various relationships are encountered amongst different social agents within this space. Social agents or "actors" include individuals as well as institutions, authorities and social groups in different positions within the hierarchically organised networks (Albert, Laberge, Hodges, Regehr & Lingard, 2008). Bourdieu and Wacquant (1992) emphasise that the focus is not on the individual (although a necessary component in the field) but on the field itself. The concept of field holds all animate and inanimate components together. It holds structures and practices and shows how these differ in contexts (Maton, 2005a) such as formal pharmacy educational and everyday contexts.

The concept of field allows for the study or analysis of any aspect pertaining to social life, taking into account the series of interrelated structures, activities and relationships of people acting within the field and affected by influences outside the field (Rhynas, 2005).

Bourdieu's (1984) theories have been applied to a wide array of social contexts across humanities, sciences, health sciences, nursing (Rhynas, 2005), public health, pharmacy and medicine (Lumme-Sandt & Virtanen, 2002). The concepts of "capital" and "habitus" are interrelated to field, however, these shall not be discussed as the focus of this study is on pedagogy using Bourdieu's (1984) concept of field as a background concept, offering insight into the relationships between pharmacists and other actors within and beyond their academic institutions.

Rhynas (2005) uses the example of hospital care and dementia patients to illustrate the concept of field. Similarly pharmacy operates as a field, which is influenced by the organisational structures of the university, different pharmacy departments, environmental factors, legislation and regulatory bodies, and the relationship between actors and activities in the field. Maton (1999) describes Bourdieu's "field" as intellectual fields and relationships where struggles over resources and status take place. The field of pharmacy, like any other field, is a dynamic and contested space. All actors in the pharmacy field (such as pharmacy academics, policy makers, students, pharmacists in practice, other health care members, patients, their families and caregivers) have the power to change the field and alter the nature and future direction of the field. The power dynamics mentioned is not the focus of this research, but have been presented to provide background into the pharmacy field and the players involved. While Bourdieu's theory is useful for analysing the nature of contexts, it is limited in its use regarding the nature of the role of knowledge and practices in those contexts (Bennett & Maton, 2010). Bernstein (1996, 2000) and Maton's (2005a; 2005b; 2009; 2013) work have therefore been used for analysis in this research as they deal with the issue of the nature of knowledge and the differences between those gained from informal everyday context and formal education.

3.3 Bernstein: Code Theory and the pedagogic device

> *Bernstein dug beneath the empirical features of education to explore their underlying structuring principles (most famously in codes) and then excavated further to analyse what generates these principles. Bernstein was, therefore, always engaged in developing more general conceptual tools in light of what was being revealed by both empirical research and theoretical excavation.*
>
> (Maton & Muller, 2006, p. 2)

Maton and Muller (2006), in their description of Bernstein's contribution to education have highlighted the sound empirical and theoretical basis of his work. Bernstein's codes are used in this study to conceptualise the principles that structure practices in pharmacy education. His pedagogic device is used to follow these principles from knowledge production through processes of transformation to knowledge reproduction in lecture rooms.

3.3.1 Code Theory: Classification and framing

Bernstein's concepts of classification and framing were originally published in 1971 as a result of his analysis of the organisation and distribution of educational knowledge (Singh, 1997). Theories on classification and framing were borne out of his interest, experimentation and years of research in a schooling context in England working with children and were largely confined to the discipline of sociolinguistics. According to Bernstein (1996), social interactions that characterise teaching and learning in a classroom are a consequence of power and control relations between subjects, discourses and spaces (Morais and Neves, 2001).

Despite the confines of code theory concepts' contexts and origins, their proliferation covers a spectrum of disciplines, contexts and participants across the globe. Research using classification and framing range from the humanities (Muller, 2007; 2009; Shay, 2011; 2012) to the sciences (Morais & Neves, 2001), and even encompasses professional disciplines (Case, 2011). They also cover a range of educational contexts from pre-school to undergraduate university students. Apart from diverse educational contexts, Bernstein's classification and framing saw geographic proliferation with research being conducted around the world in Australia, Chile, Finland, Portugal, the USA, UK and South Africa (Maton & Muller, 2006). According to Maton and Muller (2006) the extensive use of Bernstein's classification and framing is indicative of its value in providing deep and rich descriptions in educational research as well as providing explanations, lending itself to adaptability in the context of this study.

Bernstein's concept of "code" provides a means of analysing the structure of practices (Maton, 2005b). It is comprised of two conceptual instruments, classification and framing, which are used to describe knowledge and characterise how pedagogic practice occurs. Bernstein's concept of classification varies from the commonly understood biological terminology with the same name, where classification in education is the defining attribute between categories rather than a defining characteristic of the category itself (Bernstein, 1996).

Classification serves to distinguish knowledge (see Table 3.1), firstly on a level between specialised, disciplinary knowledge and everyday knowledge, then between types of disciplinary specialised knowledge and finally within specialised knowledge. In distinguishing what is meant by disciplinary knowledge and everyday knowledge, this study uses Young's (2010) summary of Vygotsky, where specialist knowledge is produced in communities (such as physicists or geographers) and concepts have specific purposes in that they enable us to make reliable generalisations which can be tested. Theoretical concepts are acquired consciously and voluntarily through formalised educational institutions (such as schools, colleges and universities) whereas everyday concepts are acquired unconsciously, through experience and in no particular order except for relating to particular problems or contexts (Young, 2010).

Classification deals with issues of power and framing with how pedagogy is controlled. Bernstein (1996) measured both classification and framing in terms of strengths (strong + or weak -). The strength of classification (C) refers to the relative strength of boundaries between categories or contexts (such as academic and non-academic, between academic subjects in a pharmacy curriculum or between topics and sections within a discipline in pharmacy). These relationships can also be conceptualised in terms of either weak or strong boundaries between categories (Bernstein, 1996). In describing knowledge relationships or making pedagogic decisions, there are options for boundaries to be kept distinct and separate or blurred which allows for integration.

Table 3.1: Classification and strengths within a pharmacy context

Classification	C+	C-
Everyday and pharmacy knowledge	Strong boundary between pharmacy discipline and everyday knowledge. Both kept apart.	Weak boundary between pharmacy discipline and everyday knowledge.
Between Specialisation	Strong boundary between subject and other subject areas. For example each of the 4 pharmacy majors is kept separate and apart.	Weak boundary between subject and other subject areas. Integration takes place amongst the majors in the pharmacy curriculum
Within Specialisation	Strong boundary between different topics within a particular module. Each topic is kept separate.	Weak boundary between different topics within a particular module. Integration and reference to other topic for example between respiratory system and neurological systems

Framing

In classification, power relations determine who gets access to particular forms of knowledge whereas in framing, importance is placed on the relationships of control that take place in different contexts and areas of the curricula (Singh, 1997). Bernstein (1996) described framing, alongside classification, which relates to matters such as selection of content, sequencing (the order in which content is covered), pacing (the speed at which content is covered) and evaluation (assessment). These are the key means whereby control is exhibited, along with socialising individuals (Wolff & Luckett, 2013). Pedagogic discourse is defined by the rules or procedures involved in the production and circulation of knowledge within the pedagogic interactions (Singh, 1997). Framing is seen as the result of two discourses: the instructional discourse (ID) and the regulative discourse (RD). ID pertains to a discourse of various kinds of skills and their relationships to each other, whereas RD refers to a discourse of social order (Singh, 1997). The relationship between RD and ID is that of ID is always being embedded in RD (Bernstein, 1996). This means that in instructional contexts, discursive rules of selection, sequence, pacing and evaluation define academic–student relationships.

The strength in framing relates to the relative strength of control within these categories or contexts (Maton, 2005b). Generally pedagogic practice is more visible when framing is strong, the rules of instructional and regulative discourse are both explicit, and the

academic has control over selection. Where framing is weak, pedagogic practice is likely to be invisible and the learner has more apparent control. In weak framing the rules of regulative and instructional discourse are implicit and are mostly unknown to the student (Bernstein, 1996).

3.3.2 Collection and integrated codes

It is important to note that classification and framing can vary independently to generate various modalities of pedagogic practice (Bernstein, 1996). Bernstein's collection and integration code highlights this relationship. The collection code is characterised by both strong classification and framing where interactions between academics and students are highly controlled. The integration code, displays the opposite, and is characterised by weak classification and framing.

Bernstein (2000) differentiated between discourses in terms of whether they were singulars or regions. Singulars referred to "the traditional pure academic disciplines" such as sciences in biology or physics that face inwards towards the discipline. Regions on the other hand, comprised of a combination of constituent singulars (facing inward) and those facing to the fields of practice (facing outward) (Bernstein, 2000). In professional qualifications such as medicine, engineering, nursing or pharmacy, the curricula comprises a combination of both, described by Bernstein as facing outward to the world of work.

3.4 Pedagogic device

Case (2011) highlighted the significance of Bernstein's pedagogic device in distinguishing between curriculum knowledge and disciplinary knowledge, which are often mistaken as interchangeable. The device also distinguishes between curriculum and pedagogy. According to Case (2011), the pedagogic device recognises distinct forms of knowledge and these take place in different fields. Disciplinary knowledge occupies the field of production (in the form of research and scholarship), which through the process of translations and transformations in the recontextualisation field is changed into curriculum knowledge. Curriculum knowledge is then turned into pedagogy (taught and

assessed) in the field of reproduction (Case, 2011). According to Bernstein (1996) the distribution of different forms of knowledge to different social groups is governed by distributive rules, whereas the official knowledge and the "what" and "how" of pedagogic discourse is governed by recontextualisation rules (Bernstein, 1996). Bernstein also made the point that the pedagogic device is not neutral or ideologically free, but rather can be controlled by those who owned the device. The rulers of the device therefore have the power and position to further their own ideological representations (Bernstein, 1996).

3.4.1 The pedagogic device in pharmacy education

In the pharmacy discourse, esoteric knowledge is produced in the field of production in terms of research and scholarship, which can take place within the university or externally - from the pharmaceutical industry, the state and regulatory boards and councils (such as the SAPC). It is important to note that the structure of knowledge in the field of production has implications for curriculum knowledge and pedagogy. The field of recontextualisation and reproduction takes place largely within the university, although these may occur at different levels within the university structure, for example in colleges, schools, or departments. While all three fields play a role in what knowledge is selected, arranged and taught, this study is largely located within the field of recontextualisation and reproduction. It involves pharmacy academics' roles in the process of what knowledge should be selected and taught in academia when producing future pharmacists.

3.5 Knowledge in educational and intellectual fields

Bernstein's work on knowledge structures is relevant to this study in characterising the knowledge structures within the pharmacy curriculum. His work showed the role of intellectual and educational knowledge structures in shaping social relations, institutional organisations, disciplinary and curricular change (Maton, 2007). Bernstein (1999), in analysing knowledge in intellectual fields, distinguished between horizontal discourse (everyday or commonsense) and vertical discourse (scholarly or professional knowledge).

By the very nature of studying pharmacy education in a higher education setting, this study is located within Bernstein's vertical discourse category. Bernstein (1996; 1990; 1999) further stratified vertical discourse into horizontal and hierarchical knowledge structures. Depending on the structure, this has implications for the way knowledge develops over time. "Hierarchical knowledge structures develop through new knowledge integrating and subsuming previous knowledge, whereas horizontal knowledge structures develop through adding on another segmented approach or topic area" (Maton, 2009, p. 45). Bernstein illustrated how hierarchical structures develop over time and how the integration of knowledge occurs using the symbol of a triangle (Δ), where knowledge progresses and integrates at lower levels towards abstraction and generalisation at higher levels (Bernstein, 1999).

Unlike hierarchical knowledge structures, horizontal knowledge is based on a collection code or serial code. The way in which knowledge develops in this code is illustrated by the series L^1 L^2 L^3 L^4 L^5 L^6 L^7…L^n, where L^2 is not built on L^1 but rather develops alongside it (Bernstein, 1999).

Segmented and cumulative learning

Maton (2009) believed that horizontal and hierarchical knowledge structures had limitations with regard to their application within the curriculum or the learning experiences of students. He expanded on the concepts developing the terms "cumulative learning", where students are able to transfer knowledge across contexts and through time and "segmented learning", where such transfer is inhibited. Knowledge building within the field of pharmacy can be viewed in terms of the degree to which meanings (in curricula and students' understandings) achieve weaker semantic gravity[23] or less context dependency and stronger "semantic density"[24] or greater condensation to meaning (Maton, 2010). Different knowledge structures, discourses, curricula, structures and forms of learning can have different degrees of semantic gravity.

[23] Semantic gravity is the degree to which meaning is linked to its context and the term is explained in further detail in section 3.7.1.

[24] Semantic density refers to the degree to which meaning is condensed and is explained further in section 3.7.2

The value of Bernstein's work

Bernstein's (1971; 1975; 1990; 1996) work has been highly criticized for being too dense or too abstract (Walford, 1995) without sufficient examples to schooling. However his research is also widely respected and extensively used, where translations have been made using contextual examples by subsequent researchers and followers, making his theories less dense and more adaptable as a "recontextualisation" of his work takes place.

Claims of his code theory being a deficit model of working class were refuted by Singh (1997), who accounted for this view as a misinterpretation due to Bernstein's selection of terminology in describing the codes. The "elaborated" and "restrictive" codes were not intended to promote social discrimination but rather to offer "a description of language use caught up in relations of class power in educational institutions" (Singh, 1997, p. 2). In educational research that explores teaching, learning or curriculum issues, as this study does, Bernstein's theory is valuable in providing a language to describe the ways knowledge is relayed by academics in the classroom (Cause, 2010). The value of the application of codes to education in general or specifically to pharmacy is that the underlying principle shapes such practices as curriculum, pedagogy and assessment. Subjects that are strongly tied to a profession have powerful selection pressures from the outside to produce a specific type of skill

> *Bernstein (1975) shows how changing codes impact on educational identities, working relations, property relationships, organisational structures and pedagogic practices.*
>
> (Maton, 2005b, p. 47)

Bernstein's codes offer a basis for researchers to identify whether or not students recognise or realise the code required for achievement within specific educational contexts, which in turn has direct implications for education policy. Understanding the code has implications for change regarding the underlying structuring principles of the discipline, curriculum or classroom to match the code or provide students with the key to unlocking the code, enabling academic success (Maton & Muller, 2006). This study is limited to describing the codes that operate in pharmacy education and understanding the underlying structures in their current form. The implications this has for change and

policy is beyond the scope of the present study and has the makings of a subsequent study.

Bernstein's code theory (2000) provides a description of the academic discourse of pharmacy as a vertical discourse, with a combination of hierarchical and horizontal knowledge structures, largely illustrating strong grammar. Grammar can be defined as the degree to which knowledge can be tested and confirmed or empirically disconfirmed (Luckett, 2010). Horizontal knowledge structures are differentiated in terms of possessing either strong or weak grammars (Bernstein, 1999). Horizontal knowledge structures which display strong grammar progress by integrating old theories into new ones and are subject to empirical testing. Horizontal structures with weak grammar progress through critique and power and cannot be empirically tested (Luckett 2010). Within horizontal disciplines, such as Pharmacy Care, a combination of strong and weak grammars may present. In the law module, strong grammars can be illustrated by distribution laws governing distribution and scheduling of drugs, whereas weak grammars can be illustrated in terms of how pharmacists deal with individual cases in distributing these drugs in a context where social, ethical and power issues exist.

The field of pharmacy also faces outwards to the world of work. While Bernstein's knowledge structures will provide the key to understanding different types of knowledge structures within pharmacy and how specialisation may work, they will not unlock the entire picture; the hierarchical and horizontal knowledge structures prove to be limited, as Maton (2010, p. 1) stated:

> *They highlight what kind of knowledge structure one might discover but not the underlying principles that make them hierarchical or horizontal*

Maton (2009) believed that Bernstein's (1996; 2000) mapping of knowledge can be criticised for offering dichotomous ideal types (such as horizontal and hierarchical knowledge structures). In addition, Young and Muller (2010) argued that Bernstein's (2000) conceptualisation represents a deficit model, where these subjects are wanting in comparison to the hierarchical structures of natural science. Maton's (2005b)

"legitimation codes", which built on Bernstein's (1996; 2000) knowledge structures, therefore exposed the principles that generate different forms of curriculum and knowledge.

3.6 Maton and the epistemic device

The epistemic device was developed to understand the principles and structures responsible for generating knowledge, curricula and forms of learning (Maton, 2009). It was further designed to complement the pedagogic device rather than replace it (Maton, 2005b; Moore & Maton, 2001). Both the pedagogic device and the epistemic device operate in the three different fields of knowledge: production, recontextualisation and reproduction (Maton, 2005b). The epistemic device looks at how knowledge is produced and acknowledges that this is influenced by power struggles. Maton (2005b) stated that control of the device allows the ruler power over access and distribution of legitimate claims to new knowledge and membership in the field (professional identity as would be the case in pharmacy) (Maton, 2005b).

3.7 Legitimation Code Theory

Maton's (2005b) Legitimation Code Theory (LCT) is a multidimensional conceptual sociological toolkit for the study of educational practice. LCT was built on the principal foundational framework of Bernstein's (2000) code theory (concepts of classification and framing) (Maton, 2013). LCT comprised of five principles of legitimation and these are - autonomy, density, specialisation, temporality and semantics. This study focuses on the aspect of semantics from the model only, as it relates to understanding meaning and how meaning relates to context (the two key features of semantics: semantic gravity and semantic density are explained in more detail in sections 3.7.1 and 3.7.2 respectively). Since its inception and despite being a relatively young theory, LCT has been used in numerous studies across the world and its proliferation extends to diverse disciplines ranging from the natural arts: music (Lamont & Maton, 2008) and design (Carvalho et al., 2009) to the humanities: sociology (Luckett, 2009; 2010), history (Shay, 2011) and marketing (Arbee, 2012). Although code theory or the pedagogic device has been used in the professional arena in studies such as medicine (Sommerville, 2012) and engineering

(Case, 2011), LCT has been predominantly been limited to nursing (McNamara, 2007; 2010a; 2010b; McNamara & Fealy, 2011) within health sciences and to an international context. The application of the pedagogic device and LCT in a South African pharmacy context provides insight and new knowledge in to the field.

3.7.1 Semantic gravity

Semantic gravity and density are used to understand the underlying principles generating forms of knowledge (Maton, 2009). Semantic gravity is an approach through which the "verticality" of a knowledge structure is described. It is defined as the degree to which meaning is linked to its context, therefore by using Maton's (2009) external language, the codes enable the analysis of texts separating contextualised meanings from decontextualised ones (Wolff & Luckett, 2013). Stronger semantic gravity (+) is indicative of being more related to context, while weaker semantic gravity (-) is less dependent on context in order to make meaning (Maton, 2013). Despite semantic density being assigned strengths (+, -), it operates on a continuum of strengths, rather than being polarised. The strongest form of gravity is the reproductive description, while the weakest form is abstraction, where meanings are decontextualised.

Table 3.2: Maton's (2009) language of description of semantic gravity

Weaker ↑	Abstraction
	Generalisation
	Judgment
	Interpretation
	Summarising description
Stronger	Reproductive description

In terms of the discipline of pharmacy, an example of strong semantic gravity would be the physical side effects of a drug taken, whereas an example of weak semantic gravity would be the mechanism of the action of a particular drug.

3.7.2 Semantic density

Halliday (1993) coined the concept of lexical density to measure the density of content or information in any text, according to how tightly the content words were packed into the grammatical structure. Lexical density is measured by the number of lexical words per clause. In much the same way, semantic density takes into consideration the complexity of concepts in the context of a particular discipline. Semantic density describes the internal relations of knowledge practices (Shay, 2012). It is defined as the degree of condensation of meaning within terms, concepts, phrases and symbols (Maton, 2011). Similar to semantic gravity, semantic density operates on a continuum of strengths. Stronger semantic density (SD+) contains more meanings condensed within terms, concepts and symbols, while weaker semantic density (SD-) occurs when meanings are less condensed (Maton, 2011), as illustrated in the following example:

Table 3.3: Maton's (2009) language of description of semantic density

Stronger ↑	Human physiology
↓ **Weaker**	Human body

It is important to note that the strengths of both semantic gravity and density are dependent on the educational context, where meaning takes place. For example the human body in a primary school biology context will not have the same meaning as a human body in a university undergraduate biology module.

3.7.3 Semantic waves

Both semantic density and gravity occur on a continuum and as a result can be strengthened or weakened depending on the objectives and contexts. Maton (2010) described the process of weakening semantic density as being when the principles or concepts are taken from concrete context or cases and made abstract. The opposite is the

case of strengthening semantic gravity where abstract ideas are taken and made more concrete. In the case of strengthening semantic density a lengthy description is repackaged into a single term or concept, whereas in the case of weakening semantic density, abstract ideas are explained in greater detail with the help of empirical evidence or detail (Maton, 2011).

Gravity and density can be combined; and when this happens it enables the movement and recontextualisation of knowledge and the likelihood of knowledge building across various contexts (Maton, 2010), leading to semantic waves. Semantic waves are therefore a construction of "recurrent movements in the strengths of semantic gravity and density" (Macnaught, Maton, Martin & Matruglio, 2013). One aspect of downward movement (towards stronger semantic gravity and weaker semantic density) involves the unpacking or simplifying of technical discourse into a more familiar commonsense language for students to access. The key, and as demonstrated by the shape of the wave, is that students cannot remain at the bottom of the wave if they are to reach higher levels of abstraction and cumulative learning. Maton (2013) and Martin (2013) illustrated the complex and specialised nature of academic subjects, where students need to exhibit mastery, reinforcing the need for the upward move in the wave towards weaker semantic density and stronger semantic density (Macnaught et al., 2013). The combination of upward and downward movements enable the recontextualisation of knowledge.

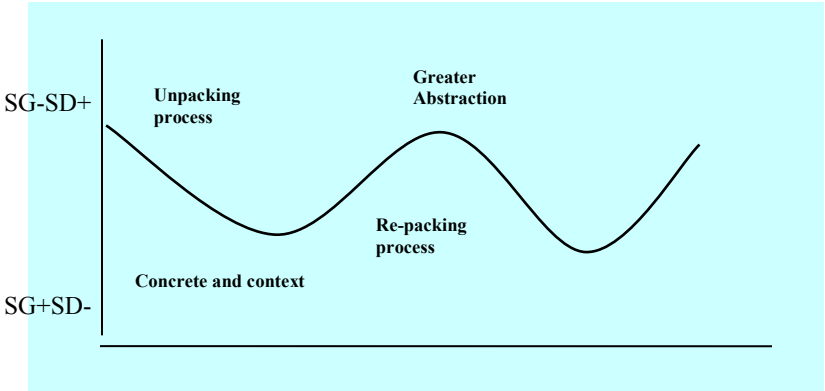


Figure 3.1: Illustration of a generic wave

3.8 Summary

Bernstein (1996; 1999; 2000) provided a description of the different types of knowledge structures, the relationship between these and how they develop with code theory and the pedagogic device, setting the scene for understanding the field. Knowledge in formal education, such as pharmacy in higher education, can be understood through a series of message systems: curriculum, pedagogy and assessment. Curriculum defines what counts as valid knowledge for developing pharmacists, pedagogy defines what counts as valid transmission of this knowledge and assessment defines what counts as valid realisation of this knowledge by students (Bernstein, 1975). Maton (2005b) extended the understanding of the series of systems through his contribution to how this happens in an academic discipline where academics play a role in legitimatising pedagogy.

Chapter 4
Research Methodology

4.1 Introduction

The following chapter captures the journey of the research approach undertaken in the study, highlighting the decisions made regarding selection of the theoretical (social realist and interpretivist) orientation and the methodological design (qualitative, case study, data sources and collection strategies) implemented. This chapter will consist of a number of sections, which cover the range of data production techniques; the various complementary data sources responsible in producing the data; and the multi-layers of data organisation from recordings to transcriptions. It also explores coding, imposing the theoretical frames to explore emerging themes and finding connections in the data. Researcher positionality is also discussed in order to navigate and locate the researcher in the space between insider/outsider dichotomies. Data analysis and the relationship between theory and data are explored in developing a language of description to better understand the pedagogical practices of pharmacy academics. The chapter, prior to conclusion, also considers issues of trustworthiness and ethical considerations in qualitative research of this nature.

4.2 Philosophical positions and the role of social realism

Philosophical positions are presented here to highlight the different ways in which knowledge and reality are viewed through the lens of human and health sciences and the implications this has for understanding knowledge in the context of the present study. Although Long (2013) made the argument for why science needs philosophical guidance, this is in the context of theoretical research and not for the promotion of a particular theoretical approach. Generally science and health-related fields such as medicine, nursing and pharmacy rely on the philosophical understandings of reality through positivism. Positivism views reality as existing in terms of a single reality, independent of human activity and requiring discovery. In positivism the researcher operates in an unbiased manner and objective manner with the aim of observing and measuring this reality (Oltmann & Boughey, 2012). The positive application of knowledge holds the view of empirical certainty of knowledge which can be obtained through sense data

inputs (Cruickshank, 2012). While positivism has greatly contributed to understanding natural sciences and has been a part of my life as a biologist, its role in understanding the social world of pharmacy academics, in this study proves challenging when dealing with the complexities of humans and human nature.

Numerous post-positivist theoretical orientations have developed in the health sciences, with the two most prominent forms being social constructionism and critical realism (Cruickshank, 2012). Social constructionism follows a relativist epistemology (theories of knowledge), which believes that all knowledge is relative to one's position or location within a set of social norms (Potter, 2003 in Cruickshank, 2012). As a result, social constructionism is believed to foster skepticism when it comes to all knowledge claims, especially those offered by people in the professional arena (such as pharmacists) who are viewed as holding authoritative roles (Cruickshank, 2012). Critical realism, on the other hand, acknowledges absolute reality independently of human action, but at the same time challenges the notion that reality can be observed purely objectively (Oltmann & Boughey, 2012). There are a number of methodologies that ascribe to a realist philosophy but differ in the details of how they work with the real. Long (2013, p. 3) presented scientific realism as "mind-independent" and "elemental". Similar to critical realism, "mind-independent" sees the world's existence as independent of our awareness. Long (2013) used the example of a falling tree in the forest to make this point; while we may not witness or hear the tree falling, it still creates sound waves. His reference to "elemental" speaks to the interrelated nature of how many larger objects are composed of smaller complex molecules (Long, 2013).

Scientific realism shares with numerous other types of realism the view that truth is not absolute but is rather of a correspondence nature and statements about the world are true to the extent of accurately representing the world. Critical realism and social realism allows us to understand the scientific world and share the common view that knowledge is a social process - one opening itself to representation in different ways - and all understanding and beliefs are fallible (Oltmann & Boughey, 2012).

In social realism the focus is mainly directed towards understanding the underlying mechanisms rather than observable events or experiences (Arbee, 2012). In line with this the study delves beyond the observable and experiences to gain deeper insight into knowledge transformation through Bernstein's pedagogic device (2000) and Maton's epistemic device (2005b) and the role of pedagogy in this journey.

As pharmacists' roles take them more into research into social pharmacy and pharmacy education, it creates a space for social theories – in particular social realism as a philosophical position in viewing the multiple realities of human observation and experience rather than a single reality perspective (Oltmann & Boughey, 2012). With the professional aspect inherent in a pharmacy education context, social realism and interpretivism allows for understanding specialisation, which can be conceptualised in terms of a knowledge dimension as well as a social dimension (McNamara, 2010).

Pharmacy is a profession which is not easily placed upon a theoretical foundation (Rovers, 2011). Rovers (2011) pointed out that while the most recent American Council on pharmacy accreditation standards mentions the role of social sciences in pharmacy and it's education, it is only mentioned once and not in terms of it's theoretical contributions to understanding the field. The theoretical applications of social theorists, in this study, such as Bernstein (1990; 1996; 2000) and Maton (2004; 2005a, 2005b; 2007; 2009; 2010; 2013), will therefore contribute to understanding pharmacy and pharmacy education from a social science perspective. Their theories will be used in data analysis to better understand knowledge, curriculum and teaching practices in a higher educational South African context. They will be used in understanding what knowledge is claimed, the underlying principles currently structuring academic pharmacy and how academics make this knowledge accessible. This will contribute to research in teaching and learning in both pharmacy education and higher education.

The use of social realism in understanding pharmacy academics' pedagogical practices provides an opportunity for dialogue between the theoretical and empirical. The methodological implications of this are empirical findings viewed in relation to the theory (Code Theory, pedagogic device and Legitimation Code Theory) to guide the study. The

approach does not lend itself to the data speaking for itself as in grounded theoretical approaches, but rather in dialogue or in communication with the theory. The research field is not entered into in the absence of preconceptions but rather hopefully in the absence of judgments. The external language of description is used for the structuring of the data; together with the internal language of description (the theoretical frame) it will provide an external language of description of academics pedagogical practices. The selection of interpretivism as a complementary philosophy is based on its emphasis or concern for an individual who searches to understand the subjective world of human experience (Cohen, Manion & Morrison, 2007), while the social realism paradigm speaks to the nature of knowledge and its transition. Together they provide a more composite picture in understanding the world of pharmacy academics, what knowledge is valued, how they construct knowledge and the pedagogies used in educating professionals. This study seeks to gain a deep understanding of the phenomenon using both an interpretive and a strong existing analytical framework.

4.3 Qualitative research

Qualitative research was selected based on its inherent characteristics of allowing for the understanding of phenomena located within the social and educational world. These worlds are characterised by "complexity, richness, connectedness and contradictions and qualitative research allows for in-depth and detailed understanding of meanings, actions, non-observable as well as observable phenomena" (Cohen et al., 2011, p.219).

Qualitative research provides an opportunity for the collection, analysis, and interpretation of data that relates to the social world and the concepts and behaviours of people within it (Anderson, 2010). Qualitative research was originally widely explored in the social sciences but is now also evident in applied fields such as health services, nursing, and pharmacy research (Anderson, 2010). While pharmacy educators are trained in natural and clinical sciences and often engage in quantitative research, emerging and growing trends highlight the importance of both quantitative and qualitative approaches in answering research questions and understanding the world (Anderson, 2010). Healthcare and education both share the feature of involving complex human interactions

that can rarely be studied or explained in simple terms. The complex and multilayered terrain of teaching and learning in higher education in a social world lends itself to be studied in as much in totality as possible rather than in fragments, therefore advocating the use of the qualitative approach in the present study (Cohen et al., 2011).

A comprehensive understanding of these dynamic and complex interactions therefore widens the scope of educational research where qualitative methodology can play a role, providing a better understanding of the nature of education in a number of different contexts (Anderson, 2010), this study being no exception.

4.4 Case study research

A case study approach was chosen because case studies are characterised by rich descriptions and details, which are necessary for understanding pharmacy academics' pedagogical practices which are dependent on numerous external and internal factors. Yin (2009) described case studies in terms of boundaries, where the boundaries between a phenomenon and its context are blurred, but importance is placed on setting the case within its context. In contrast, Creswell (1994) viewed a case study as a single instance of a bounded system (Cohen et al., 2011). Case studies also highlight the ability to view human systems in a holistic way, where contexts are unique and provide the opportunity to explore the dynamic unraveling of human relationships, interactions of events and other factors within a specific setting (Sturman, 1999). In this study the case studies of pharmacy majors and academics are situated within an institutional context of higher education - the University of KwaZulu-Natal. While there are several types of case studies, Yin (1984) has narrowed these down to three based on their outcomes as distinguishing characteristics: exploratory, descriptive or explanatory. In exploratory, case studies are used as a pilot leading to other studies or research questions; descriptive case studies provide narrative accounts; and explanatory case studies serve to test theories. This study demonstrates elements from Yin's (1984) descriptive and explanatory case studies.

Case studies acknowledge that a multitude of variables operate within a single case and argue for more than one tool for data collection and many sources of evidence in order to capture the essence of a case study (Cohen et al., 2011). The research design implemented in this study demonstrates multiple data sources and data collection tools contributing to the richness inherent in case studies.

For the analysis of knowledge changes from the field of production to institutions and lecture rooms, the vertical case study approach was selected. I draw similarites between vertical case studies and ice core extraction; where core samples are longitudinally sectioned, covering depth and traveling through various layers, each possessing its own unique characteristics. In attempting to understand the pharmacy curriculum structure and academics' pedagogical approach, the vertical case study was used longitudinally through one of pharmacy's majors. It extends from the surface layer of the Pharmacy Council[25] and external influences through various layers into lecture rooms, tutorials, practical sessions and ward-rounds, all characterised by dynamic, complex and interactive relationships and spaces. Vertical case studies offer an understanding of a phenomenon in more detail covering macro and microanalysis. Vavrus and Bartlett (2006), strongly advocate for vertical case studies and micro level analysis as a part of larger structures, influences and policies, which researchers need to understand. Vavrus and Bartlett (2006) referred to Broadfoot's (1999) argument that:

> E*ducation can only be fully understood in terms of the context in which it is taking place…. The unique contribution of comparative studies is that of providing for a more systematic and theorised understanding of the relationship between context and process, structure and action*
>
> (Broadfoot, 1999, p. 225)

4.5 Sampling and selection

Dongre, Deshmukh, Kalaiselvan and Upadhyaya (2010) believed that non-probability sampling, such as purposive sampling, is recommended because qualitative research is interested in answering "why" questions and exploring different perspectives through rich data. Purposive sampling was used in this study for the purpose of what Ball (1990) in

[25] Council refers to the South African Pharmacy Council (SAPC) unless otherwise stipulated.

Cohen et al. (2011, p. 157) referred to as "accessing knowledgeable people", such as those who have in-depth knowledge about particular issues, perhaps by virtue of their professional role, power, access to networks, expertise or experience. Academics participating in the study were knowledgeable on a combination of the above-mentioned qualities. Issues around representativeness and generalisation in selecting such a sample is not a concern because importance emphasis is placed on acquiring in-depth information from those who are in a position to share this (Cohen et al., 2011). Teddlie and Yu (2007), and Teddlie and Tashakkorri's (2009) provided six different types of purposive sampling: typical case sampling, extreme or deviant case sampling, intensity sampling, maximum variation sampling, homogenous sampling and reputational case sampling. Extreme or deviant sampling selects cases based on their opposition or space on a continuum; intensity sampling selects individuals who are clear examples of highly effective individuals; homogenous sampling is based on similarities while maximum variation sampling chooses a wide range of characteristics. Reputational case sampling operates on the recommendation of others or key players in the field, such as snowballing. In this study sampling falls within typical case sampling, where the sample is composed of the most typical cases of the group or population under study, which in this case are pharmacy academics.

4.5.1 Pharmacy academics

The pedagogical field is complex, dynamic and interactive involving many role players at various stages and levels. The importance of all role players in teaching and learning in the educational equation is acknowledged, however, this study was limited to academics in order to gain a deep understanding of their discipline knowledge and pedagogical approaches in developing professional pharmacists. While students' perspectives on their academics' pedagogical practices and their impact on teaching and learning would have been insightful, it would have shifted and extended the study beyond the scope intended by the researcher, focusing on breadth rather than depth.

Pharmacy academics teaching third and fourth year students in each of the pharmacy majors (pharmaceutics, pharmaceutical chemistry, pharmacology and pharmacy practice)

were selected. Data were generated from individually held semi-structured interviews, classroom observations and documentation analysis to gain a more complete picture and explore the phenomenon at a deeper level. Biographies for all participants were also compiled in order to provide background information and a holistic picture of the participants so that the data produced could be viewed in context and not in isolation.

Table 4.1: Profile of pharmacy academics participating in the study

Academic	Age Range	Position	Lecturing Experience (yrs)
Alben	35-39	Senior Lecturer	5-10
Ami	40-50	Lecturer	5-10
Midra	35-39	Senior Lecturer	5-10
Nardil	35-39	Senior lecturer	5-10
Riza	40-50	Senior Lecturer	20-30
Zeta	35-39	Lecturer	5-10
Zodone	40-50	Lecturer	11-20

Due to the small sample size, ranges for age and teaching experience were used as opposed to actual values. Names were derived partially from drugs and were selected for participants in order to mask race and gender.

4.5.2 Selection of the pharmacy curriculum

Justification for the selection of the third and fourth year pharmacy curriculum is provided, along with the rationale for the inclusion or exclusion of particular modules or practices (such as community service and internship). For the purpose of this study, the first and second years of academic study of the pharmacy curriculum were not considered. The first year curriculum was excluded on the basis that modules taken during this time are largely composed of general science modules or service modules (from the College of Agriculture, Engineering and Science) offered externally to the School of Health Sciences. Pharmacy academics have minimal input, interaction and engagement with the content, pedagogy and assessment during this first year. They are, however, in a position to comment based on their knowledge and experience of being

first year students themselves as well as being aware of the topics and subtopics covered within some of the first year modules.

The second year curriculum was excluded on the grounds that professional orientation is assumed to be most prominent in the third and fourth years, therefore focus was restricted to the later years in the curriculum. Ward-rounds, conducted as part of the fourth year Pharmacology module, were included despite the fact that academics do not accompany students on hospital visitations. Although ward-rounds are largely overseen by qualified pharmacists at the respective hospitals, their inclusion in the study is based on the module's location within the curriculum (towards the end of the curriculum in the fourth year Pharmacology module). In addition, academics are responsible for the planning process behind the ward-rounds and also have direct involvement in assessing ward-round write ups and presentations. Inclusion of this experiential learning component (ward-rounds) may also reveal insights on pedagogical practices designed for professionalisation.

Internship and community service years (five and six respectively) do not form part of the pharmacy undergraduate curriculum and have thus been excluded from the study. Academics are not involved in teaching students during this time and have no interaction with students during this phase of their learning as it is outside the four year academic qualification offered by the university. During internship students are placed in various settings (industry, hospitals, clinics and pharmacies) and are under the supervision of a qualified pharmacist. In the community service year, students function independently of their higher education institutions and have no academic contact. Year one, two, five and six will therefore serve as background/context. It was, however, possible to gain an understanding of academics' perspectives regarding these years from their accounts during interviews. The methodology therefore employed in the study was thus that of a cross section of the curriculum, academics' pedagogical approaches and the pedagogic device focusing on the third and fourth year of the pharmacy curriculum.

4.6 Where is the researcher? In the space between insider and outsider

Merton's (1972) presentation on the insider, outsider doctrines provides a good starting point for the discussion of not only my role but my views regarding insider/outsider debates within qualitative research, sociology, epistemology and the research context. Merton's (1972) view of the structural nature of insider/outsider illuminates the fluid nature of the space between insider and outsider research perspectives. The space between extends beyond the singular to a complementary or collective way of viewing the issue.

> *In structural terms, we are all, of course, both insiders and outsiders, members of some groups and, sometimes derivatively, not of others; occupants of certain statuses which thereby exclude us from occupying other cognate statuses. Obvious as this basic fact of social structure is, its implications for Insider and Outsider epistemological doctrines are apparently not nearly as obvious. This neglects the crucial fact of social structure that individuals have not a single status but a status set: a complement of variously interrelated statuses which interact to affect both their behaviour and perspectives*
>
> (Merton, 1972, p. 22)

As a researcher of pharmacy education, but not a pharmacist, I would be considered an outsider. In pure disciplinary terms, so too would pharmacists studying pharmacy education as opposed to their field of specialisation within pharmacy. My background in biology and knowledge of the pure sciences, which form the foundation of pharmacy, allowed me some insight into understanding certain concepts and processes, making me an outsider with insights. As an educator in higher education and a qualified science teacher, I was an insider to teaching and learning issues in a higher education context. Positioning in multidisciplinary research, between fields, by nature exposes the complexities of researcher belonging. In such cases choosing a polarised position would not do justice to the dynamic and complex systems and the infinite possibilities in the space between them.

Dwyer and Buckle (2009) supported the space between and spoke of a dialectical approach rather than a dualistic one. A dialectical approach encapsulates both the complexity of similarities and differences. There is no understanding of the self without understanding others - ways in which we are similar, ways in which we are different -

and this denotes the space between (Dwyer & Buckle, 2009). Mullings (1999) made the point that a researcher's knowledge is always based on his or her positionality, but that qualitative research allows for fluidity and the appreciation of complexities when dealing with human experience. In locating the researcher and his/her knowledge in relation to the context of the study and the disciplinary field, the purpose and focus of the researcher and the research should also be considered. I therefore chose to view my position within this research not as a researcher measured with respect to disciplinary origin but moving rather towards researcher evolution. I exist in the space where many complements of statuses exist, transcending sociological and epistemological boundaries. As researchers, we do not leave the field where we have studied intensely and immensely as the same people who started that journey.

> *Astronomy compels the soul to look upward, and leads us from this world to another.*
>
> (Plato, The Republic, 342 BCE)

Researchers share with astronomers and outer space explorers the journey from one world into another in their pursuit of seeking new knowledge or new ways of understanding knowledge. As we exit from the place of our origin (disciplinary fields for the insider purists), entering into another, where we are neither resident nor stranger, we learn what we can about the new world before re-entering into our own. We are changed by the experience and our experience of it; the meaning we make of the world we explore is not independent of the journey it has taken us to get there.

4.7 Data production

4.7.1 Entry into the field and meeting with participants

As researcher entering a different field, I was introduced to new people, creating the opportunity for me to introduce not only my study but myself. The purpose of the research was explained in order to avoid and alleviate unwarranted concerns and clarify any confusion participants may have. Official gate keeper permission was obtained (Appendix 3) and in addition, the school manager assisted with facilitating contact with

study participants. Appointments with participants were thereafter scheduled and interview sessions were arranged during the initial meeting with participants. The interview sessions were scheduled at a place and time convenient for the participants.

4.8 Piloting the study - the "trial run"

Pilot studies were implemented prior to the research being conducted, with piloting of both interviews and observations taking place. Conducting pilot interviews served several purposes: it met its intention of refining the research instruments prior to the commencement of the interviews, as well as providing insight for researcher growth and development with regard to interviewing techniques, pacing of the interview, and probing, guiding, interjecting and redirecting if necessary. Feedback received from one pilot participant regarding the interview session led to the refinement of the certain questions, eradicating ambiguity and in refining my explanations as well. The sequencing of the questions and the pacing of the interview were thus deemed suitable. The pilot aided in resolving the dilemma of whether to split the interview or not, based on the number of aspects and questions that needed to be covered. I decided not to split future interview sessions as the pilot interview was not exceptionally long and continuity was preserved. The interviewee also supported a single interview session in terms of allowing a flow of thought and for participant convenience. My reflections on the pilot interview highlighted areas requiring improvement and assisted in not only refining the instrument, but also the process.

In addition to piloting the interview, lecture observations were also piloted. They directed my focus and the debriefing session with my supervisor, after the lecture, was most useful in matters relating to the observation schedule, background, lecture-settings, academic-student relationships and areas of where focus should be placed.

4.9 Data sources

According to Yin (2009), case studies acknowledge numerous variables interacting within a single case, warranting more than one data production tool and multiple data sources to capture the implication of these variables (Cohen et al., 2011). This research was therefore based on multiple sources of information. Data were collected over an approximate six-month time period, beginning in January 2012 and ending in June 2012. During this period interviews were firstly conducted, followed by lecture and practical observations. Hospital ward-rounds and student presentations were also observed.

4.9.1. Data production strategies

The main data production activities involved in this research comprised of interviewing academics, observing academics and various components of the modules (practicals, tutorials and hospital ward-round sessions), and performing documentation analysis. The various strategies implemented in data production, along with details of their recording, are illustrated in Table 4.2.

Table 4.2: Data production strategies and instruments used in the research

Data production strategies	Instruments	Information required	Data recording
Questionnaires	Questionnaire forms	Academics biographical data, educational backgrounds and work experience	Written
Interviews	Interview schedule	Academics pedagogical practices and views on teaching and learning	Audio-recording
Direct observation – lecture	Observation schedule	Academics' pedagogical practices and discipline knowledge	Video-recording
Practical	Observation schedule	Curriculum, pedagogy and assessment	Field notes
Ward-rounds	Observation schedule	Curriculum, pedagogy and assessment in the absence of academics	Field notes
Student presentations		Lecturer assessment and feedback	Field notes and Power-Point slides
Document analysis	College documents, lecture notes, textbooks, tests, slides and videos	Curriculum and the way knowledge is structured	Electronic and hard copies.

4.9.1.1 Questionnaires

Biographical data and background information were collected using a questionnaire, which consisted of a mixture of both open-ended and closed-ended questions eliciting responses pertaining to personal details such as age, sex, race, educational backgrounds and working experience (Appendix 4).

4.9.1.2 Interviews

Semi-structured interviews took place prior to the observation sessions. Interviews commenced at the beginning of the semester, during the months of February and March and were conducted by the research rather than being outsourced. This decision was based on the fact that the researcher did not work with the participants or within the pharmacy department and as such could avoid the biases generally associated with "insider research". Interviews were approximately an hour in duration and were conducted in the pharmacy department for the convenience of the participants. Upon gaining participant consent, interview data were recorded using a digital recorder, which correlates with Rice's (2010) comments regarding interviews and the importance of recording devices. He described interviews as the favoured digging tool for mining into people's lives, with tape recorders in the sociologist's bag of evidence, a vocational disposition similar to medical doctors' stethoscopes (Rice, 2008; 2010). Interviewing academics (using semi-structured questions in Appendix 5) provided an account of their curriculum development and pedagogical practices, with lecture and practical observations further exploring this phenomenon in a more natural and interactive space.

4.9.1.3 Observation

Pharmacy modules generally follow the format of formal lectures, experiential learning, tutorials and practical sessions. All of these environments were observed for a topic or part of a topic covered in the first semester syllabus. Depending on the module the format for tutorials varied, from being integrated into the lectures to independent sessions involving Moodle[26]. Double lecture sessions for each of the pharmacy modules (Pharmacology, Pharmaceutics, Pharmaceutical Chemistry and Pharmacy Practice) were

[26] Moodle is an open source learning management system

attended over the third and fourth year curricula. Depending on the timing of the lectures the content covered varied from sections to complete topics, tests reviews or a revision session of the highlights of the entire module. For example, in Pharmacology 301, the curriculum is divided into two main sections: autocoid pharmacology and central nervous system (CNS) pharmacology. Each component ran for approximately six weeks and within each of the two types a broad range of topics were covered, lasting approximately a week. The table below illustrates the schedule and details of the modules observed.

Table 4.3: Observation schedule for major pharmacy modules

Date	Major	Module Code	Lecture content	Teaching Material	Recording
09/04-13/04	Pharmacology	PHRM 301	Histamines and Anti-Histamines	Power-Point presentation, notes	Video-recording
05/03	Pharmaceutical Chemistry	PHRM 311	Drug design	Power-Point, video, chalk board	Video-recording
18/04	Pharmaceutical Chemistry	PHRM 311 Practical	Synthesis of aspirin	Practical in laboratory, chalk board	Detailed notes only
08/03	Pharmaceutics	PHRM321	Sterilisation	Transparencies, notes and chalk board	Video-recording
18/04	Pharmaceutics	PHRM 321 Practical	Microbial Contamination	Chalk board and practical notes	Video-recording
07/05	Pharmacology	PHRM 401	Hormones and contraception	Power-Point and notes	Video-recording
11/05	Pharmacology	PHRM 401	Erectile dysfunction, osteoporosis, bone mineral homeostasis, thyroid	Power-Point, notes and case study	Video -recording
17/04	Practical	Hospital ward-rounds and student presentations	Clinical diagnosis	Patient files, ward-rounds notes, presentation notes and student Power-Point slides and reviews and	Detailed notes only

				assessment grids	
02/05	Pharmaceutics	PHRM 421	Test + Revision	Power-Point, OHP[27] and notes	Video-recording
03/05	Pharmaceutical Care (Pharmacy Practice)	PHRM 433	Revision session	Quizzes and games	Video-recording.

This study acknowledges the difficulties of observing pedagogical practices and the debates around this issue. With regard to the presence of the researcher affecting participants' performances, following the same cohorts to most of their lessons, practicals and tutorials allowed participants to adapt to my presence. The study incorporated the observation dimension because of the wealth and richness that observation (although this is a snap-shot into the practices) offers. It also contributed to and enhanced the data produced from the interviews and documentation analysis. In searching for a deep understanding of what academics do in the days in and days out of academic life, shaping and molding future pharmacists, this would not have been complete without observations. Observing academics in their "natural environment" (natural as possible, taking into account that the presence of the researcher and video recording equipment would impact on the situation) shows how knowledge structures and pedagogical practices intersect. The observation schedule devised based on Bernstein's (1996) and Maton's (2004) work provided a framework for observations and a way to better understand the external language of pedagogy (Appendix 6). Lecture observation data was coded in terms of classification and framing strengths, along with detailed notes on the physical and contextual setting of the observation, participants, curriculum and events. Both researcher and supervisor attended an observation session where they individually coded the observation data and recorded notes, which were thereafter compared, discussed and agreed upon during the de-briefing session.

[27] OHP refers to the use of the overhead projector

4.9.1.4 Documentation

Documents from the various sources listed below were used in the analysis of research data.

Websites

Websites of South African institutions offering the B. Pharm curriculum were reviewed for comparative purposes, with emphasis on the structure of the B. Pharm qualification and generalist training.

Policy documents

The SAPC's website was reviewed, with a focus on the outcomes and guidelines pertaining to the B. Pharm degree and specialisation in Higher Education (HE). Electronic documents, printed documents, files and e-mail correspondence regarding the school's planning for the new curriculum were also analysed. These documents were viewed for background purposes to understand the role regulatory councils play in pedagogical practices and to follow curricula changes to the B. Pharm curriculum.

Module and curriculum material

The College handbook regarding the modules, credits, content, aims and prerequisites were reviewed. Outlines for each of the modules under study were reviewed along with all the relevant documentation pertaining to the module, such as academics' Power-Point presentations and notes, student lecture and practical notes, case studies (designing and assessment in tests and exams), assessment guides, ward-round presentations, textbooks and journal articles used in the modules as well as Moodle quizzes and video presentations/segments. These multiple data sources provide a more complete picture of what takes place within the modules and how this shapes pedagogical practices.

4.10 Transcriptions

While transcriptions may seem a simple process of converting audio or visual recordings to written text, it is anything but simple. A wealth of research exists on transcriptions and the almost unending decisions (pertaining to style, linguistics, verbal and non-verbal interactions) that need to be taken when considering the purpose, format, layout and final presentation of the written text. Audio and video recordings are a major source of data in qualitative research such as this, and a substantial amount of literature pertaining to transcribing these recordings now exists. However, these are usually limited to linguistic and discourse analysis (Hammersley, 2010). Hammersley (2010) highlighted the breadth and depths of what transcription entails, especially in terms of all the decisions that researchers have to make with regard to the journey from audio and electronic data into written text.

The decisions taken in this study began with the decision to transcribe most of the data personally, as opposed to outsourcing. Halcomb and Davidson (2006) listed the benefits of researchers transcribing their own work, which included a deeper understanding through first-hand knowledge of the experience and personal involvement in the interview process. The researcher also brings an expertise into the interview subject and the advantage of having participated in both verbal and non-verbal exchanges with the participants. Transcribing data is extremely important in a field such as pharmacy, with discipline-specific terminology, concepts and procedures; it poses many challenges for someone who was not present to be involved in the transcription, as without knowledge of the discipline, content or supporting documents (textbooks and course notes), points of clarification would prove problematic.

The transcription of audio and visual material in the study differed. All audio recordings of participant interviews were transcribed verbatim and included words repeated by participants. Non-verbal signals, sounds, gestures and pauses were excluded from audio recordings, whereas notes on the environment were recorded in transcriptions of classroom observations, as these provided a more comprehensive picture of the dynamic processes taking place.

Some authors (Seale & Silverman, 1997; Silverman, 1993; van Teijlingen & Ireland, 2003) believe that verbatim transcription is not necessary for thematic or content analysis because the analysis technique is to identify common ideas from the data. This study uses a strong theoretical frame in addition to content analysis, therefore verbatim transcriptions were preferred.

4.11 Organisation of data

The data were organised per module in folders and contained all aspects pertaining to the modules. Transcribed interviews and observations and practical sessions were all stored prior to coding. The documents were coded using content analysis, which involved some of the steps outlined by Brenner et al. (1985). These steps involved categorising the data, creating labels and codes, reflecting on the data, developing interpretations and meanings. It also included synthesising, condensing and editing the data before reevaluating the process. The observation files and interviews were coded according to the following pattern: direct speech of participants was illustrated as normal text, whereas classroom observation notes were illustrated in italics. The first alphabet referred to the participant's initial, this was then followed either by a capital "P" which indicated a practical component of the module or a capital "L" which referred to lectures. The first small "p" represented the page number of the transcript, while the second small "p" referred to the paragraph of the transcript. The "L" in the end denoted the starting line where the quotation was obtained (for example A/L/p2p4L22). For references to pages in a particular practical manual, the module code appeared, followed by the page number (for example 321, p. 2).

4.12. Coding and analysing data

Qualitative data analysis generally involves condensing raw data into themes based on interpretation and valid inference. This process is driven by inductive reasoning, where themes become apparent from the data through the researcher's thorough examination and interpretation. According to Patton (2002), qualitative analysis should not exclude the option of deductive reasoning. Deductive reasoning is a theory testing process that starts with an established theory and explores if the theory is applicable in specific instances (Hyde, 2000). Deductive reasoning starts with the idea and uses the data to

either confirm the idea or not, whereas inductive reasoning allows research findings to emerge from dominant themes present in raw data, without constraints imposed by structured methodologies (Schwandt, 1997). The purpose of the deductive component in this study, which was incorporated in the earlier part of analysis, was more than just testing the theory, but rather involved using the theory to guide the descriptive analysis of current pedagogical practices. Berg (2001) believed that generating concepts from theory or previous studies, especially at the initiation of data analysis, is very valuable in qualitative research. In a deductive analysis of the data, this study used Bernstein's (2000) code theory and the pedagogic device, as well as Maton's (2005b) gravity and density from LCT, in order to make meaning of the data (Table 4.4). Each concept was coded using a language of description or a means of translating between theoretical concepts and empirical data. The coding scheme, a description of each code and the relative strengths were depicted. For example, in the case of semantic density, analysis followed the approach taken by Maton (2009).

In determining the strengths of the relationships in selection, sequencing, pacing and evaluation of the knowledge transmitted and received in the pedagogic relationship between academic and learner, Bernstein's (1996) codes were used. The strength of the relationship for each category was either classified as strong (+) or weak (-), or at times as a combination of both strong and weak classification (Table 4.4).

Table 4.4: Conceptual categories for characterising knowledge in the pharmacy curriculum (based on Bernstein, 1996 and Hoadley, 2006)

			Coding		
			Strong	Weak	Combination
Classification			+	-	+ -
	Relationship between everyday and specialisation	Strength of boundary between the subject area and everyday knowledge	+	-	+ -
	Between specialisations	Strength of boundary between the subject area and other subject areas	+	-	+ -
	Within specialisations	Strength of the boundary between sections or topics within the subject area	+	-	+ -
Framing					
	Selection	Extent to which academic controls selection of the content	+	-	+ -
	Sequencing	Extent to which academic controls sequencing of content	+	-	+ -
	Pacing	Extent to which academic controls pacing of content	+	-	+ -
	Evaluation	Extent to which academic makes explicit the rules of evaluation of students' academic performance	+	-	+ -
	Academic-student relationship	Extent of the social relationship (formal or informal) between academic and students	+	-	+ -

Inductive reasoning is a theory building process, beginning with observations of specific instances, and searching to draw generalisations about the phenomenon under investigation. Inductive analysis in this study followed after deductive analysis and took the form of allowing themes to emerge from evidence-based accounts through content analysis. Evidence based data generated from interviews, observations, field notes and document analysis were coded. According to Creswell and Clark (2011), the core feature of qualitative data analysis is the coding process, which groups evidence and labels ideas so that they reflect increasingly broader perspectives. After reading through the transcribed text from interviews, observation transcripts, and module documents (obtained from the various data sources), short phrases or ideas were coded in the margins of the transcripts. The text was divided into small units (phrases, sentences or paragraphs) and each unit was assigned a code, after which the codes were grouped into themes (Creswell & Clark, 2011). Interrelated themes were summarised in order to obtain a smaller set of themes. These themes were then interpreted using an interpretivist paradigm to make meaning and gain an understanding of pharmacy academics' pedagogic practices at UKZN. It provided an understanding of how knowledge structures intersect with classification and framing and provided insight into why academics use the pedagogical approaches that they do when preparing students to become professional pharmacists. The final analysis occurred as a step in conceptually interpreting the data set in its entirety.

4.13 Validity, reliability and trustworthiness

Creswell and Miller (2000) raised the use of a wide array of terminology in qualitative research for validity, which include goodness, authenticity, trustworthiness, credibility and adequacy. Maxwell (1992) argued for the need to replace positivist notions of validity with the notion of authenticity in qualitative research. While terminology may vary, common amongst qualitative researchers is ensuring that their research is credible. Demonstrating rigour is essential in all research traditions, from quantitative or qualitative research. Creswell and Miller (2000) defined validity in terms of the accuracy of the account in representing participants' realities. They also made the point that validity extends beyond the data to the inferences drawn from them.

According to Dongre et al. (2010, p. 2) the "meaningfulness and insights generated from qualitative data have more to do with the richness of the data obtained", and not sample size.

In addition to exploring a thick, rich description approach to enhancing credibility of this study, the following approaches were taken towards validating the evidence obtained. Interview transcripts, lecture observations and document analysis were coded individually by the researcher and supervisor using the theoretical framing imposed. During the debriefing session, interpretations of data (from the various data sources: interview transcripts, lecture observations and documentation) and coding strengths (classification and framing strengths) were compared and agreed upon. In addition, data from a Pharmaceutical lecture observation, and a test was coded for semantic gravity, density and the construction of waves by the researcher and compared with supervisor's account of the same information. Misunderstandings were therefore resolved and the analysis of other data was better informed as a result of this validating process. Data from thematic analysis followed a similar process, with individual researchers labelling, coding and categorising the data prior to meeting, discussing and synthesising into coherent themes. In addition, themes arising from the research were thereafter further researched in order to engage with current literature and trends pertaining to these emerging themes.

Authenticity or credibility in qualitative research can be enhanced by carefully arranged and sequenced data sources which provide an in-depth understanding of contextual aspects, along with human responses (Dongre et al., 2010), which was done in this study. Creswell and Miller (2000) referred to this procedure of establishing credibility through thick, rich description, which involves describing the setting, the participants and the themes in rich detail, rather than thin descriptions which merely aims to report facts. According to Cohen et al. (2011), credibility can be addressed through depth, richness, scope of the data achieved and the objectivity of the researcher.

4.14 Ethical considerations

Ethical implications of research should not be considered in terms of an organisational obligation, but rather as respect for people participating in the research, and about being sensitive and aware of the possible implications and consequences of one's actions (Rapley, 2007). Research should prevent any harm or distress to participants, whether psychological or physical in nature. This protection extends over the entire duration of the research process (field work and write up) (Rapley, 2007). According to Creswell and Clark (2011), ethical considerations should consist of providing reciprocity to participants for their assistance in

providing data, including correct handling of sensitive information, as well as disclosing the purposes of the research.

Ethical approval was successfully obtained from the Humanities and Social Sciences Research Ethics Committee at the University of KwaZulu-Natal (Appendix 7). Participants in this study were informed of the project and were free to withdraw from the study at any time. Participants voluntarily participated in the study and signed informed consent forms to this effect (Appendix 8). Written permission was also granted from students for the use of their SOAPE notes and slides from their Power-Point presentations (Appendix 9). In addition, permission for video-taping of lessons was also obtained from students. Academics who felt that this method of recording was intrusive and felt uncomfortable were given the alternate option of digital voice recordings only and field notes. Participants were also under no pressure to give permission for the recording of the data. Other ethical considerations mentioned by Rapley (2007) were also followed, where the option of stopping recordings at the requests of the participants was exercised if it had an adverse effect on the participant or the research environment. All data obtained from participants were also securely stored and electronic documents were also password protected.

The identity, privacy and dignity of the participants were protected through confidentiality and anonymity. This included not disclosing any personal identifying details of participants, the removal of all details that could identify the specific participants and the secure storage of all physical and electronic recordings and documents of a confidential nature (Rapley, 2007). This study complied with all the ethical requirements stipulated by the University of KwaZulu-Natal (see Appendix 7 for ethical clearance documentation).

4.15 Limitations and challenges of current design methodology

Limitations were experienced in terms of time constraints. The entire B. Pharm curriculum or all pharmacy academics teaching in the undergraduate programme could not be explored. Time constraints also limited the engagement with observation of participants' practices. In an ideal world with no constraints, perhaps the breadth and depth of pedagogical practices across the entire curriculum could have been explored, however, operating in the real world, the study attempted to provide a slice of the whole, highlighting pharmacy academics' pedagogical practices with the aim of understanding why these practices are being used.

Therefore, operating within time and resource constraints, selections were necessary and the rationale for these were provided.

Another possible limiting factor pertains to the participants' age, gender and teaching experience. Most academics in the study were female, and young (under 40 years), with 10 years' or less teaching experience. Perhaps academics across a broader age and experience range, along with a more gender neutral sample, may have yielded different insights. Burton's (2013) study of pharmacy academics across the eight institutions offering the undergraduate programme in South Africa, however, reveal a similar profile with regards to respondents' age (41% under 40 years), gender (75% women) and years in higher education (75% with 10 years and less).

Employing a case study approach may also be viewed as a limitation with regard to the transferability of case studies, yet Marshall and Rossman (1999) argued that findings from case studies can still relate to other contexts. This is especially important in case study research, where researchers use lessons of one case to make recommendations that can apply to others. Good qualitative work is linked to the complete picture, with the researcher looking holistically at the setting to understand linkages among the system (Toma, 2006). According to Lincoln and Guba (1985), the only way in which to ensure transferability is to create detailed or rich descriptions of the original context of the case so that researchers working in other contexts can assess similarities between their contexts and the case study presented. Thick descriptions of case studies provide the power to possibly influence theory and practice. I however, preferred Denzin's (1983, p. 133) view of rejecting generalisability as the goal, but rather believing that "every instance of social interaction, if thickly described, represents a slice from the life world" and is thus a proper subject matter.

4.16 Summary

This chapter covered the philosophical positions of the theoretical paradigm underpinning the study, along with methodological approaches undertaken in the research and the rationale behind it. The case study approach, along with the various data sources and production strategies employed, were described. The organisation, storage, coding of data and analysis were briefly outlined. Participant selection and profiles were presented, as well as decisions outlining how modules within the curriculum were selected. Clarification regarding my position, as researcher, within the study was also provided. Finally issues of trustworthiness, credibility around data and interpretation were also covered, as were ethical considerations and limitations experienced or perceived were also discussed.

Chapter 5
From Council to Lecture Room

5.1 Introduction

This chapter introduces the upcoming analysis chapters and provides a brief background to pharmacy education in South African higher institutions of learning. Thereafter, the undergraduate B. Pharm curriculum is discussed within the context of the UNZN case study. Emphasis is placed on Pharmacology, Pharmaceutical Chemistry, Pharmaceutics and Pharmacy Practice in the curriculum, as these are considered "majors" within the degree structure. This chapter, however, focuses on Pharmacology in order to exemplify the recontextualisation of knowledge from the statutory council enacted to regulate the education and training of pharmacists in the lecture room; it is but one piece of many in a complex, dynamic system that is evolving. While the depth and breadth of what takes place in the field of teaching and learning cannot be captured in its entirety, and any one piece does not do justice to the whole, this snapshot serves to highlight and provide a glimpse into this complex and evolving picture.

5.2 Background

5.2.1 Pharmacy as an academic discipline

The pharmacy curricula across South African institutions offering the B. Pharm degree have a common thread of training generalist pharmacists, despite superficial differences within the degrees in terms of course names, codes, allocated credits and structures of degree over the years of academic study. Across all institutions, the B. Pharm degree comprises of four years full-time study (a year longer for the extended programmes[28]), followed by a year of internship or pre-registration training. The pre-registration component is designed to expose students to practical settings and students have the opportunity to serve this time in various sectors: community pharmacies, hospital pharmacies, industrial pharmacies or wholesale pharmacies, on the explicit approval of the facility by the council for such training (SAPC, 2015).

[28] Extended programmes in South Africa are a curriculum intervention designed specifically to address the articulation gap in higher education. These programmes provide additional curriculum time for foundational learning in order to develop students' academic and social foundations (CHE, 2013).

All institutions in South Africa exhibit a similar first year structure, with pure science modules or slight variations of these comprising the foundations. Common modules include biology (or anatomy), chemistry, physics, mathematics (or statistics) and depending on the institution, other first year modules such as language modules (English, Zulu or Xhosa), community based modules or computer science may be incorporated. Modules pertaining to human behaviour or psychology are also evident but to a much lesser degree. Subsequent years may see variations in curricula across institutions, however, in accordance with SAPC guidelines, Pharmacology and Applied Therapeutics, Pharmaceutical Chemistry, Pharmaceutics, and Pharmacy Practice feature strongly throughout the years and across all institutions (SAPC, 2015), as these are prescribed by the SAPC.

As previously mentioned universities in South Africa are largely tasked with training generalist pharmacists. As there are structural similarities in degree design this study seeks a deeper understanding of the knowledge structures and pedagogical practices of pharmacy academics, using one institution, UKZN, as a case study for deeper exploration of pharmacy knowledge on its path through recontextualisation.

5.2.2 The SAPC and curriculum change at UKZN

The implementation of the revised B. Pharm qualification in 2013 was driven by a directive from the SAPC (a letter was issued to the Head of School of Pharmacy and Pharmacology at the University of KwaZulu-Natal in July 2010 - see Appendix 10). UKZN was informed that the revised qualification should be implemented at the beginning of the 2013 academic year. The SAPC made reference to section 3 of the Pharmacy Act of 53, 1974, stating that one of their objectives was to establish, develop, maintain and control universally acceptable standards of pharmaceutical education. The last year of enrolment of the old qualification would be 2012[29] and the revised curriculum would take place effective from 2013.

The directive for curriculum change from existing unit standards to pre-determined exit level outcomes, initiated by the SAPC, contained very little regarding the shape and form these changes would take. It did, however, set a series of events in motion at the university, college, school and lecturer level, impacting on the field and many of its actors. At UKZN, a

[29] This research traces Pharmacy knowledge of the curriculum, prior to revision as the revised curriculum was not implemented at the time of this research.

series of curriculum workshops followed with the aim of engaging academics in a dialogue about the upcoming curriculum change and what that would mean for the curriculum, teaching and learning (see Appendix 11 for details of workshops). The workshop focused on the pharmacy degree structure and the modules offered, examining modules within the curriculum, their intended purpose and the learning outcomes. Service modules[30]offered in year one were also discussed with regard to what students were learning and what academics believed they needed to learn. Issues around student learning in subsequent years (two to four) were also discussed.

The module templates, outlines and descriptions of module content, along with details of teaching staff per module, were compiled and presented in the student lecture notes in addition to being discussed during the workshops. This information provided a holistic picture of the B. Pharm degree, as individual pieces (each module within the degree structure) shed light for example on the modules' aims, structure and content. It also allowed for comparative analysis across the curriculum with the aim of ascertaining how learning could best take place across modules. Discussions on pedagogy and the type of student academics would like to develop took place, (such as what type of graduate would staff like to see produced?). The staff was also guided to reflect on the knowledge, attitudes, skills and values that future graduates should possess (Appendix 12). The workshops played one part in the process of curriculum change, but did not mark the final stage of the process. Arising from discussions during the curriculum workshops issues were raised and discussed via e-mail correspondence with the Head of School. Staff agreed to proceed with a hybrid TBL method of teaching within blocks. Themes and golden threads running through the themes would also be implemented in the future, which speak to the future recontextualisation of pharmacy knowledge. How this process will unfold and what themes and golden threads will be selected as legitimate knowledge; why certain content or material would be selected over others; and what power struggles or tensions will take place as modules compete remains to be seen. Discussions on how themes and threads will translate from department/school level to the reproduction of knowledge in the lecture room within the respective modules also remained to be finalised.

[30] Service modules refer to modules within the B. Pharm programme that are outsourced or taught in a different School or College within the University. For example Chemistry is taught within the College of Agriculture, Engineering and Science and not by the School of Pharmacy within the College of Health Sciences.

5.3 Pharmacy education and the pedagogic device

Bernstein's (2000) pedagogic device (discussed in Chapter 3) is mentioned here to highlight its contribution to understanding the underlying structural principles that operate in creating, transforming and reproducing knowledge in a pharmacy education context (Maton, 2005b). Luckett's (2010) description of the pedagogic device as a valuable tool in understanding the transformation of knowledge renders it useful in exploring pharmacy knowledge from its production to its reproduction. The pedagogic device allows for analysis of the process, whereby knowledge is translated into curricula and subsequently pedagogy (Luckett, 2010). The device's three fields of practice (production, recontextualisation and reproduction) can assist in showing how pharmacy knowledge is transformed from esoteric knowledge to knowledge in the lecture room. This process, described by three fields, involves complexities, rules and symbolic structures.

The field of production describes where new knowledge is generated or created and this knowledge is transformed into curricula in the field of recontextualisation. Knowledge in the field of reproduction is where the curriculum is taught and evaluated. These three fields in terms of pharmacy knowledge predominantly take place at university level. While each field is important, the first is only briefly covered in this research as the focus rests on the latter two.

Table 5.1: The pedagogic device (Luckett (2010) adapted from Maton & Muller, 2007)

Field of practice	Form of regulation	Symbolic structure	Main types	Typical sites
Production	Distributive rules	Knowledge structure	Hierarchical/ horizontal knowledge structures	Research, laboratories, publications, conferences
Recontextualisation	Recontextualising rules	Curriculum	Collection/ integrated codes	Curriculum policy documents, textbooks
Reproduction	Evaluative rules	Pedagogy and evaluation	Visible/ invisible pedagogic codes	Lecture rooms, assessment

5.4. The field of production of pharmacy knowledge

New knowledge in pharmacy is generated mainly via academia or driven by large multi-national companies in the pharmaceutical industry sector. While at one stage the split between academia and industry might have been distinct, recent trends indicate a hybrid model, with knowledge production taking place between the world of academia and pharmaceutical companies. Depending on the country, university or collaboration, there are different degrees of partnership between academia and industry. Collaboration between major pharmaceutical companies varies in the origin of the research, nature of the research and extent of the relationship. Major pharmaceutical companies such as Pfizer and AstraZeneca, have collaborated with multiple research institutions in an attempt to speed up the development of the next generation of drugs (Ledford, 2011).

Eichler, Kong and Grégoire (2006) went further to speak of triangular collaborations, extending beyond universities and industry to include third-party payers[31] in the mix and arguing that research collaborations have resulted in benefits for patients in terms of speed to access and the introduction and development of new medications. Eichler et al. (2006) did, however, make the point that "basic research should be the appropriate domain of academic researcher" (Eichler et al., 2006, p. 130). Many research findings in academia have often led to long-term involvement from drug companies. Trends reveal academia and industry partnerships flourishing, with universities delivering new therapeutic entities which are taken through clinical development by industry (Tralau-Stewart, Wyatt, Kleyn & Ayad, 2009). Tralau-Stewart et al. (2009) provided several examples of successful ventures arising from the academic-industry partnership, which also includes the research and development of new drugs to combat rheumatoid arthritis and cancer. An increase in collaborative relationships, such as these, are generally driven by financial constraints, which either resulting in pharmaceutical companies closing their research divisions or universities facing limited funding, leading to stronger industry and academic links.

While it appears to be a lucrative venture for all parties concerned, the collaboration raises questions about the nature of the research, publications, intellectual property rights, confidentiality and credibility (Ledford, 2011). It also leads to academic divisions between those who favour collaboration with industry and those who view it as diluting academic

[31] Third-party payers include new players such as Pharmacoenomists, Pharmacoepidemiologists and outcomes researchers.

purity (Ledford, 2011). Research produced, which results in the creation of new knowledge, is different in both these circumstances. The debate surrounding inherent biases, however, extends beyond the scope of this study, but is briefly mentioned here in order to highlight the players and tensions in the field of knowledge production in pharmacy education. The focus here is, however, on describing the field of knowledge production in pharmacy with the intention of tracing where new knowledge is produced. As shown above this takes place in academia, industry or in the spaces between (the collaboration of both). The focus is also on what constitutes legitimate knowledge (in the field of production), who deems it so and the impact this has on the enacted curriculum.

Crespo and Dridi (2007) believed that the university-industry partnerships have led to a change or shift in knowledge/learning regimes. They saw knowledge in academia moving from largely for public good to becoming more commercially oriented (Crespo & Dridi, 2007, p. 63). Gumport (2002) offered a different viewpoint, believing that both "social-institution logic" and a "commercial oriented regime" operate together in universities. Gumport's (2002) mention of academic managers, professors and other professionals as actors who are responsible for academic capitalism and not simply absorbed by market pressure, fits in with the concept of "field" and the role players have in the field. These different forces and tensions exist and affect the field. The terrain in the field of pharmacy education in a higher education is affected by both internal and external factors. The academic discipline of pharmacy is positioned such that academia is not independent of the external working environment of pharmacists or without ties to industry based on its professional dimension.

Bernstein's (2000) concept of region, where an academic discipline faces outward towards the world of work, sheds light on how knowledge is structured differently in these fields. It also raises issues surrounding academic disciplines of a professional nature, such as pharmacy, which does not exist exclusively in academia. New knowledge is also driven by society's needs and when the role of pharmacists encompassed a more clinical focus, this had implications for the pharmacy curriculum in the recontextualisation and reproduction fields. The structure of knowledge in the field of production also influences what type of curriculum is created in the field of recontextualisation and subsequently affects the type of pedagogy that manifests in the field of reproduction (Luckett 2010).

5.5 Field of Recontextualisation

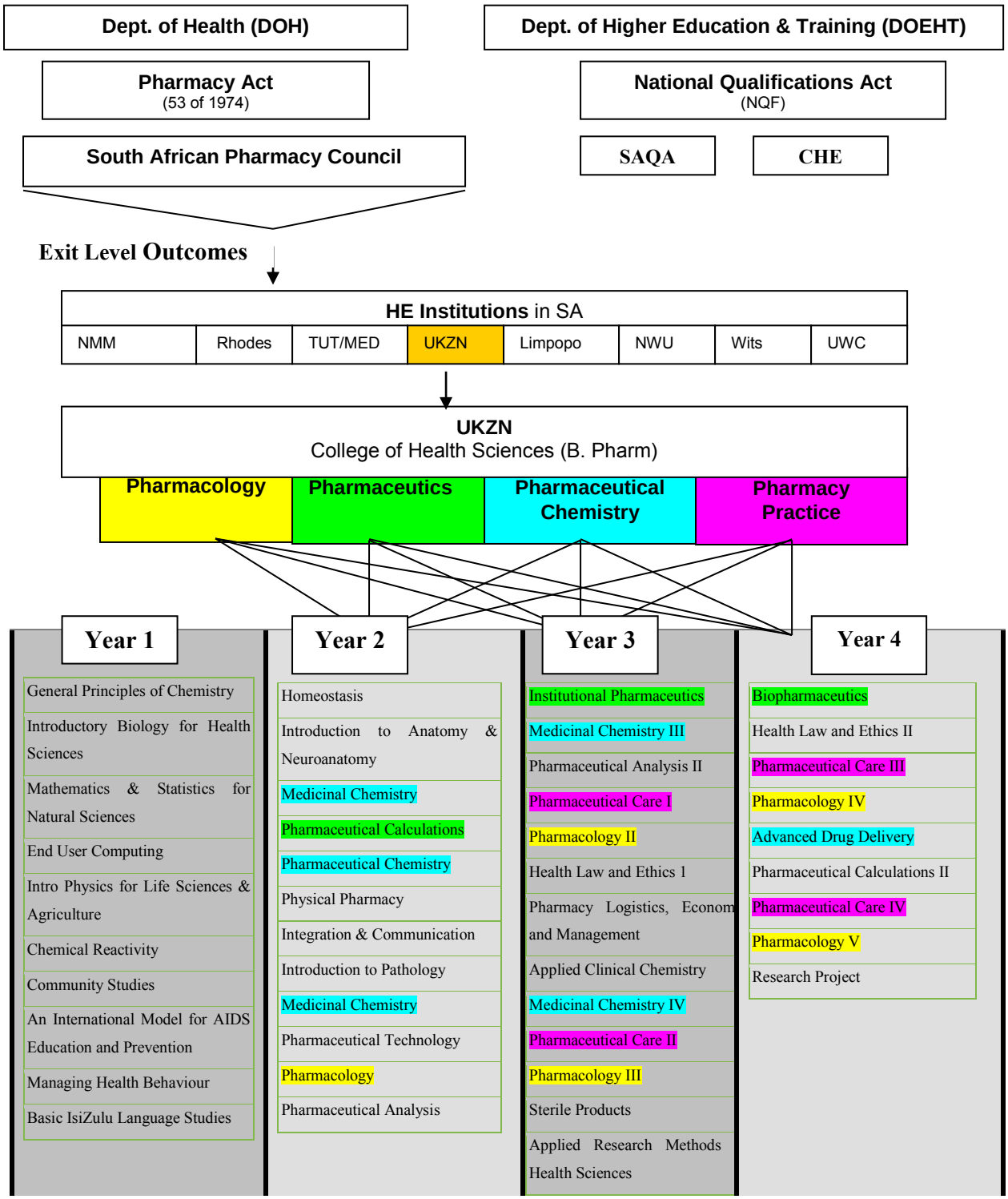


Figure 5.1: Illustration depicting the field of recontextualisation in pharmacy (B. Pharm curriculum at UKZN presented above, with majors highlighted).

The B. Pharm curriculum at UKZN (Figure 5.1) indicates that some pharmacy majors are covered to a small extent in year one. Due to the number of modules offered across years, a subset was selected for the purpose of this research, details of which have been covered in Chapter 4. While there may be plans for the B. Pharm degree to change to a theme-based approach, instead of majors, this study focuses on the existing curriculum. The new curriculum in the TBL format was also only launched only for year one and two when this study was undertaken.

5.5.1 Recontextualisation of pharmacy knowledge at UKZN

In seeking to understand the knowledge structures and pedagogical practices that shape the visible pharmacy curricula and specialise students on their journeys to becoming professional pharmacists, this study traced the recontextualisation of pharmacy knowledge from the SAPC to the lecture room, where pharmacy students can access and acquire knowledge.

The SAPC was selected as a starting point on the grounds of their direct influence on the programme through the prescription of broad exit level outcomes (Table 5.2) for pharmacy students. Upon completion of their academic qualification, pharmacy students need to achieve the exit level outcomes as prescribed by the SAPC. This is confirmed by way of the pre-registration examination run by the SAPC, which pharmacy graduates must successfully complete to register as an independent practitioner/pharmacist. In addition the B. Pharm qualification has already been in existence for over 50 years, and therefore interaction regarding the programme with higher bodies such as the Department of Health (DoH) or the Department of Higher Education and Training (DoHET) are minimal. The DoHET, through the Council on Higher Education (CHE), designated the SAPC as the Standards Generating Body (SGB) and Educational and Training Quality Assurer (ETQA) bodies. If this were a newly developed pharmacy degree or programme under investigation, then it would require DoHET, SAPC and CHE approval processes, necessitating that these bodies be discussed in more detail.

5.5.2 The SAPC

The SAPC does not dictate specific module content or details of assessment, but rather states broad exit outcomes (Table 5.2), which universities then interpret and translate into their curricula, accounting for variations in curricula across the various institutions in South Africa. The role of the SAPC is seen as setting broad outcomes which are open to interpretation and subsequent curriculum design by academics.

Table 5.2: SAPC's prescribed exit level outcomes (replacing unit standards) which are applicable to all institutions offering the B. Pharm qualification (SAPC, 2015)

	Exit level outcome	Unit Standards (Used previously)
1	Integrate and apply foundational scientific knowledge and principles to pharmaceutical sciences	
2	Apply integrated knowledge of product development and formulation in the compounding, manufacturing, distribution and dispensing of pharmaceutical products	Organise the manufacturing, compounding and packaging of pharmaceutical products.
3	Compound, manipulate and prepare medication in compliance with Good Pharmacy Practice rules (GPP) and/or Good Manufacturing Practice guidelines (GMP)	
4	Manage and control the development, manufacture, packaging and registration of pharmaceutical products	
5	Manage the logistics of the procurement, storage and distribution of pharmaceutical products	Organise the procurement, storage and distribution of pharmaceutical products.
6	Dispense medication and ensure optimal pharmaceutical care for the patient in compliance with Good Pharmacy Practice rules (GPP)	Dispense and ensure the optimum use of medicine prescribed to the patient.
7	Apply a pharmaceutical care management approach to ensure rational drug use	Provide pharmacists initiated care to the patient and ensure the optimum use of medicine
8	Initiate therapy, where appropriate, within the scope of practice of a pharmacist	Provide education and information on health care and medicine
9	Promote public health within the scope of practice of a pharmacist	Promote community health and provide related information and advice.
10	Integrate and apply management skills in the provision of pharmaceutical services	
11	Participate in research to develop products and/or enhance pharmaceutical care programmes and services for patients	Participate in research to ensure the optimal use of medicine

Most participants in the study felt that the SAPC did not directly affect their teaching and curriculum design, but spoke of the need to address the broad exit level outcomes. Academics thus retain their academic freedom and autonomy to a certain extent. When questioned about the role of the SAPC in directing curriculum, Zeta responded:

> *The Pharmacy Board [32]states what the outcomes should be but its broad in terms of they would say management of diseases where we would know and we break it down into these subsections. But if we want to focus for instance a little more on central nervous system and a little less on gastrointestinal, there's nothing to tell us not to do or to do that. So that's our own decision. So we have the freedom there, but it's also freedom within limits. Ja! It's probably best to say that. Ja! you have your outcomes for the programme that's dictated by Pharmacy Council, so as I said I can't start teaching them history of art just because I'm very interested in it, in art or something. But in terms of the content of the module I have to reach the outcomes but exactly what I teach them is up to me. Ja! Probably up to me as long as I decide to teach that.*
>
> (Z/I/p6p2L1)

Riza: *They're not really specified but the thing is they're quite, maybe in the middle line, they're not too broad, neither are they specified….that is why no two universities have the same programme. That's basically because of the fact that Pharmacy Council, they never dictate to you what you should be doing but they give you the broad framework and you work within that framework, ja. And then the other opportunity that they give you is to have electives. It gives you the minimum credit points and you can go about it so there's lots of flexibility.*

(R/I/p10p3L1)

5.5.3 University: Exit level outcomes translated into curriculum

UKZN has translated these broad exit outcomes below into the visible curricula over four academic years presented at the bottom of Figure 5.1. The B. Pharm degree is structured with a total of 544 credit point value as approved by Senate, and extends over eight semesters of full-time study. All modules in the curriculum are deemed compulsory (College of Health Sciences, 2012, p. 96). All compulsory modules within the B. Pharm degree over years one to four can be found in Figure 5.1. In addition, students are required to complete a one year internship followed by a year of community service before they are allowed to register with the SAPC as a pharmacist. The exit level outcomes and cross field competencies from the SAPC are addressed within the degree structure and not within each module.

[32] The term 'Board' is also used to refer to the SAPC

5.5.4 Knowledge structures within the academic curriculum

As previously discussed, Bernstein (1999) differentiated between two forms of discourse: vertical and horizontal. Within vertical discourse, he also differentiated between hierarchical and horizontal knowledge structures. A hierarchical knowledge structure is hierarchically organised, explicit, coherent and systematic (Bernstein, 1999); and this knowledge form is based on an "integrating" code. It builds up via theory development by integrating knowledge at lower levels towards greater abstraction and generalisation (Bernstein, 1999). Horizontal discourse, on the other hand, refers to everyday, common-sense knowledge that is generally context dependent and tends to be acquired in everyday settings. Vertical discourse, however, occurs in formal pedagogical contexts (Doherty, 2010). The academic discipline of pharmacy is thus an example of vertical discourse. However, there appears to be movement between horizontal and hierarchical discourses in pharmacy, depending on whether the disciplines within have their roots in the pure sciences or are applied and linked to the social sciences. So the pure and applied sciences form the hierarchical base upon which the pharmacy modules such as Pharmacology, Pharmaceutics, Pharmaceutical Chemistry and Pharmaceutical Care rest.

While the focus of this research is on the four majors, for the purpose of illustrating the knowledge trail through recontextualisation and reproduction, Pharmacology 401 will be used. The remaining modules are however examined further in the following chapters, with emphasis differing from this chapter. The academics' voice also features intermittently to highlight the impact that external or internal factors may have on the field.

All academics in the research undertaken believed that students cannot study pharmacy without year one (Figure 5.1) and that the pure sciences [33]are a pre-requisite for subsequent pharmacy modules, which depicts the hierarchical nature of knowledge structures within pharmacy. Nardil's views on the importance of the pure sciences are as follows:

> *No! It will be difficult for them because they don't have the most basic knowledge, Ja! Generally I don't think we encourage that. They must, they must have a background in science.*
>
> (N/I/p19p3L5)

[33] Pure sciences refer to biology, chemistry, mathematicss and physics. Applied sciences refer to disciplines such as microbiology, biochemistry and physiology. Bernstein (2000) refers to pure sciences as parent disciplines.

Nardil's repetition of the words "they must" stresses the importance of the pure sciences as a foundation. A similar view was echoed by Midra when asked if students could proceed with year two and three of the pharmacy curriculum without the pure sciences in year one.

> *Midra: Oh no!! absolutely not! They must have the foundation.*
>
> (M/I/p9p2L3)

Zeta further expanded on the role of pure sciences in pharmacy education, indicating its necessity:

> *Yes they need a basic chemistry because if the drug is hydrophilic then it needs to do that and when its hypophilic ...at least you need to know the terminology but that I think the chemistry is sufficient but they need to know the anatomy and physiology of ....because at least when we talk about the central nervous system, they need to know where the brain is and something like that. So, ja! all that is knowledge that is needed that we do before. And yes they do need a little bit of chemistry, they do need mathematicss because we do a little bit of ...which is just equations and working out blood levels and those things so they do need the mathematicss. They do need the biology because the biology has to do with the anatomy and physiology so yes I do think they need that year one and semester two year one. What I miss is a bit more biochemistry but yes its not like that they can come in and I can teach them without it.*
>
> (Z/I/p12p3L1)

While there was total agreement amongst academics, regarding pure sciences (which displays a hierarchical knowledge structure), they differed in their opinions on the placement of the law module within the B. Pharm curriculum, a module which is more horizontally structured. The module is currently offered in year three of the curriculum (Figure 5.1), with some academics believing it is situated in the correct place in the curriculum and others arguing that it should be offered sooner:

> Zeta: *I think they, we should probably have it sooner I assume. I think they start with it in year three before they go out and start working in pharmacies and the laws regulating professionals. I think ideally it should be a little earlier like year two before they get into year three where they start looking at patients and treating patients. I, I would prefer to have it sort of continuous line throughout because the law obviously and ethics applies to everything you do.*
>
> (Z/I/p12p4L4)

> Ami*: I will because I used to work in the hospital before and we have second year students of the university working with us at the hospital. And you can tell from certain ways of their thinking that they don't really know what the laws are saying in terms of*

pharmacy. So if we are going to be making students, allowing them to work from the second year, I will expect them to give us a bit of ethics, you know basics of ethics and professionalism as well as the laws of pharmacy. I will expect us to let them be exposed to it at that time, at that stage. Ja!

(A/I/p63p7L1)

5.6 Recontextualisation of Pharmacology

5.6.1 Pharmacology curriculum and knowledge structures

Pharmacology is structured in modules over years two, three and four, however, it only commences in the second semester of year two. Pharmacology modules 301 and 302 occur in semester one and two respectively in year three, while Pharmacology 401 and 402 are taken in the final academic year in semesters one and two (Figure 5.1).

Table 5.3: Pharmacology modules[34] offered at UKZN (compiled from the College of Health Sciences Handbook, 2012, pgs. 263-264)

PHARMACOLOGY				
Year	**2**	**3**	**4**	
Module Code	**PHRM 202**	**PHRM 301**	**PHRM 401**	**PHRM 401 notes**
Prerequisites	Biology, chemistry and mathematics	PHRM 202, Anatomy. Human movement studies	PHRM 232,PHRM 202, PHRM 301, PHRM302	
Aim:	To provide students with an understanding of basic terms and principles of Pharmacology with special reference to Pharmacodynamics and Pharmacokinetics	To provide students with a basic understanding on the pharmacology of drugs affecting mediators of inflammation and pain. Clinical pharmacological concepts used in the diagnosis, prevention and rational treatment and management of certain CNS disorders	To provide learners with clinical pharmacological concepts used in the diagnosis, prevention, rational treatment and management of certain systemic diseases	This part of the module will teach students clinical pharmacological concepts used in the diagnosis, prevention, rational treatment and management of certain systemic disorders. This will enable students to apply their knowledge when confronted with these conditions in a pharmacy or hospital.
Examples of content:	Drug receptors and receptor theories, agonists and antagonists, and neurotransmitters	CNS pharmacology with ref to neurodegenerative disorders: Parkinsons and Alzheimers	Pathological disorders: in GIT and respiratory systems.	

[34] Only the first semester in years three and year four were considered as these fell within the research period. The second semester in year two was included because of its foundational role in the study of subsequent Pharmacology modules.

The second year Pharmacology module (202) introduces the discipline and covers the foundational Pharmacology concepts, terminology and knowledge that are applied in subsequent years of study. While both year three and four are dependent on the year two, the syllabus in year four does not necessarily build up – on the knowledge acquired in year three. Years three and four are differentiated by the study of different body systems (where knowledge from year two forms a vital part). Year three focuses on CNS disorders in semester one and chemotherapy and infectious diseases in semester two, while year four focuses on the respiratory, endocrine and cardiovascular systems, amongst others. The aim of modules over the years (Table 5.3) indicates the moving away from terms and concepts, to focus on drugs, and clinical diagnosis and treatment. From the handbook, lectures, lecture notes, module outlines and student booklets, knowledge in year two is more technical and perhaps abstract, whereas subsequent years exhibit a decrease in technical knowledge at times, with a focus rather on the application of prior knowledge. Students in year two, for example, learn about agonists and antagonists and apply this when studying histamines and anti-histamines in year three, as well as in the endocrine system with regard to hormones and contraception in year four (this is also reflective of the knowledge structure mentioned previously in section 5.5.3).

Modules stipulated as prerequisites in the Handbook (Table 5.3) also reflect what the university and academics deem to be relevant prior knowledge to facilitate learning in the Pharmacology module. Knowledge in Pharmacology therefore appears to be structurally designed as horizontal towards the top but built on a multi-layer of hierarchical building blocks. The foundation comprises of the pure science disciplines in year one (biology, chemistry, mathematics and physics). In addition to second year, first semester modules such as homeostasis and anatomy require the application of some of the basic sciences. Zeta's description of the year two modules illustrates its importance for subsequent study.

> *Year two is the basis for everything. You can do year four without year three, not necessarily. No, no now I'm lying. You can't do any year without year two because year two is the introduction to pharmacology so it explains the basics of pharmacology. So you can't go on in pharmacology without that you will be totally lost. It all feeds into year four, I told you, where they have the ward-rounds, can't know all the drugs but they might see a patient taking pain medication that he has done in year three so that would bring everything together. So in year four you bring everything together.*
>
> (Z/I/p11p11L1)

Nardil's account of the structure of the modules throughout the years also highlights the importance of year two as a building block and its relationship to subsequent years of study:

> *The lower modules like Pharmacology 202, for second year students. There they learn about the basics of pharmacology, which is applicable throughout all the other modules in pharmacology, while once they get to systemic pharmacology it's more specific let's say for example cardiovascular pharmacology, central nervous system pharmacology, peripheral nervous system pharmacology, blood disorders, then it becomes very specialised on a specific field but the concepts that students learnt in second year in second semester, they can apply that to all those modules.*
>
> (N/I/p7p4L4)

Pharmacology 401 takes place in year four and contains the practical component of ward-rounds, which will be used to illustrate the recontextualisation process in more detail. Pharmacology 401 is a module divided into two terms per semester, covering the broad topic areas of respiratory and endocrine pharmacology. The module is divided into two major sections in the first semester and is taught by two different academics. Within the Pharmacology department, academics design the curriculum for prospective pharmacists guided by the broad exit level outcomes (Table 5.2) and critical cross-field outcomes (CCFOs) as outlined by SAQA. CCFOs refer to generic outcomes that inform all teaching and learning practices, for example working effectively with others as a member of a team, or collecting, analysing, organising and critically evaluating information (SAQA, 2014). Academics decide on the outcomes their modules will address and do not necessarily have to cover all exit level outcomes, as the B. Pharm degree is designed to holistically achieve this.

Pharmacology IV
PHRM401 W1 (48L-0T-0P-39S-16H-11R-44F-0G-2A-15W-16C)
Prerequisite: PHRM232W2, PHRM202W2, PHRM301W1, PHRM302W2.
Corequisite: None
Aim: To provide learners with clinical pharmacological concepts used in the diagnosis, prevention, rational treatment and management of certain systemic diseases.
Content: Treatment and/or management of the following pathological disorders: GIT: Peptic ulcer disease, Gastro- Oesophageal Reflux Disease (GORD), Inflammatory Bowel Disease (IBD), Irritable Bowel Syndrome (IBS), diarrhoea, constipation, hepato-billiary diseases, nausea and vomiting. Respiratory System: Bronchial asthma, Chronic Obstructive Pulmonary Disease (COPD) and other respiratory disorders, including cough, pneumonia, congestion, rhinitis. Endocrine System: Growth hormone, anti-diuretic hormone, osteoporosis, infertility (gonadal hormones, contraception, erectile dysfunction, hormone replacement therapy), hormones of the thyroid gland (hypothyroidism and hyperthyroidism), adrenocorticosteroid hormones (glucocorticoids and mineralocorticoids). Anti-protozoals and Anthelmintics: Anti-infective drugs for malaria, amoebiasis, intestinal helminths, trypanosomiasis, schistosomiasis. Anti-neoplastics: Principles of cancer chemotherapy, cancer cell cycle kinetics, anti-metabolites, alkylating agents, antibiotics, microtubule inhibitors, steroid hormone antagonists, monoclonal antibodies.
Ward-rounds:15 x 3hrs ward-round visits + 15 x 3 hrs ward-round presentations
Assessment: Formative: 60% of the average of 2 tests + 40% of ward-round presentation marks. Summative: 1x 2-hour paper. Final Mark = 60% Examination Mark + 40% of CAM. A 40% subminimum rule will apply.
DP Requirement: The learner must obtain a CAM of ≥ 40%. 100% attendance of all ward-rounds visits and ward-round presentations, except where the Head of School has specifically excused a student from a particular session

Figure 5.2: Pharmacology content (College of Health Sciences Handbook, 2012, p. 264)

The Pharmacology 401 module in the College Handbook describes the aim of the module as being "to provide learners with clinical pharmacological concepts used in the diagnosis, prevention, rational treatment and management of certain systemic diseases" (College of Health Science Handbook, 2012, p. 264). The content highlighted in the handbook includes treatment and management of various pathological disorders extending over various body systems (such as respiratory, gastrointestinal or endocrine, to name a few) and a range of diseases (such as obstructive pulmonary disease, osteoporosis, hypothyroidism and hyperthyroidism), along with details of the accompanying effective drug therapies.

Table 5.4: Similarities between the College Handbook and the module outline for Pharmacology

	College Handbook	Module Outline
Aim of the PHRM 401 module	To provide learners with clinical pharmacological concepts used in the diagnosis, prevention, rational treatment and management of certain systemic diseases Components of the module: - Lectures - 15 x 3hrs ward-round visits & - 15 x 3 hrs ward-round presentations	This part of the module will teach students clinical pharmacological concepts used in the diagnosis, prevention, rational treatment and management of certain systemic disorders. This will enable students to apply their knowledge when confronted with these conditions in a pharmacy or hospital. Components of the module: - Lectures - 15 x 3hrs ward-round visits & - 15 x 3 hrs ward-round presentations
Assessment	Formative assessment comprising 60% (calculated by averaging 2 tests) and the remainder 40% comprising of ward-round presentation marks. The exam is weighted 60% and the continuous assessment component counts for the 40%.	Two class tests (one per academic), Class test (50 marks): The "test will assess your knowledge on basic terminology (e.g. definitions) and pharmacological applications (case studies). An Aegrotat test is also offered". Exams as per handbook

In Pharmacology 401, the aim of the module as described in the course outline and lecture notes closely resemble that mentioned in the College Handbook. The module aims to teach students clinical pharmacological concepts, which are then translated through lectures, ward-rounds and student presentations. Within each of these components (lectures and experiential learning) representation takes different forms. Lectures feature CBL while experiential learning is comprised of ward-rounds and presentations of the ward-rounds in seminar format (there is no tutorial component to this module).

The academic translates the disciplinary knowledge selected from multiple sources (for example the College Handbook, research or journal articles and various textbooks) into the pharmacology curriculum taught in lectures.

The curriculum selected is closely aligned to the module outline in the College Handbook, which directs academics in the selection and sequencing of knowledge. Academics have indicated the effect the Handbook outlines have on their modules: These outlines are

generated by the academics based on the module content as aligned to the learning outcomes. Guidelines are not independently formulated by the college and include the application aspect of knowledge.

The endocrine system is one of several mentioned in the College Handbook forming part of the Pharmacology 401 syllabus. From just a word or a phrase in the Handbook and on the lecture timetable (Appendix 13), the topic develops through various stages in its journey from one context to another. The module outline and student lecture notes select various components comprising the endocrine system and these are listed under section three of the content page (Appendix 14) which refers to drugs and the endocrine system. Here specific topics under the broad heading of "endocrine system" are selected for further expansion, the sequence of which is as follows: the hypothalamic and pituitary hormones, followed by gonadal hormones and inhibitors and then erectile dysfunction. The section on gonadal hormones and inhibitors cover the subsections in the following sequence: oestrogens, progestins, SERMs[35], oestrogen/progesterone agonists, antagonists, synthesis inhibitors, hormonal contraceptives, androgens and anti-androgens.

Nardil's lecture covered the subsections while the Power-Point slides and student lecture notes elaborated on the content within each of these sections. During the course of the lecture, the academic used Power-Point slides and the students followed the respective sections in their lecture notes which elaborated on the various points raised in the Power-Point slides. This section was expanded on mainly in point form in the PHRM 401 notes, from section 3.2 on page 39 to section 3.2.7 on page 48. Whilst a range of sources were accessed in the production of the lecture notes, it is not possible nor the intention of this particular study to view each of these in great depths. For the purpose of this study, content was traced from Chapter 57 of Brunton et al.'s (2006) textbook entitled "Goodman and Gilman: The Pharmacological Basis of Therapeutics" which covered the endocrine system. The lecture notes makes considerable reference to particular chapters within this textbook and it is one of the recommended resources for students, with copies placed on reserve in the library for students to access.

[35] SERMs refers to selective oestrogen receptor modulators, which are non-steroidal compounds that bind to oestrogen receptors (Goldstein et al., 2000).

The various topics and sub-topics covered in the textbook were very detailed and covered all aspects in depth. This information is thereafter distilled through a series of processes similar to alcohol distillation, where at each phase the process is refined. Content is extracted from the text and other resources by academics. The content, whilst resembling the original in some respects, is now an extraction of that body of knowledge and is summarised and simplified sometimes into just words or phrases on a slide or in lecture notes, in addition to being diagrammatically illustrated for easier understanding.

Visual representation of important cycles depicting pathways and negative feedback mechanisms were presented in the text, Power-Point slides and the student handbook. Visual representation for the section on gonadal hormones and inhibitors, the subgroups of drugs that act on the gonads and the female menstrual cycle are simplified in Figure 5.5, with the gonads, the hormones acting on each gonad and the relevant associated subgroups of drugs acting on the gonads. The visual representation serves to simplify the differentiation between male and female gonads and the respective hormones associated with each, along with the drugs acting upon them. Figure 5.4 simplifies the chemical pathways showing feedback mechanisms of the hormones, their synthesis, activation and release. Not all diagrams found in the textbook are used in the module material; certain material is selected over others, for example the chemical structures or history of progestin are not discussed in depth.

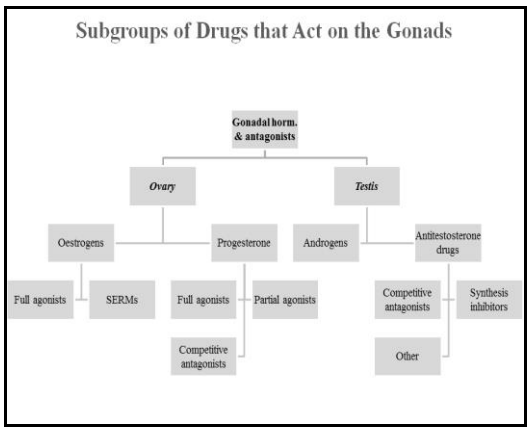


Figure 5.3: Subgroups of drugs

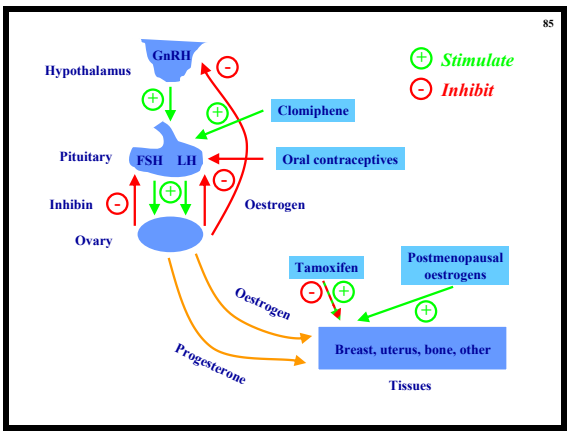


Figure 5.4: Feedback mechanism

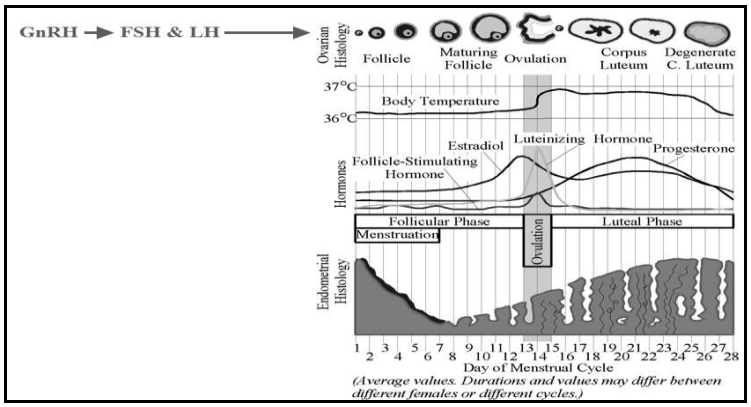


Figure 5.5: Menstrual cycle

Key points are extracted from the textbook, with examples and links to the world of work, following a pattern of discussing the theoretical aspects of concept, followed by application. Slides are sequenced in a very similar order to that observed in the text in terms of discussing each hormone first (oestrogen, then progesterone), along with the menstrual cycle before discussing several different types of contraceptives.

Lecture slides on the topic of oestrogen started firstly with a definition, followed by metabolism, oral bioavailability, effects, receptors, mechanism of action, clinical uses and toxicity. These were all in point form and were usually a sentence long, which was a significant reduction from the detail covered in the textbook. Notes and slides followed the sequence in the textbook, where hormones are first discussed, followed by hormonal contraceptives. Contraceptives covered target individual hormones (oestrogen or progesterone) as well as include a combination of oestrogen and progesterone contraceptives. These sections covers how the contraceptive works (in terms of receptors and pathways), mechanism of action, dose, form, duration of administration and also covers active ingredients contained. It appears that sequencing follows the premise that oestrogen and progesterone have to be learnt prior to understanding how hormonal contraceptives function and that one cannot design drugs to block a receptor without knowledge of understanding of the mechanisms of action. It also appears that understanding contraceptives has to follow sections on hormones, menstruation, and ovulation cycles and pathways. Abbreviations of hormones are used on slides (see the example below) as well as arrows to indicate the activity (increase or decrease) to facilitate learning are indicative of semantic density.

Side-effects of the various drugs are also mentioned. The theory of the side effects of drugs is linked to the practical experiences of patients in real life and case studies highlight this link. Serious side-effects can occur in some patients so slides on several absolute and relative contra-indications are also discussed in point form. Guidelines for the choice of contraceptive preparations are also further illustrated in point form (as indicated below, the use of arrows to indicate increases or decreases):

- *Drug interactions need always be considered. The following scenarios warrant additional contraceptive methods (e.g. barrier) to prevent unplanned pregnancy:*
- *Drugs that ↑ metabolism of oestrogens include rifampicin, barbiturates, phenytoin, carbamazepine, corticosteroids and St. John's wort*
- *Drugs that ↓ enterohepatic recycling of metabolites include antibiotics (e.g. tetracyclines, ampicillin). The antimicrobial drug kills intestinal flora that produce enzymes requires for hydrolysis and re-uptake of conjugated metabolites initially secreted into the intestine via the bile.*

(PHRM 401 lecture notes, 2012, p. 46)

The lecture on gonadal hormones and inhibitors concluded with case study three on oral contraception, which required an understanding of the hormones, their pathways and the various different oral contraceptives. The case study was displayed as a Power-Point slide, while students followed in their lecture notes.

A young woman was diagnosed with pustular acne and came to the pharmacy with a prescription for Tetrex® 250 mg capsules (tetracycline 250 mg, sodium hexametaphosphate 70 mg). The directions on the prescription read "1 cap q6h pc mitte 28". Upon dispensing the prescription, the pharmacist noticed on her medication record history that Triphasil® (various amounts of norgestrel and ethinyl oestradiol) was dispensed a week ago.

Figure 5.6: Pharmacology case study three (PHRM 401 lecture notes, 2012, pgs. 58-59)

The questions followed a similar format to the lecture, where a medical condition was identified and discussed, followed by an examination of the appropriateness of prescribed drugs, how the drug works and possible side effects. Case studies are presented and students thereafter have time to go through them prior to class discussion and academic input. All case studies are covered prior to a test and the student lecture notes makes particular mention that case studies will feature in the test, apart from covering pharmacological definitions. Case studies one and two from the test shared similarities with the case study in the class in terms of outlining a clinical condition which required students to assess if the type of drug and dose

administered was correct, and at times also required knowledge on the mechanisms of action as well as side effects. This pattern was also evident in the practical component of the module, i.e. ward-rounds.

5.6.2 Ward-round visits

In the experiential learning component of Pharmacology 401, knowledge recontextualisation takes the form of ward-rounds. While ward-rounds are complex pedagogical processes, for organising purposes, they have been simplified using subheadings to describe some of their inherent features. There are organisational and technical aspects, the visits themselves, and research and presentation on the clinical cases culminating in assessment and feedback. The focus of this research is placed on the academic side of this pedagogical approach, but organisation and technical aspects are briefly covered as background.

5.6.2.1 Organisational and technical aspects

The "housekeeping rules" and the hospital visits timetables indicate the sequence of different groups on the hospital ward-rounds. Students are informed of the procedures and processes and are given explicit written instructions and copies of the document, which outlines what is deemed appropriate during the hospital visits and the procedure that needs to be adhered to. These aspects are dealt with by the school administration and graduate students, and do not fall under the direct responsibility of the academic/s teaching the module.

5.6.2.2. Housekeeping rules

The housekeeping rules (Appendix 15) are comprised of a combination of the technical aspects during the ward-rounds as well as the academic write up and presentation of results that follow the ward-round (to be discussed later). The housekeeping rules cover details about the meeting times and places for departure from the university, as well as contact details of health care professionals at the hospitals. An example is illustrated below:

> *Arrive at the hospital. If you will be visiting King Edward Hospital Pharmacy, report to the pharmacy manager (Ms Gill Cutting). If you will be visiting King George V Psychiatric Hospital, report to the Outpatient Department first. If you will be visiting any of the other hospitals, report to the main pharmacy.*
>
> (Point 4 of the PHRM 401 ward-rounds housekeeping notes, 2012).

5.6.2.3 Hospital visits: Clinical cases and presentations

As indicated above, the students visit a series of hospitals. The ward-rounds are co-ordinated by the UKZN Pharmacology department with the assistance of a graduate assistant. At the time of this research, there were nine groups of students (approximately ten students per group), with one group leader assigned per group. The group leader assigned is responsible for communicating any issue/concerns to the university staff member overseeing the ward-rounds. The staff member is located in the pharmacy department. Each group visited six different hospitals and ward-rounds took place on Tuesdays, starting in February and ending in April. Students visited King Edward VIII hospital pharmacy and went on ward-rounds at the following hospitals: King George V Hospital (TB), King George V (Psych), Prince Mshiyeni, McCord and R. K. Khan's Hospital. Each group had a two week break from ward-rounds and depending on their groups, these two weeks varied.

Table 5.5: Schedule for ward-round hospital visits (Student groups and times)

Month	Date	Pharmacy	Ward-rounds				
		KE VIII	KG V TB	KG V Psych	Prince Mshiyeni	McCord	RK Khan
		Group 1	Group 9	Group 8	Group 7	Group 6	Group 5
Feb	14						
	21	2	1	9	8	7	6
	28	3	2	1	9	8	7
March	06	4	3	2	1	9	8
	13	5	4	3	2	1	9
	20	6	5	4	3	2	1
	27	7	6	5	4	3	2
April	10	8	7	6	5	4	3
	17	9	8	7	6	5	4

Over the course of the eight weeks they, however, prepared seven reports which covered patients' subjective and objective data, as well as provided assessment, a plan and education (SOAPE)[36] and could be asked to present on any of their hospital visits except for the hospital pharmacy visit where they completed a separate form to that of the SOAPE notes and were not marked or assessed on that visit. Students were informed on a Friday preceding the Tuesday clinical presentations and were also informed about which hospital visit/SOAPE notes they would be presenting. Each student had one turn to present in the semester due to

[36] SOAPE (or sometimes known as SOAP) refers largely to the experiential component or ward round reports and stands for Subjective/Objective/Assessment/Plan/Education.

the large number of students registered for the module; approximately nine students presented each week.

Nardil's account of the process of how ward-rounds work illustrates the link between the module design structurally (in terms of what is covered in the experiential learning sessions, followed by the seminar session), the inner workings on ward-rounds, and the learning experience for both students and health team members.

> *Ok, I'm going to explain to you Pharmacology 401 and 402 that's when the students go on ward-rounds to hospitals, so they go with a pharmacists or a medical doctor on a ward-round, they see a patient and student writes up a set of notes on the patient, there is subjective data, objective data, the diagnosis, the treatment and then also the discharge summary. Then for the tutorials we generally ask students to present on that case. The role of the of the supervisor or the lecturer in that regard is then to listen to the presentation, ask questions about that specific case and then also to guide the student, to make sure that the student understands the case completely. It also allows student to learn to speak in front of other people, to learn to speak in a scientific sound way and I would also then say to gain self-confidence to talk about a case because when they go out to do their internship and community services they're exposed to these cases all the time, not necessarily in the pharmacy but when they go on ward-rounds with somebody else because they are the experts on medical usage, they also provide the input there.*
>
> (N/I/p4 p4L4)

Although Pharmacology academics do not accompany students on ward-rounds, they strongly control the process with detailed descriptions and instructions on what needs to be carried out and directing the selection and sequencing of content. Issues covered include how SOAPE notes should be completed, relevant signatures for verification, submission issues and details of student presentations. Strong control is exhibited over headings that correspond with the SOAPE notes and academics go as far as mentioning that students should find additional information and references.

> *Prepare a Power-Point presentation on the clinical case. Use the same headings as in the SOAPE note. You should do additional research and list any references. The presentation may not be longer than 15 minutes. Time will be strictly kept.*
>
> (PHRM 401 ward-rounds housekeeping notes 2012, Appendix 15)

Students only have a choice over the selection of the patient file and clinical diagnosis - the rest of the process is very tightly structured. Students consult patient files and are interested

in the clinical diagnosis of patients, the drug treatment for the medical condition, and the proposal of both from a pharmaceutical and non-pharmaceutical (for example recommending a change in diet or a particular exercise) treatment options.

> *Complete at least one set of SOAPE notes under the supervision and guidance of the healthcare professional (pharmacist, nurse, doctor or specialist in charge). Remember to include the ward number as well. You may not identify the patient personally, but can for example refer to him/her as "patient X". Once complete, have it signed. If you are visiting King Edward Hospital Pharmacy, complete the Pharmacy Visit Report and have it signed by the Pharmacist. Please note that King George V Psychiatric Hospital does not reveal all the contents of the patient's file, and you would rather be given specific information directly by the psychiatrist.*
>
> (PHRM 401 ward-rounds housekeeping notes 2012, Appendix 15)

The aim of ward-rounds has been outlined as providing application for knowledge in clinical settings for diagnosing and treating patients. This requires a holistic knowledge of human beings and the systems involved in their organic functioning (which is dependent on years three and four, see Table 5.3). In addition students are required to apply their knowledge of drugs, their mechanisms of action, as well as anticipate any possible drug interactions or conditions (such as diabetes) that can impact on the patient and their health. Students therefore use their knowledge from lectures, textbooks, research articles and various resources, and select and apply relevant information for the case. This is combined with further research to derive at the recommendations they suggest during their clinical presentations. This is indicated from the ward-round notes:

> *Students had the opportunity and freedom to view patient files and select their patient. At all hospitals, except for the King George psych ward, students had access to patient files. The patient charts contained baseline details on vitals such as respiratory rate, temperature, blood pressure, and glucose tests. Also included were blood results (with blood chemistry results), x-rays, scans. Students recorded their patient's details in the form provided to them by Pharmacology department at UKZN, known as "SOAPE" notes. The format contained headings such as brief history of the patient, diagnosis, management and was approximately three pages in length. Below each major heading spaces where provided for note-taking by students. Students recorded results from their respective medical files based on a combination of objective and subjective data. Objective data took the form of vitals taken directly from the patient charts whereas subjective data was or could be obtained from talking to the patient directly. Communication with patients was not stipulated or compulsory so practice varied amongst the students with some talking to the patients, and others not.*

I spoke to a few of the students and they said that they generally do not disturb the patients and can get a lot from the charts. They would chat to the patients however, if they wanted to clarify any issues or required additional information that may be pertinent to the patient's medical condition. Students, for obvious reasons, were particularly interested in the drugs prescribed. They recorded the names of the drug, dosage forms and method of administration and recorded all drugs prescribed by the physician/s treating the patient. They later consult their textbooks (mainly use SAMF) about the different drugs dosages, best method of administration and possible drug interaction.

(Ward-round notes, 17 April 2012)

Table 5.6: Clinical presentations in Pharmacology (arranged in order of student presentations conducted on the 17th of April 2012)

Student	Hospital	Date of Visit	Patient Condition	Gender/ Age	Final Assessment
Student A	Prince Mshiyeni	17/04	Acute cholecystitis	F 24	71.3
Student B	R.K. Khan	06/03	Meningitis with TB	F 21	73.3
Student C	King George	23/03	Vascular dementia	M 64	70.6
Student D	Prince Mshiyeni	17/04	Bowel obstruction	F 54	71.3
Student E	King George Psychiatric	20/03	Hypertension & epilepsy	F 63	74.6
Student F	Prince Mshiyeni	10/04	Meningitis	M 26	75.3

Students are also exposed to multiple cases with varying clinical conditions, ranging from physical, mental or a combination. Despite the different conditions, the presentation format follows a very similar sequence, which is not unexpected given that these are outlined in the format for SOAPE presentations. The level of research conducted, however, varies amongst the clinical cases. I selected Student A's presentation (Table 5.6) and pieces of it were presented to highlight the pedagogy and assessment procedure surrounding ward-rounds. The presentation followed the sequence of the SOAPE report (Appendix 16) with the general broad headings, but she illustrated the baseline vitals such as temperature, blood pressure and fasting glucose tests in an easy to follow table. Blood chemistry was also given. She, however, spent time explaining to the class about the gall bladder and gallstones and uses visual representations to illustrate this in her presentation. The sequence of the slides bore a resemblance to the sequencing of the content and case studies covered in lectures, and increased in complexity. It started with a clinical condition, subjective data and objective data, and progressed to an evaluation of drug management and therapeutic recommendations (involving research, decision-making and judgment).

Student A:

Ward-round: 17th April 2012

Hospital:

Prince Mshiyeni,

Patient:

24 year old, female, African

Diagnosis:
Acute cholecystitis

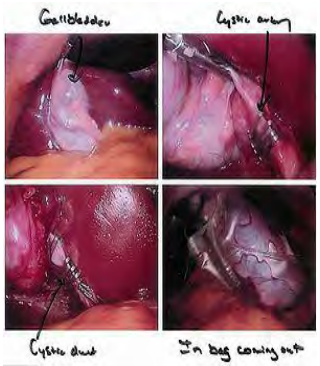
Subjective Data

ØPatient X is a 24 year old African female
ØResides in UMlazi section N with her mother and son
ØShe was admitted 14/04/2012 and was brought by EMS accompanied by her mother and was immediately put on IV fluids and analgesics
ØOn admission she complained of having pain in her Right Upper quadrant for a single day and that her abdomen was extremely tender.
ØBefore admission, she had a persistent cough and epigastric pain and night sweats which she did not take much notice of.
ØPatient X works at Bread ahead as a Cashier
ØShe drinks alcohol occasionally
ØShe has no known allergies

Objective Data

Baseline data upon arrival

Pulse rate	95 beats/min	60-90 beats/min
Respiratory rate	20 breaths/min	15-20breaths/min
Temperature	36.6 °C	37 .5°C
Blood pressure	110/50 mmHg	120/80 mmHg
Blood pressure	122/64 mmHg	120/80 mmHg
Fasting glucose tests	6.7 mmol/l	6.0 - 7.7 mmol/l



Blood chemistry

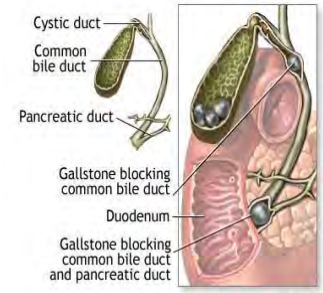
	VALUE(mmol/L)	RANGE(mmol/L)
Sodium	135	136 -143
Potassium	4.2	3.5 - 5.5
Bicarbonate	22	22 -29
Urea	3.6	1.7 -8.3
creatinine	98	64 -104

The LDL results were unobtainable
ØEndoscopy was performed and revealed normal
Ø Surgical cholecystectomy was performed on the 15/04/2012

Diagnosis

Acute Cholecystitis

ž ØThis is sudden inflammation of the gall bladder that causes severe abdominal pain. It is caused by gallstones in the gall bladder. It occurs when bile becomes trapped in the gall bladder. The build up of bile causes irritation and pressure in the gall bladder.
ØØCholesterol is not very soluble, so in order to remain suspended in fluid it must be transported within clusters of bile salts called *micelles*. If there is an imbalance between these bile salts and cholesterol, then the bile fluid turns to sludge. This thickened fluid consists of a mucus gel containing cholesterol and calcium



Assessment of Management

- The use of cefuroxime was appropriate for preventive use :clean -contaminated or potentially contaminated surgical procedures, 2.25g dose administered intravenously just before surgery (approximately one -half to 1 hour before the initial incision) is recommended
- Omnopon and panado were also appropriate as they were used for the correct indications (alleviate pain) and in correct doses.

Management

DRUG NAME	Dose, Route of admin.	Mechanism of action	Rationale behind prescription of drug	Side-effects
CEFUROXIME (Zinacef)	750 mg, TDS, IV	As beta-lactamase antibiotic, it disrupts the synthesis of the peptidoglycan layer of the bacterial cell wall. It binds to penicillin binding protein that regulates the bacterial cellwall,destroying the cell wall	2nd generation cephalosporin Given in slow IV injection over 3-5 min for severe infections	•Renal – impairement •super infections

Discharge Summary

ž ⦿Prevent recurring of cholecystitis she must maintain a reasonably ideal weight.
ž ⦿Reduce fat intake.
⦿She must eat a diet high in fibre, vegetables, and fruit.
ž ⦿Schedule follow-ups with the patient.
ž ⦿Advice patient not to over work herself after surgery.
ž ⦿To consult the doctor if nausea, vomiting or constipation becomes bothersome or if she has trouble breathing due to the effects of the opioids and warn her that she may feel dizzy, so she must be cautious when driving or performing tasks requiring alertness.

Figure 5.7: Student Power-Point presentation from ward-rounds

There was a panel of three assessors, including two academics (Nardil being one of these) from UKZN and a medical doctor. Each assessor's style and approach varied with regard to questions and feedback. Students were either asked questions relating to the particular case or

to broader issues that may impact on the case, (for example pointing to vitals and asking if the patient is diabetic). Students were not given the answers during the feedback session but were rather lead or guided through a series of questions or various comments to discover the answers for themselves. Rich feedback was offered and students gained from the addition of a medical practitioner on the panel, as he offered insights into conditions gleaned from his knowledge and experience in the practicising field. Questions and feedback from assessors taught students the importance of questioning what they found with patients or from their files and not to just to write things down without understanding. The broad range of questions and deep level of questioning extended beyond the results obtained, but also to the tests performed and whether they were necessary. The combination of two academics teaching the Pharmacology module also allowed for reference to prior knowledge and content covered throughout the academic years, affording them the opportunity for probing at times. The type of questions posed by the assessors spoke to the interrelated nature of the discipline knowledge across modules within the pharmacy programme and was not restricted to Pharmacology 401. Students were probed and provoked, extending to thinking about direct and indirect factors affecting the clinical cases and to justify their rationale or approach taken in a particular clinical case (L2 refers to the academic member and Stu A to student A).

L2:	*Was the patient given omnopon and panado together? Temperature is normal.*
	Why did they give her Ranitidine? Her endoscopy was normal?
Stu A:	*Ranitidine given to patient before surgery to prevent acid reflux during surgery.*
L2:	*If gallstones are lodged in bile duct what do you expect to see in the patient?*
Stu A:	*High levels of cholesterol!*
L2:	*Examining the patient what do you expect to see?*
Stu A:	*Jaundice*
L2:	*That's right jaundice. The general opinion is that cholesterol is bad for you but you need it to produce bile to dissolve fat. There is something about the blood glucose test results, 6.0-7.7. Is this a blood glucose fasting test, what does it tell you?*
Stu A:	*[No response]*
L2:	*If the glucose level is above 7, patient has to be diabetic.*

(Clinical presentation notes, 17 April 2012)

5.6.2.4 Assessment

The transformation of knowledge and the journey the student makes ends in the assessment process. While the culmination of the learning experience of the ward-round is a single mark for students, the process to get to that singular point involved a journey. From the initial instructions on the construction of the SOAPE notes to the ward-round visits, and the selection of information for compilation of the report, to the research, the extraction from SOAPE notes to Power-Point slides, and to oral responses to assessors' questions, knowledge was transformed throughout the process.

Each assessor had a sheet with a format outlining various categories and a breakdown of marks to be allocated (Appendix 17). Nardil's pointed to the complexities involved in the assessment process:

> *Assessing the case studies is complex because it is a combination of the SOAPE notes and the presentation and you have to constantly go between the two, also students' responses to questions or their clarification/changes to SOAPE notes is important.*
>
> (Clinical presentation notes, 17 April 2012)

Assessment is therefore not only based on the presentations on the day, but on a combination of the SOAPE notes and students' responses to questions. Assessors use a structured grid with a breakdown of mark allocation (Table 5.7).

Table 5.7: Mark allocation grid for Pharmacology clinical presentations (Includes the breakdown of how marks are allocated)

	Mark Allocation	L 1	L 2	L3	Average
Notes (SOAPE)	[5]	4	4	4	
Diagnosis Assessment	[10]	7	8	8	
Treatment Assessment	[15]	11	12	10	
Education	[10]	5	6	8	
Questions	[10]	6	6	8	
Marks	[50]	33	36	38	
Percentage	[100]	66	72	76	**71.3**

The SAPC makes mentions of the role of experts in enhancing the programme and while experts make an appearance as guest lecturers in other modules or practical tutorials, it is interesting to see the extent to which medical expertise is used in the ward-round design. The

medical doctor in the ward-rounds offered a dimension beyond academia, providing clinical insights from experience which bridges the world of work, similar to the relationship of knowledge production between academia and industry in the field of production.

5.7 Summary

Pharmacy knowledge, from its field of production to the field of reproduction, undergoes many changes. Throughout the process knowledge is subjected to external and internal influences, to varying degrees, within the field. The recontextualisation of Pharmacology knowledge illustrates the journey taken from council to lecture room, showing how knowledge is selected, transformed, expanded or shortened. It further shows how academics select and distill sections, how the packaging and repackaging of knowledge differs from lectures to practical components and how knowledge is ultimately evaluated. The following chapter is strongly guided by the theoretical framework (discussed previously in Chapters 2 and 3) and delves deeper into pharmacy academics' pedagogical practices at UKZN for the majors located in year three of the curriculum.

Chapter 6
Within lecture rooms: Third year disciplines and academics

6.1 Introduction

The previous chapter provided the necessary background highlighting the terrain from statutory council to lecture room. This chapter delves deeper into the lecture room providing insight into the pedagogy in the third year pharmacy curriculum. It describes academics' practices in the third year modules: Pharmacology, Pharmaceutical Chemistry and Pharmaceutics using Bernstein's (2000) classification and framing and Maton's (2005b) semantics, from LCT as a structuring device. It explores a variety of settings: lectures, tutorials and practical components, along with assessment in characterising the curriculum and academics' teaching approaches.

6.2 Pharmacology

6.2.1 Background and context

Pharmacology is first introduced into the pharmacy syllabus in the second semester of second year. Students thereafter continue with Pharmacology in their third and fourth academic years. The introductory Pharmacology module (PHRM 202) offered in second year is aimed at providing students with an understanding of basic terminology and principles of pharmacology with particular reference to pharmcodynamics[37] and pharmacokinetics[38] (College of Health Sciences Handbook, 2012, p. 263). The third year Pharmacology module (301) focuses on developing students' understanding of the pharmacology of drugs (in particular those affecting mediators of inflammation and pain). There is also the move towards clinical pharmacological concepts used in the diagnosis and management of certain CNS disorders.

[37] Pharmcodynamics is the study of the biochemical and physiological interactions between therapeutic agents and living systems.

[38] Pharmacokinetics is the study of the processes of absorption, distribution, metabolism and excretion of medicinal products.

6.2.2 Classification and Framing

6.2.2.1 Classification

The boundary between "everyday" knowledge and pharmacy knowledge

Bernstein's (2000) work focused on the boundary between everyday and specialised knowledge, "everyday knowledge" being common sense knowledge, where meaning is easily understood by people. For example "influenza" forms part of common sense, everyday knowledge. Its meaning is easily understood and people can relate to the condition and medical symptoms which usually include sore throats, coughing and sneezing, amongst others. When someone has influenza, the condition does not warrant a definition, explanation, further expansion or elaboration. Specialised knowledge, however, as suggested by the name, deals with specific knowledge and access to such knowledge is generally acquired through formal education or training in a particular field. Examples of specialised knowledge pertaining to the influenza will cover the virus, it's mechanism of replication, the effect it has on the body, drugs to combat symptoms and the mechanism of action of these drugs. Specialised knowledge will contain the relevant scientific terminology and is a language of its own with restricted access.

Pharmacy knowledge is specialised knowledge and depending on the discipline within the programme, the levels of specialisation and complexity varies. Specialised knowledge is related to "everyday" life at times (general) but also to the "everyday" working life of a pharmacist (practice) which targets a different body of knowledge and understanding. The emerging knowledge typologies indicate knowledge types extending beyond "everyday" and "specialised" categories (these will be discussed in greater detail in Chapter 8). These knowledge types are briefly discussed here within the majors where they predominantly feature. The focus is only on differentiating types and not a repetition of those previously covered (everyday and specialised are applicable to all majors).

The boundary between everyday and Pharmacology knowledge

Snapshots into lectures, tutorials and practicals, in this study, illuminate knowledge structures. Evidence of these accounts from selected examples is used to paint a picture of the structure of knowledge and pedagogy within pharmacy modules. These are pieces of a whole which contribute to a greater whole resembling the construction of a bee or wasp hive, when one single

comb is constructed (Pharmacology, Pharmaceutics or Pharmaceutical Chemistry) it is only one piece of the entire hive (the entire B. Pharm programme, external and internal factors affecting knowledge and pedagogy and so on).

The relative strength of boundaries between categories or contexts is conceptualised in terms of Bernstein's (2000) classification (C), with strong boundaries indicating a clearly demarcated separation between everyday and pharmacy education and weak boundaries indicating a blurring of the lines between everyday and pharmacy knowledge. Within Pharmacology, strong boundaries exist between specialised and everyday knowledge, but also feature an applied specialised knowledge linked to the world of work and patient care, demonstrating weaker boundaries. These knowledge types (indicated below) varied with regards to their use within the lecture observed. General trends within the lecture indicate the use of everyday examples as an introduction to simplifying complex specialised knowledge into simpler forms but still remaining within specialised knowledge and not always moving to "everyday". Examples related to the workplace environment generally featured towards the latter part of content discussion.

Zeta's explanation of complex terms and concepts using everyday experiences of allergic reactions is illustrated below:

> *Most of you would have seen histamines or would have taken an anti-histamine at some point in your life. And when you hear the word histamine and anti-histamine, you know, you immediately think of allergic reactions. You have other effects as well it's not only for allergies. They also play a role in pain and inflammation and sometimes, you do know with an allergy you have the itching and the pain so that's the role in pain.*
>
> (Z/L/p1p3L1)

Later, she explains complex specialised knowledge into a less complex form but remains within the specialised domain as the content does not lend itself to everyday, concrete links.

> *Histamine is formed inside of the body, like I have said. You don't take a pill or something. It's formed in most of your tissues by the amino acid L-histidine that is decarboxylated by the enzyme histidine decarboxylase. Ok! The cells in the body where it is stored, mostly your mast cells and your basophils, so histamine has been manufactured in the body or synthesised in the body, it's stored in those cells.*
>
> (Z/L/p2p1L2)

When discussing the mechanism of action of anti-histamines, towards the latter part of the lecture, Zeta relates anti-histamines to first generation and second generation drug knowledge and shows its practical link to the world of work.

> *Now if you've ever taken an anti-histamine you do know that very importantly you get sedated. You feel so drowsy that you cannot keep awake. So if ever you give someone an anti-histamine you tell them that they're going to get drowsy. That's one of the major adverse effects of the first generation anti-histamine and the other one is the adverse allergic reaction. Those are the most important with anti-histamines.*
>
> (Z/L/p2p2L16)

Zeta's discussion of first and second generation drugs, their use and side effects makes these concepts accessible and also illustrates that memorisation of the textbook or notes will not be sufficient. Rather an understanding and relevant application is needed. Knowledge of both generation drugs are important but prescription of these will require decision making based on patient circumstances. The practical application of the theory of first and second generation drugs is reinforced towards the latter part of the lecture when the case study is reviewed.

> *So it's not necessarily that the drowsiness is a bad or an adverse effect. Sometimes you want that drowsiness. Obviously if somebody is suffering from allergic rhinitis and he is a taxi driver by day you don't want to give him an anti-histamine because he is going to fall asleep on the road. So you have to look at your patient and what the needs of that patient is.*
>
> (Z/L/p4p3L11)

Zeta shows the link between theory and practice, where prescribing anti-histamines is dependent and located within the context of the patient. Her explanation and paraphrasing of specialised discipline specific knowledge and use of personal pronouns throughout all knowledge types aids in locating knowledge closer to students. Examples and links to everyday or the working environment feature throughout the lecture, however the discipline content itself, in general, with its strong pure and applied science base remains in the specialised knowledge domain.

Between Specialisation

There are strong boundaries between Pharmacology and the other majors. At times references to other modules are made, however this is almost at a superficial level, highlighting or exposing the links but not the relationship before moving on. This can be attributed, to some extent to the

programme design where modules are compartmentalised for reasons sometimes extending beyond the teaching and learning domain (for example impacted by timetable or administrative factors). Zeta describes the nature of the relationship between Pharmacology and the other majors, in her response to the question if integration takes place and to what extent:

> *No, they are not integrated at this point, that's the big problem we facing and that's why we trying to do the re-curriculation, we want to try to integrate it because they do talk to each other. And our main aim is that when I teach you about drugs used for migraine for instance in Pharmacology that the person in Pharmacy Practice teaches you how to treat a migraine, these are the signs and symptoms, this is the drug, they don't tell you about mechanisms of action but you know the drug already, that this is the dosage form. The person in pharmaceutics will tell you, you use that dosage for a migraine because of these and these things or reasons. And chemistry feeds into pharmacology in that you give that dosage because of its lipid solubility or it passes straight through the system so you can't give it orally or something like that. So that is the idea that we should start integrating it. But to answer your question in short and sweet, No! We are not doing it at this point as such.*
>
> (Z/I/p5p3L1)

Zeta strongly supports an integrated approach, as it reduces the amount of repetition or duplication between pharmacy disciplines (a weakening of the inter-disciplinary boundaries is provided in her example of an umbrella topic such as pain and inflammation and the different approach it would take amongst the various majors or disciplines).

Within specialisation

The content covered within the Pharmacology curriculum is structured under broad sections of CNS pharmacology, autocoid[39] pharmacology and inflammatory conditions. Boundaries between the broad sections, mentioned earlier, are strong and insulated from one and other. They are further separated by different academics teaching these larger sections with one teaching CNS and the other covering autocoid pharmacology and inflammatory conditions. Sub-topics within broad sections also display strong intra-disciplinary boundaries. For example within the section of CNS pharmacology, neurodegenerative diseases such as Parkinson's and Alzheimer's diseases are discussed. Although both conditions form part of neurodegenerative diseases, they are covered separately with no links or relationships made between the two. The section on Parkinson's is completed in its entirety (from physiological features to treatment and case

[39] Autocoid pharmacology deals with pain and inflammation

studies) prior to Alzheimer's disease, which also covers physiological features, treatment and case studies). Other sub-topics within CNS such as the treatment of headaches and migraines are also kept separate displaying strong classification. Sub-topics within autocoid pharmacology and inflammatory conditions are also characterised by strong intra-disciplinary boundaries (Appendix 18 for timetable and module outline covering topics).

6.2.2.2. Framing

Selection

Selection refers to the content that is selected for inclusion into the curriculum. While the SAPC and outcomes guide selection decisions, academics demonstrate strong control over the selection of content as Zeta explains below:

> *The Pharmacy Board states what the outcomes should be but its broad in terms of they would say management of diseases where we would know and we break it down into these subsections. But if we want to focus for instance a little more on central nervous system and a little less on gastrointestinal, there's nothing to tell us not to do or to do that. So that's our own decision.*
>
> (Z/I/p6p3L2)

Academics have strong control over the selection of the content and selection for the broad topics covered are generally decided by the team of academics involved in teaching the module. Decisions regarding the selection of material are based on the outcomes and guidelines from the Council, in the broad framework and more detailed or guided by the module outcomes. The two major sections, mentioned earlier, CNS pharmacology and autocoid pharmacology are sequenced in this order, based on the way the module was historically taught. The module could start with either of the broad sections as they are independent and learning of autocoid pharmacology does not rely on CNS pharmacology. In terms of current sequencing the module begins with the CNS, which runs for approximately two months and thereafter deals with autocoid pharmacology, which is taught by a different academic.

Sequencing

The order in which Pharmacology content is covered is strongly classified and while different organ systems can be sequenced in any order, the sequencing within Pharmacology has not changed over the years. CNS is taught prior to autocoid pharmacology and pain and

inflammation. The sequencing of the overall format or lecture design for both sections, however, follows a similar pattern with major subsections ending with a case study. When dealing with the CNS, the section on neurotransmitters appears first, followed by a case study before sedative-hypnotics, anti-seizure drugs, skeletal muscle relaxants are taught with their appropriate case studies. Alzheimer's diseases and migraines feature towards the latter of the module, with drugs of abuse featuring at the end. Sub-topics in autocoid pharmacology are generally sequenced in a more hierarchically organised fashion for example when dealing with histamines students need to know targets and receptors, mechanisms of action before drug design, effect and side effects.

Pacing

Pacing deals with the timings of the different sections and subsections within the curriculum, how long it takes an academic to move from one section to the next. While Bernstein (2000) describes pacing in the classroom and measures these according to strengths (strong or weak) there is no prescriptive or measure of pacing and how it is determined lies within the subjective domain of the researcher. For the purpose of this research, pacing is described based on a combination of factors such as interjection for questions, providing the opportunity for questions, repetition of certain aspects within the content, how quickly the academic moves between sections and the amount of student interaction during these spaces or at other points within the lecture time and pauses before moving to section or physical breaks.

Pacing within the Pharmacology lecture is generally strong during the didactic components, with weakening towards the case study. Pacing therefore varies throughout the lecture and is affected by the mode of teaching (varies amongst didactic, CBL, class discussion and feedback sessions). Pacing also varies between the components comprising the module with stronger pacing evident in lectures and weaker pacing during on-line Moodle tutorial sessions. Pacing can therefore be viewed as moving along a continuum or like different strengths of coffee with lectures displaying a stronger blend than tutorials.

Evaluation

The strength of evaluation is measured according to the extent to which academics make explicit the rules for evaluation of students' academic performances and is not based on a comparison of the content taught and the content tested. Pharmacology displays a combination of strong and weak control, all assessment tasks were clearly outlined at the beginning of the module, along with the test dates for each section. Strong control is exhibited over tests, whereas weak control is evident at times with on-line tutorial assessment component of the module, where Moodle is used. Moodle tasks cover quiz sessions for marks (but where students conduct the on-line tests during their own time and at their own pace) and sessions which contain You-tube videos or flash cards for example (Appendix 19) that assists students in understanding concepts and terminology covered in lectures.

> *The students know exactly what the objectives of the modules are. I think it's quite clear in that I do explain how I assess them. I try and link it with the way I teach in that you give them the cases so you try and assess in that trying and using the case studies as well, giving them little stories and not just asking them if that's long or short. I don't like that type of questions but ja! once again I feel I am the lecturer, I know what I need to teach. I do explain to them what I expect of them but I'm always in control.*
>
> (Z/I/p7p2L6)

> *Yes, the first lesson is an introduction, in that lecture period they are explained that that the whole marking, not the marking system but the assessment. The tests, how the tests are done, what constitutes a test, the Moodle quizzes, what part of the year mark the Moodle quiz will be examined, the exams are similar to the test so that is explained within the first lecture period. They get all of that.*
>
> (Z/I/p7p2L14)

Zeta described the Moodle session in her lectures as "graphical" and "illustrative". The diagrammatic nature of the Moodle tutorial assists students in understanding complex concepts and is especially beneficial for students who respond to visual stimuli. Tests also cover cases as case-based learning is a pedagogical approach utilised in the module. Case-based learning shall be covered in further detail in Chapter 8, for all modules using this approach and therefore will not be elaborated on within individual majors.

The academic's philosophy regarding the purpose of assessment contributes to the weakening of assessment during the Moodle tasks. Zeta's response sheds light on peer-learning, deeper understanding and independent, but guided learning. The tasks are not designed only for measuring performance but promote greater flexibility, self-learning and encouragement. Tests and exams, on the other hand, follow a more structured format, with performance linked directly to marks obtained.

> *The Moodle tutorials I do for a quiz, I tend to give them a little more time. I don't have a problem. It's not a test for me in such that they have to do ten questions in 40 min. I don't mind if they have their books with them, they read through, as long as they understand what the answers are, so usually they all get full marks. For me that is not a problem, they can even help each other. I don't have a problem with that. I have a problem if one student does it for everyone else. But what I try and do is have a question bank so that the questions get shuffled so two students don't necessarily have the same set of questions so they can't sit next to the other and the one answers everything, so Ja!!*
>
> (Z/I/p3p5/L8)

Relationship between academic and students

Clearly a hierarchy exists, where academics are in control and the role of both is very clear. Zeta talks about how students need to address her formally, using her title, which illustrates the gap between herself and students. She is very clear about her relationship and acknowledges that the dynamics of this changes over the years (as she sometimes teaches the same cohort at a later stage). Lecture observations revealed interactions between Zeta and students but these were largely limited to the case study component of the lecture. The didactic component of the lecture was dominated by Zeta, with very little student voice coming through further indicating strong control.

> *I'm not friends with the students I don't, I won't. I expect them to call me Dr X*[40] *and when they send me an e-mail it's appropriately addressed or I shout at them. I have shouted at them if they write improperly. I don't tolerate them being anything but ja I think it evolves.*
>
> (Z/I/p7p4L4)

Zeta's comment about the evolution of the relationship is expanded on below and highlights the difference amongst the various cohorts, their behaviour in the teaching and learning environment

[40] X refers to Zeta's surname or last name.

and their interaction with her. It points to the dynamic nature of human relationships, and while these may change over the years, they are still strongly classified.

> *In the fourth year they are focused, they want to get out there. The third years play around. The second years are too new, they are so stressed, you know, they don't know what's going on. But I think it changes as you get to know the students that interaction changes because you get to know them by name and you know whose doing what.*
>
> (Z/I/p8p1L4)

Zeta's description of how students differ amongst the years (second years are "stressed" whereas fourth years are "focused") not only speaks to the changing relationship between academics and students over the years but also highlights the broader issue of student transformation and development. As students progress through their degrees and move from academia towards the profession, they demonstrate perhaps a growth in confidence, independence and maturing. Similarly a change in learning is also believed to take place. Research in American and Canadian contexts found undergraduate pharmacy students' approaches to learning mature through the programme (Smith, Krass, Sainsbury & Rose, 2010). Williams et al., (2013) described a similar trend, describing learning as moving away from reproduction-directed approaches at the beginning of the degree to meaning and application directed-learning towards the end.

6.2.3 Semantics

6.2.3.1 Semantic gravity

As previously covered in Chapter 3, semantic gravity is defined as the degree to which meaning is linked to its context. In cases where semantic gravity is stronger (SG+), meaning is more related to context. Weaker semantic gravity (SG-), on the other side of the continuum, is less dependent on context in order to make meaning (Maton, 2013). The strength of semantic density and gravity are also dependent on the object of study (Maton, 2013) as meaning is linked to context; semantic gravity conceptualises the extent to which meaning is dependent on that context. Martin's (2013) use of the example of cilia illustrates the relationship between semantic density and the context in which it is found. The meaning attached to cilia and its function differs depending on the educational level from (primary or secondary school biology settings). The concept of semantic gravity continuum is illustrated in the Pharmacology example below, which deals with histamines and anti-histamines.

Itching, pain and inflammation strongly related to everyday experiences and can be the result of any underlying medical condition. These feelings and sensations are not part of specialised, discipline knowledge but rather illustrate concrete, context dependent knowledge that can easily be understood. This knowledge demonstrates stronger semantic gravity[41]. Allergic reactions, however, display weaker semantic gravity than itching, pain and inflammation, with mechanism of action of anti-histamines (a complex, specialised and abstract concept) displaying even weaker semantic gravity on the continuum. Understanding the meaning of these terms cannot be easily related to context, everyday or generalisation.

6.2.3.2 Semantic density

Semantic density describes the internal relations of knowledge practices (Shay, 2012). It is defined as the degree of condensation of meaning within terms, concepts, phrases and symbols (Maton, 2011). Similar to semantic gravity, semantic density operates on a continuum of strengths. Stronger semantic density (SD+) contains more meanings condensed within terms, concepts and symbols. Weaker semantic density (SD-) is where meanings are less condensed (Maton, 2011). For example the mechanism of action of a drug displays strong semantic density because more meanings are condensed within the concept. The mechanism of action of a drug on the body "unpacked" or reduced to concepts within cover knowledge of the structure of cells, receptors, molecules and how they behave differently (hydrophilic or not), where and how it affects the body. It is a complex concept containing many meanings and not limited to one interpretation. Examples of the semantic density continuum are provided in the context of the third year Pharmacology curriculum and it is important to note that the context in which knowledge is taught and learnt also has implications for density.

6.2.3.3 Semantic waves

Although semantic gravity and density have been described separately above, they both serve to understand the underlying organising knowledge principles. When plotted together they track the changing pattern between context and condensation of meaning over time (Maton, 2013). Depending on the movement of meaning of knowledge practices in the lecture room, from context independence to content dependence and from very condensed to less condensed and vice

[41] Reference to academics strengthening or weakening semantic gravity and density is based on the researcher's analysis and not on academics conscious behaviour or pedagogical practices.

versa, the semantic gravity and density might reveal upward and downward profiles, resembling waves. The waves[42] illustrate the dynamic nature and transformation of meaning, the importance of which shall be covered in more depth at a later stage.

Semantic waves for Pharmacology lecture

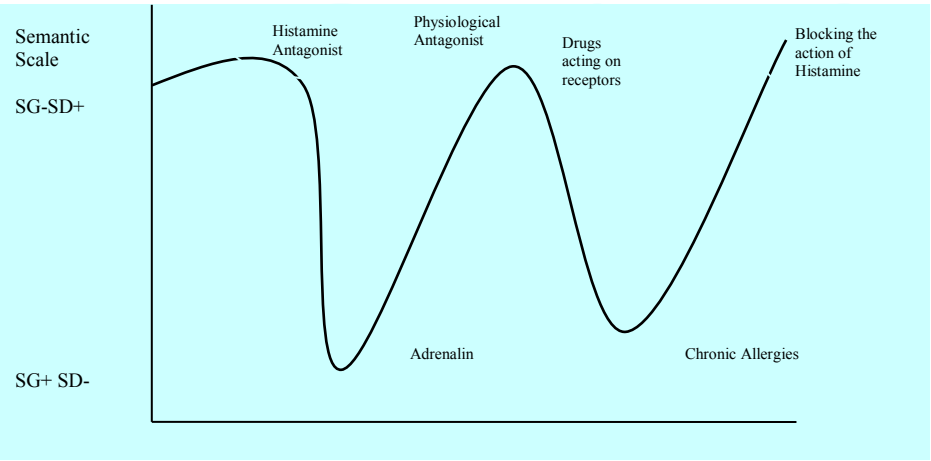


Figure 6.1: Semantic wave in Pharmacology depicting unpacking and repacking pharmacological concept of histamines and mechanism of action

At the beginning of the wave (Figure 6.1), Zeta is unpacking the highly condensed and decontextualised concept of histamine antagonism to explain a different antagonist (physiological) that has an opposing action. Both histamine antagonism and physiological antagonism display weak semantic gravity and strong semantic density. Zeta mentions their opposing mechanism of action prior to "unpacking" physiological antagonism. Zeta strengthens semantic gravity by locating physiological antagonists in a more concrete and everyday context by relating it to adrenalin. In linking adrenalin to everyday knowledge she describes anaphylactic shock as seen on television and then unpacks the concept further (weakening semantic density) by explaining the opposing actions of histamine in terms of its effects on blood pressure (adrenalin increases blood pressure whereas histamines have the opposite effect of slowing it down). Her "everyday" example makes the opposite relationship between both abstract,

[42] Semantic waves constructed for the various disciplines are representative of the kind of pedagogical unpacking that took place in lectures and these examples are not the only time semantic waves took place. Semantic waves also vary in the analysis chapters, sometimes semantic density and gravity are presented together and other times apart. These differences indicate the nature of waves, their variation and how the examples used, discipline contexts impact on the construction of waves.

decontextualised concepts concrete in her explanation of the inverse relationship with blood pressure. After strengthening gravity, she moves again to levels of weaker gravity and greater levels of abstraction by showing how the drugs cromalin and noecrobal act on receptors, blocking the action of histamine but once again relates it to everyday knowledge in discussing chronic allergies (strengthening semantic gravity and weakening semantic density). The pedagogic practice of Zeta follows the movement of a semantic wave, with her repetition of concepts and explanations starting the wave again.

> *So where histamine will let your blood pressure drop very quickly, adrenalin will have the opposing effect. You also get release inhibitors, now you have seen that histamine are stored in cells, something triggers the release of histamine so you can block that release of histamine so histamine never gets released from the cells and it never gets reaches the receptor. There's two that can be used, those are cromalin and noeocrobal,, now these drugs don't interact with the histamine receptor, they block the release of histamine and they can be used in allergic rhinitis more chronic conditions where people need to take these drugs chronically. So there are other ways of antagonising or blocking the actions of histamine.*
>
> (Z/L/p4p1L9)

> *Not all of them are important for you but there are four types of histamine receptors and these histamine receptors are membrane receptors, meaning that they sit on the membrane of a cell, the moment they are activated it results in activation of G-proteins and those G-proteins result in some kind of effects.*
>
> (Z/L/p2p1L13)

Zeta unpacks the density of meaning further by differentiating histamine receptor types and giving its various elements (details of activation) which in themselves are quite dense. She still remains in the domain of specialised disciplinary knowledge, just making the individual components clearer to see through the "unpacking" process.

6.3 Institutional Pharmaceutics

6.3.1 Background and context

Pharmaceutics is offered from year two to year four of the pharmacy curriculum. Institutional Pharmaceutics is a third year Pharmaceutics module which covers content pertaining to microbial structure, nutritional requirements, microbial growth, metabolism and sterilisation (College of Health Sciences Handbook, p. 269). Various methods of sterilisation are discussed and these include heat, filtration, radiation and gaseous techniques. Sections covering disinfection and infection control in hospital and institutional pharmacy practice are also covered, along with selected pathology and immunology (PHRM 321 lecture notes, 2012, pg. 1). The aim outlined in the College Handbook and subsequent lecture notes is aligned to:

> *To train students in pharmaceutical aspects pertinent to institutional/hospital pharmacy practice with special emphasis on sterilisation, disinfection and infection control.*
>
> (College of Health Sciences Handbook, 2012, p. 269)

Knowledge types and structure

Pharmaceutics knowledge is based on a hierarchical structure and based on an understanding or pure sciences (biology and chemistry) and applied sciences such as microbiology. The prerequisite of the Biology 103 module indicates the biological based required for understanding the module. Ami's description of the module as starting from basics and going to "more detailed stuff" highlights the knowledge relationship and complexity within the module (A/I/p21p9L1). Ami's example below illustrates the hierarchical knowledge structure and cumulative nature of Pharmaceutics knowledge.

> *Say for example I start off with the structure of the bacteria and then we go onto sterilisation processes. So when you're doing sterilisation you have to know exactly what it is, which part of bacteria you're dealing with. And you know you work out the way that you're going to destroy that particular structure of the bacterium. So you have to know the structure to be able to know what type of process you're going to be using later on to you know destroy the structure. So it does follow up.*
>
> (A/I/p22p1L1)

Strong links are evident between theoretical knowledge, laboratory application and the world of work that practicing pharmacists finds themselves. Content and discipline knowledge within

Pharmaceutics is directed towards industry and hospital settings as outlined in the aim and content of the module, rather than towards the generalist pharmacist. Technical knowledge was evident which not only related to the discipline specific knowledge such as streaking techniques and titrations but also the technical component which deals with the procedures and processes in the laboratory settings. For example reference to "come dressed" was not elaborated upon but was based on a mutual understanding by staff and students to refer to wearing of a white laboratory coat and other protective gear required for the laboratory practical session. (Laboratory safety rules are outlined in the first page of the practical manual and point three refers to the wearing of a laboratory coat, while point five refers to how long hair should be maintained to prevent it from catching alight on the Bunsen burner or contaminating cultures. Technical knowledge pertaining to laboratory rules does not vary significantly from year to year and at a third level knowledge of the rules and compliance are expected as it extends beyond the rules of the module but speaks to the greater issue of health and safety regulations.

6.3.2 Classification and Framing

6.3.2.1 Classification

Knowledge in Pharmaceutics exhibits strong boundaries between everyday knowledge and specialised disciplinary knowledge. Most concepts are specialised and are built upon knowledge and application from the pure and applied sciences (such as chemistry and microbiology respectively). While at times, the academic uses examples to make concepts more relevant to students, these examples relate to the everyday working environment rather than everyday common sense knowledge. Lecture content on sterilisation, disinfection and infection control in hospitals uses examples that relate largely to practical applications in the working world such as why sterilisation is needed in their context and how this encompasses the sterilisation of products and the environment as well.

Both lecture and practical sessions display strong classifications between specialised and everyday knowledge. Knowledge within the discipline is specialised as demonstrated in references to the various agar media, the scientific names of bacteria, contaminants, names of indicators and the microbiological processes such as streaking or chemical techniques such as titration. Similar to lectures, practical sessions showed the links between discipline specialised

knowledge and the workplace without relating to common sense or "everyday" knowledge, as indicated below:

> *Ok! Right we are starting. Today we are doing BP tests for microbial contamination. Now sometimes you will find that the products that we work with can get contaminated, like the creams or medicines or something like this. Now what we have to do we have to do tests to see what the contaminants are.*
>
> (321/P/p1p1L1)

In addition, the need for precision in practical applications also featured strongly, indicting further the specialised nature of the discipline.

Between specialisation

Pharmaceutics demonstrates strong boundaries with Pharmaceutical Chemistry, Pharmacology and Pharmacy Practice, with very little reference made to these during lecture and practical sessions. Within the lecture, connections are made largely with previous knowledge within the module or within the chemistry, biology or microbiological base upon which the module is based rather than the other majors. For example in discussions on moist heat sterilisation and the destruction of organisms focus is on the effect of very high temperatures on bacteria and the mechanism of action relating to protein denaturing whereas dry heat discussions revolve around the oxidation of the cell constituents (A/L/p2p2L4). In both cases relying on previous knowledge of biological structure of organisms and proteins and the effect of chemical changes, pointing to the knowledge base. The Pharmaceutics practical component also demonstrated strong boundaries with other majors. Knowledge was isolated from the other pharmacy modules but not from sections within Pharmaceutics, where references were made to sections previously covered (examples that relate to these are elaborated upon in the section on sequencing below).

Within specialisation

Strong boundaries are also exhibited within the different topics or sections covered in Pharmaceutics. Under the topic of sterility, different methods to achieve sterility are discussed such as heat, filtration, radiation or gaseous techniques. The sterilisation processes, however, comprises of very distinct processes, exhibiting strict boundaries despite all being designed for the purpose of achieving sterility.

Sterility, we mentioned before, absence of living organism's an absolute term. Sterilisation, obviously follows from sterility, it is a process of achieving sterility. Now there are different methods that you will be using to achieve sterility and going back to last week, what are the methods that you can use to achieve sterility?

(A/L/p1p10L9)

Student responds*: Moist heat, dry heat*
Academic: Ok! You can use moist heat, coming back to moist heat, how can moist heat cause sterilisation? What does it actually do to the organisms?
Ok! You apply heat and you know that the enzymes that you require for the metabolic processes within the organisms are made up of protein. And what happens to proteins at high temperatures? They become denatured. So this is how moist heat is going to work, it can act on protein structure, causing deactivation of protein for it to destroy the organism. Ok! Moist heat was one form of sterilisation, what was the other?

(A/L/p2p1L1)

6.3.2.2 Framing

Selection

Strong selection is evident in the module, with content selected relating to the aims and outcomes of the module. The material selected for the slides and overhead are all provided in the lecture notes which students follow closely. The dependence on the notes and reference to page numbers can be attributed to the fact that the module is taught by an ad hoc[43] lecturer, using the notes developed by the previous academic. Subsequently the temporary appointment also affects other areas of framing such as sequencing and pacing.

Sequencing

Sequencing in the lecture is strongly controlled by Ami and she follows the headings and subheadings within the student manual. The lecture section on sterilisation started with what the process entailed and then moved on to the various different approaches and their suitability based on the bacteria or organism to be destroyed. The practical session, which is taught by the principle laboratory technician (PLT), focuses on specific bacterial contaminants and how to identify them. There were several cases when the PLT referred to prior knowledge either directly or indirectly. Direct examples include reference to the first practical about streaking techniques or

[43] A part-time teaching appointment for lectures or a module.

different types of media and indicators, which were covered in lectures. Examples of indirect references include mention of soluble and insoluble products.

> *When you inoculate your agars you're going to use the streaking technique I taught you in the very first prac when you want to see individual colonies, you will put your individual name because you will be marked as an individual for your plates, you can start of as a group so I'm going to mark your techniques, your labeling and things like that.*
>
> (321/P/p3p1L16)

The technique used in the current practical (Practical 9) was dependant on the technique learnt in practical one of the present module and this reveals more about the structure of the way the knowledge is organised (hierarchical) as well as provides insight into the sequencing of sections within the module. This practical therefore could not go before practical one as students would be unfamiliar with the technique required. Pure culture and aseptic techniques were covered in the first practical and the objectives for this section were described as: to learn aseptic techniques procedures and their importance and also to learn to isolate colonies using the streak plate technique (PHRM321 Practical manual, p. 2).

The sections prior to this practical in the manual, along with their objectives are outlined in the table below. Each section begins with definitions pertinent to the practical at hand before including the outline of the methodology to be followed.

Table 6.1: Adapted from information provided in PHRM 321 Practical manual

Practical	Objectives	Examples of definitions required	Diagrams
Pure Culture and Aseptic Techniques	To learn aseptic techniques procedures and their importance. To learn to isolate colonies using the streak plate technique	Aseptic Incubate Sterile	Aseptic Transfer
The Gram Stain	To learn the Gram stain procedure To learn to distinguish gram-positive and gram-negative organisms	Differential Stain Inclusion bodies Micrometer	None
The effect of incubation temperature on generation time	To understand the phase of growth curve. To understand the effect of temperature on generation time. To learn how to calculate generation time. To learn how to use semi-log paper	Absorbance Generation time Optical density Spectrophotometer	Growth curve showing four phases of growth
Moist and dry heat sterilisation	To provide background information on some physical sterilisation methods. To introduce a quantitative lab method for determining the susceptibility of different bacteria to the lethal effect of moist heat-thermal death point and thermal death rate. To demonstrate the use of lab equipment commonly used for physical sterilisation of moist and dry materials.	Autoclave Boiling Dry heat oven Irreversible Denaturation Pasteurisation Pathogen Thermal death point Thermoduric Thermophile Tyndallisation	None
Osmotic pressure and the rate and amount of microbial growth	To provide an introduction to osmotic pressure and show its importance. To show that some micro- organisms grow better in high salt or sugar concentrations	Generation time Growth curve Halophilic microbes (not all examples given)	None
Antiseptic and Antibiotics	To provide introductory information about the origin and usage of antibiotics, antiseptics and disinfectants. To provide the student with an opportunity to evaluate the bacteriostatic activity of antibiotics, antiseptics and disinfectants with	Antibiotic Anti-septic Co-enzyme Competitive inhibition Disinfectant	Table of chemical compounds

	a modified Kirby-Bauer test.	Essential metabolite pathway Pathogen	
Identification of Gram Negative Rods	To learn to identify bacteria using biochemical tests. To understand the physiological basis for tests To become familiar with organisms commonly seen in a clinical laboratory especially those causing urinary tract infections	Enteric Fermentation Coliforms	None
Epidemiology: A *Staphylococcus* carrier study	To enable you to participate actively in an epidemiological investigation.	Coagulase Haemolysin Selective medium	
Tests for microbial contamination	None specified	None	None
Kelsey Sykes Test (Modified) SABS Method 509	None specified (students required to use aseptic techniques throughout the test)	None	SABS Method 509 provided

Strong sequencing is demonstrated both in the practical session observed and within topics covered in the practical manual. Each practical followed a similar pattern, starting with a brief introduction around the topic, sometimes points to take note of were included (under the heading of notes), definitions, objectives, materials and procedures and questions. Subheadings denoting each of the above categories were in bold. At times diagrams were included as well. The Practical demonstrator refers students to follow in their manuals as she goes through the testing procedure.

> *You can follow in your manual, we are going to be testing one of these four cultures. Now we've got our known cultures, which I have given to you and we have our unknown, so now what we're going to do is and for the rest of the prac, we're going to have two sets of media and ...and the unknown and this way you will be able to work out your unknown culture, right!*
>
> (321P/p1p1L24)

Knowledge in Pharmaceutics is built on an understanding of chemistry and microbiology. This is evident throughout the practical, with many references to content and technique. In addition, as previously mentioned knowledge in Pharmaceutics is accumulative and based on prior knowledge and becomes more complex as students proceeds. Microbiological processes, techniques and knowledge of agar types, selective, indicator, nutrient, reference to streaking techniques (earlier practical in the manual) are built upon as complexity increases. For example earlier practicals cover distinguishing between gram negative and positive organisms, whereas a latter practical links the identification of gram negative rods to the intestine. Particular reference is made to enteric (associated with the intestine) and coliforms (gram-negative rods found in the intestine that ferments lactose e.g. *Escherichia coli*) which link the abstract, discipline specific knowledge to application in the working environment and understanding patient conditions. This is also indicated in the complexity of definitions as the practical proceeds. There is a general increase in complexity, if one looks at the objectives as well as the definitions. Practicals covered towards the beginning of the module emphasise identification and techniques, equipment and units of measurement whereas latter ones show links and practical applications of patients and medical conditions.

Pacing

Pacing was strongly classified for both the lecture and practical session. Pacing during the lecture was completely controlled by Ami. She moved quickly from one section to the next, covering the various types of sterilisation. Despite the session being filled with questions aimed at eliciting student response, students showed very little control over the pacing. A further indication of the strong pacing was evident from the lack of breaks between sections. Perhaps the strong pacing within Pharmaceutics can be linked to what Ami calls “the large volume of factual content” that she has to cover in the module. The issue of workload and amount of content to be covered was mentioned both in the lecture room at times and as well as within the interview session.

The practical component of Pharmaceutics, which was based on testing for microbial contamination, revealed a didactic introductory section with strong framing, followed by a weakening when students engaged in the execution of the practical. The introduction was strongly framed in terms of pacing as the PLT conducting the practical explains in great detail

(step by step) what the practical entails. She uses diagrams on the board to illustrate the different combinations of agar medium and contaminants, which students will encounter through the practical session. Apart from the didactic approach, a further indication of strong classification is evident from the general lack of the student voice during this time. They do not ask any questions or interact in any way except for later when questioned about their finishing time the next day to check on the results.

Pharmaceutics was characterised by strong classification (indicated above in 321P/p1p1L1), whereas control varied at times with respect to framing. Selection and evaluation were strong whereas academic-student dynamics and pacing varied depending on the timing of the practical. For example, both pacing and academic-student interaction were very strong towards the beginning of the practical where the practical session was informative and guided but as the practical continued, there was evidence of a weakening of pacing and the relationship dynamics.

Evaluation

Assessment was very strong and explicit especially during the practical session. Students were taken through what was required from the practical and the laboratory supervisor distinguishes between group work and individual assessment.

> *The marks that you get from your practical tomorrow will be taken individually even though you are working in groups today.*
>
> (321P/p1p1L19)

> *You will put your individual name because you will be marked as an individual for your plates, you can start of as a group so I'm going to mark your techniques, your labeling and things like that.*
>
> (321P/p3p1L16)

The PLT also provided great detail about what content should be contained in the write up which would be assessed. The structure of how the information would be presented was also discussed in detail. Requirements are very clear and she goes as far as even mentioning that the data must be in a table.

> *And for your write up you going to have to give me your results, now I want it like this. You're going to do it in a table form and you're going to have one*

column with your known and one column with your unknown and obviously the the different media that you used. And it's only going to be the agar media, right, not the broth media. Say for instance you're doing the first one which is Cetrimide agar, right now with the known with Pseudomonas aeruginosa, it gives off a green pigment, right that's why I told you'll to observe the colour of the plates you were given because with these results you need to see what is the colour of the colonies because some of the colonies change colour. Some of them the agar change colour and some of them don't change colour so you need to report on both, the colour of the colonies and the media. And if it is not in your your unknown sample, if it has Pseudomonas aeruginosa then you'll see it has green pigment then you know that your unknown is Pseudomonas aeruginosa. If it's not then you know your unknown is not Pseudomonas right and you'll do this for all your plates eventually you will come to a set of agars with the matching results and then you say that this is your unknown, right. So I need to see the table, I need you to tell me which is your sample number and tell me what is your unknown sample, that that goes in your write ups. You'll have to have the sample number otherwise you won't get a mark because it will have to be one of the four right so you'll need to know which sample it is. Also in your write-up I need to have the constituents of the agar and I'm going to tell you which ones are for which groups.

(321P/p3p3L3)

There is no mention of mark allocations and based on the timing of the practical (Practical 9) observed, it is likely that this was covered previously. The above extract also illustrates the importance of observation skills and the pedagogy employed to teach deductive reasoning skills and the process of elimination in order to move from the known to the unknown. Early examples are general, with lots of reference to colour but as the lesson progressed she used specific examples of colour to indicate the importance of colour change. She also made explict the implications of this with regard to identification and solving for the unknown.

Relationship between academic and students

Both the lecture and practical session demonstrated a clear hierarchy between students and academic staff members. Most of the session observed indicated a didactic teaching approach, strengthening the boundaries between students and staff, with staff members knowledgeable about their subject areas and with very little student interaction unless prompted with direct questioning. During the practical session, the introductory session outlining the practical on microbial contamination was didactic in nature with a strong and clear knowledge divide between laboratory supervisor and students. As the practical progressed, interaction increased but there was always strong control by the laboratory supervisor.

Ami's account for control over various aspects of teaching and learning can be seen below:

> *Sometimes if you give them too much of control then we lose control of them.*
>
> (A/L/p23p5L1)

This statement exposes the issue of control and how control extends to wider issues in a social space where teaching and learning takes place. It extends beyond classification and framing, to include other behavioural and social dimensions. It also sheds light on why academics believe they need to be in control regarding aspects such as selection, sequencing and pacing (to be discussed in greater detail at a later stage).

6.3.3 Semantics

6.3.3.1 Semantic gravity

Pharmaceutics is generally characterised by weak semantic gravity. Terminology is very specialised, technical and disciplinary specific and the module focuses on processes and procedures relating to sterilisation and the destruction of microorganisms. It involves microbial structure, nutritional requirements and microbial growth, metabolism and death rates, concepts that are removed from everyday experiences.

6.3.3.2 Semantic density

Pharmaceutics generally displays strong semantic density. An example illustrating strong density is the term culture. The microbiological concept of culture is complex, similar to the human social meaning of culture. Within the term, different types of cultures in terms of growth patterns, different organisms that could grow in the culture: bacteria, virus, fungal are covered. Other aspects include the different interactions that take place in a culture, growth periods, types of agar upon which the culture is grown and the different techniques (such as streaking) used in the growth of the culture. The term also displays strong semantic density as it is specialised and cannot be easily understood without the academic, discipline-specific knowledge.

6.3.3.3 Semantic waves

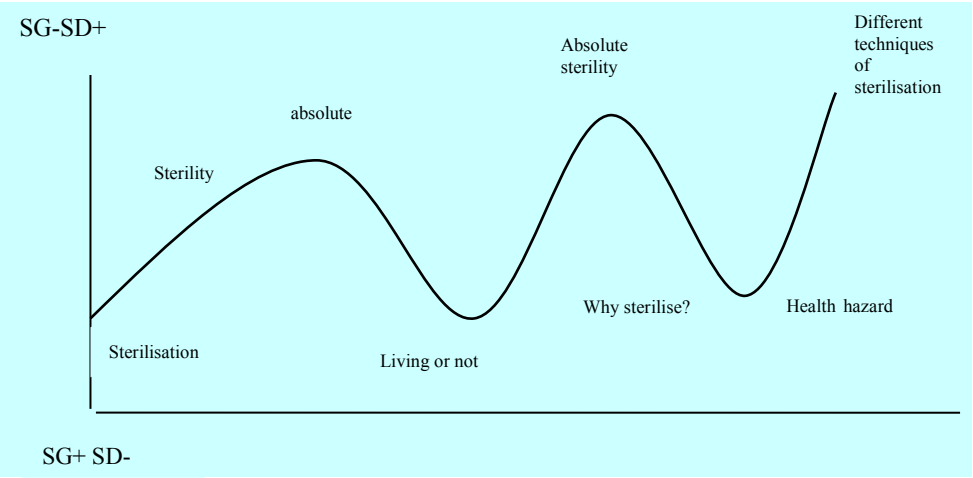


Figure 6.2: Semantic wave in Pharmaceutics based on sterilisation topic

Refer to Figure 6.2 in text, Ami starts off the lecture by using the terms sterilisation, which everyone can relate to and the term in general demonstrates strong semantic gravity and weaker density. As she progresses, she moves from sterilisation as a process to discuss sterility and how it relates to the term "absolute". She explains that if something is absolute, then it is either sterile or it is not, in defining absolute sterility she shows how this relates to the definition of sterility, which they just covered. The concept of absolute sterility is then explained as either living organisms are present or not. In her explanation of the concept of absolute, she weakens semantic density, thereafter strengthens semantic gravity when she questions the class about whether this is "a practical thing that would occur in real life". She links the concept of absolute sterilisation to the workplace and what students should expect to find when they are preparing products.

> *It's not really possible, it may be possible for small batches of whatever but overall it's very difficult to get 100% sterility in any product that you are forming. That is why there are degrees of sterility. There are certain degrees that are acceptable so when we are doing sterilisation ……get 90% , won't get 100%.*
>
> (A/L/p1p4L5)

The link to the working environment further strengthens semantic gravity, locating the knowledge within a concrete context. Discussions on why sterilisation is necessary also indicate a

weakening of semantic density and strengthening semantic gravity. Although reference is made to discipline knowledge in reference to "microbiological" and "soiled dressings", their impact as a health hazard risk strengthens semantic gravity as students are aware of what these outcomes are likely to be in a hospital setting. After unpacking absolute sterility and its practical applications, she moves up the wave to discuss the various techniques that can achieve sterility. Ami weakens semantic gravity and a strengthens semantic density as each technique or process such as "moist heat" (discussed below) incorporates organism structure, mechanism of deactivation, conditions necessary and decisions on when to use the approach.

> *You can use moist heat, coming back to moist heat, how can moist heat cause sterilisation? What does it actually do to the organisms?*
> *Ok! You apply heat and you know that the enzymes that you require for the metabolic processes within the organisms are made up of protein. And what happens to proteins at high temperatures? They become denatured. So this is how moist heat is going to work, it can act on protein structure, causing deactivation of protein for it to destroy the organism. Ok! Moist heat was one form of sterilisation, what was the other?*
>
> (A/L/p2p1L2)

Ami uses a series of questions as she moves upward and downward through the semantic wave. While there are many references to the notes, with mention of particular page numbers, her explanations and questioning technique recontextualises the written text. The practical component of the module, which focuses on tests for microbial contamination (Figure 6.3), also demonstrated movements from weak semantic gravity and strong semantic density in discussing the BP tests, to stronger semantic gravity and weaker density in linking how the tests are related to the working environment of pharmacists and the products they prepare. Knowledge does not remain in the context dependent phase but the PLT thereafter moves towards the abstract and theory of how to treat different products based on whether they are soluble or insoluble.

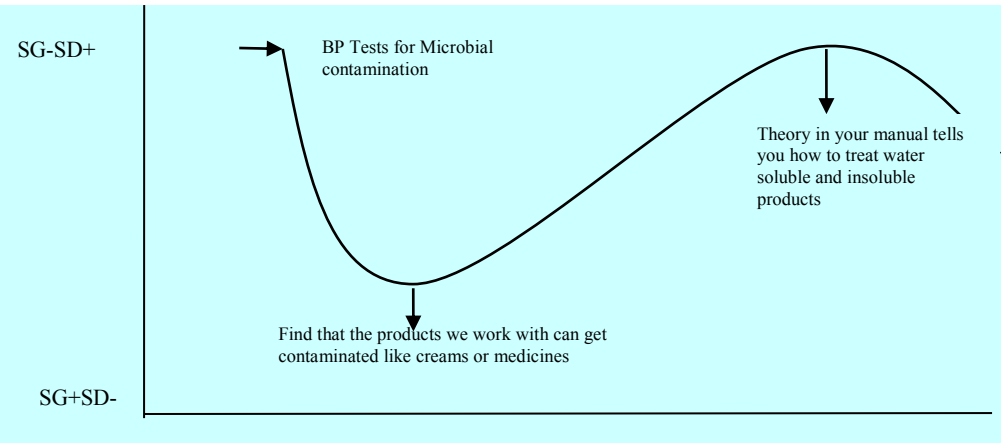


Figure 6.3: Semantic wave in Pharmaceutics practical session

In Figure 6.3, the practical is designed to identify unknown contaminants based on tests involving chemical reactions and colour changes with the agar cultures. This practical is based on a process of elimination and demonstrates a slightly different wave (Figure 6.4). While knowledge shows semantic weakening and strengthening, from the unknown to the known, it all takes place within the specialised discipline and semantic gravity is not strengthened with everyday or concrete examples.

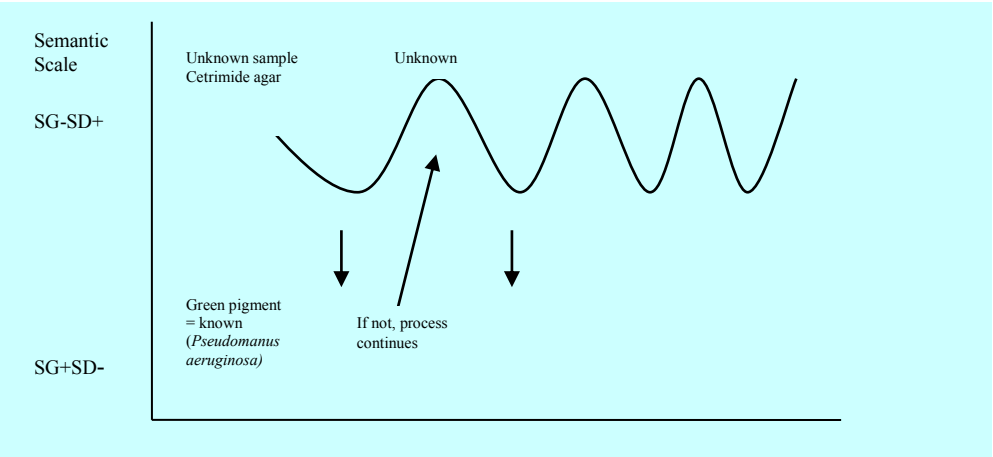


Figure 6.4: Semantic wave in Pharmaceutics practical session on microbial testing

6.4 Pharmaceutical Chemistry

6.4.1 Background and context

Students start with Pharmaceutical Chemistry from year two and continue until year four. Pharmaceutical Chemistry is based on a foundation of chemistry, mathematics and physical science. Medicinal Chemistry forms part of the Pharmaceutical Chemistry major and requires Pharmaceutical Chemistry (PHRM 213) as one of the prerequisites.

Medicinal Chemistry is divided into four modules: Medicinal Chemistry I to Medicinal Chemistry IV. The aim of the Medicinal Chemistry modules is to provide an understanding of the different stages of drug design and structures of drug design and development. Medicinal Chemistry I introduces students to concepts in drug design, the stereochemistry of drugs and drug targets that are important in medicinal compounds. Medicinal Chemistry II is aimed at teaching students the chemistry of functional classes and heterocyclic compounds (College of Health Sciences Handbook, 2012, p. 265-266) and covers sections on the development of enzyme inhibitors as drugs, anti-viral drugs, biotechnology, principles of drug design and discovery, drug development and clinical trials (College Handbook, 2012). The module outline is divided into four parts: A,B, C and D. Section A deals with the principles of drug discovery, design and development, B with proteins as drug targets and C with the introduction to principles of biotechnology and D with antiviral drugs. The lecture observations dealt with section A.

Knowledge types and structure

Medicinal Chemistry, as the names suggests is dependent on an organic chemistry base with the pre-requisites for Medicinal Chemistry 1 being Chemistry 110 and 120. Knowledge is hierarchically structured and students need an understanding of chemical structures, bonds, before they can design drugs. The topics covered in the module starts with the structures of proteins, before moving to enzymes, catalysts and active sites (Figure 6.5). Alben also reveals the hierarchical structure below when discussing student feedback affects his pedagogical approach. Without an understanding of the basic concepts within Medicinal Chemistry, further progression is hampered.

> *For example I started teaching Medicinal Chemistry and then after the third or fourth lecture I said you know I always like to have feedback from students. And most of the feedback saying we need to implement some basics of Medicinal Chemistry. And that is what I started to implement at once. I prepared some extra lectures, additional lectures to catch up with the missing topics that the students feel they do not fully understand.*
>
> (A/I/p6p9L7)

The "missing topics" can be attributed to the fact that the prerequisite first year chemistry modules required are taught outside the College. Alben believes that the outsourcing of these basic chemistry modules has an impact on Medicinal Chemistry because the chemistry is not specifically designed for Pharmaceutical purposes. This further lends support to the hierarchical knowledge structure of Medicinal Chemistry.

6.4.2 Classification and Framing

6.4.2.1 Classification

A strong boundary between Medicinal Chemistry and everyday knowledge is evident. The lecture content is characterised by very technical, specialised, disciplinary knowledge based on a chemistry foundation as suggested by the name of the module, but also largely evident in the content. The module relies on an understanding of chemistry (as mentioned in pre-requisites and during academic interview) because chemical bonds and molecule interactions, amongst other chemical concepts are covered. Alben uses the approach of almost going through the lecture in a step by step process, explaining complex concepts into simpler forms before moving to the next complex concept. Simplification of terminology and content, however, does take place in the realm of specialised disciplinary knowledge and does not lend itself to many "everyday" references.

Between specialisation

A strong boundary between Pharmaceutical Chemistry and the other pharmacy majors exist, despite references to other majors within the lecture. Interview data shed some light on the relationship between specialised disciplines, as well as chemistry, mathematics and computer sciences as the foundational pillars. While the lecture reveals limited referral and interaction, Alben's interview sheds light on links between Pharmaceutics and Pharmacology in terms of the drug design:

> *Ja, it's very closely related, it has to be related because if you look at the stages of designing a drug or having knowledge about some drug, it's all linked together. The drug is a chemical compound, so that's the chemistry background, additional chemistry. Unless chemical component has pharmacological activity and that's what Pharmacology department is doing for us to understand the pharmacological properties in these compounds. And also when I satisfy this compound I need to identify and make sure that I am following the right chemical pathway. So I send this compound to the analytical chemistry people to analyse this compound… So we go to the pharmaceutical people in the pharmaceutical department. So it has to be linked together, you start from the chemical compounds and you end up with a tablet or a capsule or whatever. And it goes on over these stages, chemistry, analytical chemistry, pharmacology and it ends up under the pharmaceutics so all departments are linked together.*
>
> (A/L/p4p9L1)

While the various disciplines contribute to the drug design process, at different stages, teaching of the process occurs within the Medicinal Chemistry module, with boundaries insulated from the other majors. This is confirmed by Alben's response to the issue of integration between modules and topics.

> *I must be honest, you know I find some of the modules are linked together, but most of the modules they are not talking to each other. And that is something we need, you know we need improvement. The old modules and the people who are employed with teaching these modules should collaborate together and see the contents and see if there is a flow in the contents or not. But currently as I said I am honest, I don't see that kind of collaboration.*
>
> (A/I/p5p3L1)

Within specialisation

Strong and weak boundaries exist between most of the different sections within Medicinal Chemistry. Strong boundaries are kept as sections within Medicinal Chemistry are taught separately but a weaker relationship exists when the actual drug design process is discussed and the sequence in which topics occur lends itself to what Alben describes as the "flow". The section on drug design involves knowledge and application across various topics or sections. The section and project pertaining to drug design is based on previous knowledge, topics and sessions covered not only in the year three module but also with regard to previous modules. Alben describes his pedagogic approach of making sections flow and "telling a story" which points to a weakening of boundaries within the specialisation and also speaks to sequencing of the module.

Actually when I started, when I started this position there was an old book, but I've started doing it from scratch again to make sure that all topics are having this kind of flow. Then the topics are talking to each other, so I like to make it as a story then the students can link and they can understand the concept more properly.

(A/I/p5p11L1)

6.4.2.2 Framing

Selection and sequencing

Based on the nature of the pedagogical approach used in Medicinal Chemistry, selection and sequencing are interwoven and shall therefore be covered together. Content covered in Medicinal Chemistry is also infused with visual and technological dimensions further warranting the discussion of selection and sequencing together. Strong selection and sequencing are linked to the "story-telling" approach employed by Alben. Topics are selected from the notes and these are sequenced in order to start from the medical condition and end with the clinical drug process. Contained between these two ends, sections are selected to mirror the actual process from designing drugs to the testing phase.

Ja, as I said in Medicinal chemistry is mainly concerned about the drug design concept and different stages of drug design. So in my module I started stepwise with the students starting from the first stage of drug design is knowing the target, knowing the disease and the target involved in your disease. And as I said the targets could be an enzyme receptor, DNA or RNA. So in my module I start giving the student knowledge about the targets and structure of enzymes and receptors and DNA and RNA. Then from there I started talking about designing of compounds that are added in these targets or acting on these targets. Then I started about the structural activity relationship, how the variation of your structure will affect the activities of drugs. Then I move forward into big clinical studies and then I ended up with clinical studies. So I've covered all the topics, all the stages of drug design in like a story way of presentation.

(A/I/p5p13L1)

The use of technology is evident throughout the lecture and its inclusion was not for purposes of an "accessory" or add-on but rather appeared infused in the lecture, taking many different forms. The selection and sequencing of which is also important. Alben's lecture reveals a video used at the beginning of the lecture, serving an introductory purpose and covering background content or knowledge with easy to follow visual representation. During the lecture, 3D diagrams were used

to explain molecule structures and he touched on computational tools and the value of computer modelling. Reference to the internet and particular websites and databases also featured towards the latter of the lecture, promoting independent learning and engaging students beyond the lecture.

> *So my lecture normally I start with like a video session. So to let the students have a feeling and have a visual feeling about drugs, enzymes, receptors, DNA, RNA. By starting with such videos, I get students having as I said a visual feeling about the targets. Because we have a drug target which is enzymes, DNA receptors, without having a full picture in these targets you cannot design an inhibitor or a drug to work on these targets. So I always like to start my lecture with animation or a video and then I start talking about the theoretical background on that topic.*
>
> (A/L/p2p6L4)

Selection of material for inclusion into the module is not only based on the content required for the present module but also covers previous knowledge and basic concepts that students experience difficulties with. Therefore selection also covers basics outside the parameter of the present module.

Sections in the manual are sequenced towards greater detail with technical detailed knowledge, equations and calculations. Lecture follows the pattern of the story however because of the depth at which these areas are explored in the notes (Figure 6.5), the story pattern is not as easy to follow unless one looks at broad subheadings as illustrated in part B.

Part B: Proteins as drug targets - Enzymes

Chapter 1: Protein structure

1.1. Primary, secondary, tertiary and quaternary structure of proteins

Chapter 2: Drug action at enzymes

2.1. Enzymes as catalyst – Enzyme kinetics

2.2. An enzyme active site

2.3. Substrate binding at an enzyme active site

2.4. The catalytic role of enzymes

2.5. Medicinal use of enzyme inhibitors

2.6. Case study of drugs acting on enzymes (cyclooxygenase inhibitors)

Figure 6.5: Medicinal Chemistry chapter outline (PHRM 311 lecture notes, 2012, p. 3)

Strong selection and sequencing is evident in both lecture and practical components of the module. The PLT controls the selection of the content which is aligned to the detailed practical manual that students follow.

Pacing

Pacing is strongly controlled in the lecture with Alben moving from one section to the next or between technological applications and discipline specific knowledge. A change in pace is noted during the case study, where students have more time to engage with the case. According to the Alben, students' control over pacing pertains to sections where students experience difficulty and require him going over it again. Pacing is also affected by student interaction and the pace at which learning may take place.

> *It's actually very flexible and in some cases before I start the lecture I say this topic is going to take 20 minutes. But depending upon the students, how the students receive that topic you kind of change the pace of the lectures. So again you are not isolated, you need to interact with the students. You need to get feedback from them.*
>
> (A/L/p7p9L1)

The practical component is also strongly controlled by the PLT who spends a lot of time discussing the practical and the write up. Pacing varies with the actual practical conducted by students, with some groups working faster and completing before others.

Evaluation

Evaluative criteria are strongly framed as students are aware of how they will be assessed. Alben specifically mentions that there is a link between work covered in class and what they can expect to find in tests and exam sessions. The evaluative criteria is controlled and driven by the academic and students display no control over the formative and summative assessments. Students do not select questions or have options and are required to complete all assessment tasks. Alben places emphasis on understanding rather than memorising. He makes particular mention of this during the lecture and reference to previous discussions in other lessons as well. The practical component of the module also displays explicit evaluative criteria. Students are made aware of what is required in the write up and the laboratory supervisor even goes into details of the appropriate referencing style (a technical aspect, apart from the content guidelines

given) during the practical session. The practical session started with the previous assessment task feedback and highlights of what future work should contain.

Relationship between academic and students

The relationship between academic and students is strongly framed in both lectures and practical sessions (Alben, however, does not teach the practical component). While framing is strong, the relationship between Alben and students is softened by the use of technology and humour in lectures. Alben's philosophy of wanting students to learn for themselves is evident by his provision of on-line notes and links, where students are guided to carry out additional, independent research generally based on a topic already covered. Alben does however monitor this process and happily reveals that most students visit the sites provided. While the didactic teaching reveals Alben in control and knowledgeable in the field, he empowers students to take control of their own learning. He is seen to foster learner independence and this is evident in direct and indirect forms throughout the lecture. He emphasises that students "will be able to this for themselves" (in reference to designing their own drugs). Alben's view regarding the sequencing of student input reveals strong framing and the hierarchical divide between academic and students.

> *Yes, I would like to bring the student input, but not at initial stage. Let's say I start from my view because this view comes from experience and knowledge. And then when I move on with the students I can then later add in their input. The way we can add things, delete things which is more useful to them. So at some stage we need to have the students input and that's what I am actually doing.*
>
> (A/I/p6p9L1)

Most academics, in this study, share a similar view that students are not in a very informed position to make selection and sequencing decisions because they are not exposed to the entire curriculum.

6.4.3 Semantics

6.4.3.1 Semantic gravity

Pharmaceutical Chemistry knowledge is characterised by weak semantic gravity, most of the lecture operates in the region of specialised, technical, disciplinary knowledge. Throughout the lecture complex concepts are broken down but everyday knowledge and references are not used as the content involving the actual process of drug design remains removed from direct daily applications. The knowledge still operates in the specialised, disciplinary space, with targets, receptors, enzymes and structures that often involve visualisation rather than direct everyday comparisons. The content is strongly linked more to its organic chemistry foundation and applied sciences involving abstract, scientific terms and concepts such as molecules, receptors, 3D structure, chemical bonds and interactions, drug design and target sites. There appears to be very little strengthening of semantic gravity except for the diseases linked to the drugs that are being designed or a description of how the drug addresses a condition for example designing a drug to lower blood pressure, which covers high blood pressure, a common condition which most people are aware of.

6.4.3.2 Semantic density

Overall the Medicinal Chemistry module demonstrates strong semantic density. The drug design process itself has weak semantic gravity but strong semantic density full with technical discipline specific content knowledge featuring illustrations, equations, calculations and graphs. This is observed in lecture notes and academic slides (for example PHRM 311 lecture notes, 2012, p. 17 covers the therapeutic index, while PHRM 311 lecture notes, 2012, p. 26 covers the Hansch equation). Greater condensation of meaning, often complex specialised, disciplinary terms are unpacked and explained using videos and diagrams. Knowledge also demonstrates the feature of application rather than memorising textbook content, for example in the case of designing a drug, depending on whether students have the 3D structure or not would determine the approach selected for further work.

6.4.3.3 Semantic waves

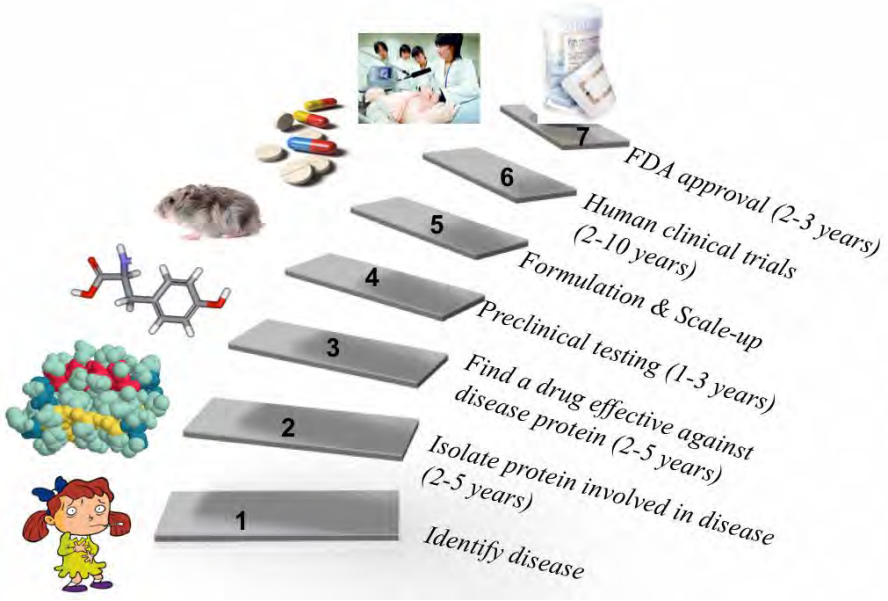


Figure 6.6: Drug design process developed by Alben

Alben leads students through a symbolic mental journey from step one to step seven (Figure 6.6). The illustration above covers semantics on almost a macro scale as within each of the topics covered in steps one to seven involve considerable content, displaying both upward and downward semantic profiles. On a broad scale the numbers show the sequencing of the steps in drug design, with the right hand side showing strong semantic density and weak semantic gravity. The visual symbols, on the left, however, are concrete examples serving to strengthen semantic gravity, enabling students to make connections with stronger concrete lived experience in understanding the weaker gravity theoretical concepts underlying certain processes in drug design (found on the right hand side). It does, however, not necessarily indicate a weakening in semantic density as the processes concerned are very technical and required specialised knowledge. Sequencing of steps is important as four deals with animal testing prior to human testing in stage six. Structures two and three are found in lecture slides and notes and represent dense structures, containing bonds and interactions. Videos and colour slides were used to illustrate these abstract shapes not found or described everyday. Use of visual representation goes to weaken semantic density (by breaking down the complex process of drug design, characterised by numerous reactions, interactions, steps) and strengthening semantic gravity in how these relate to life and

the pharmaceutical working environment. The lecture excerpt extracted focuses on one to three in dealing with hypertension (as the disease in step one) to how the drug designed combats the disease (step three). Stages four to seven are mentioned in the lecture but not in any greater detail as these sections are dealt with later in the curriculum and are described in the manual. Semantic wave from Medicinal Chemistry Lecture is illustrated below:

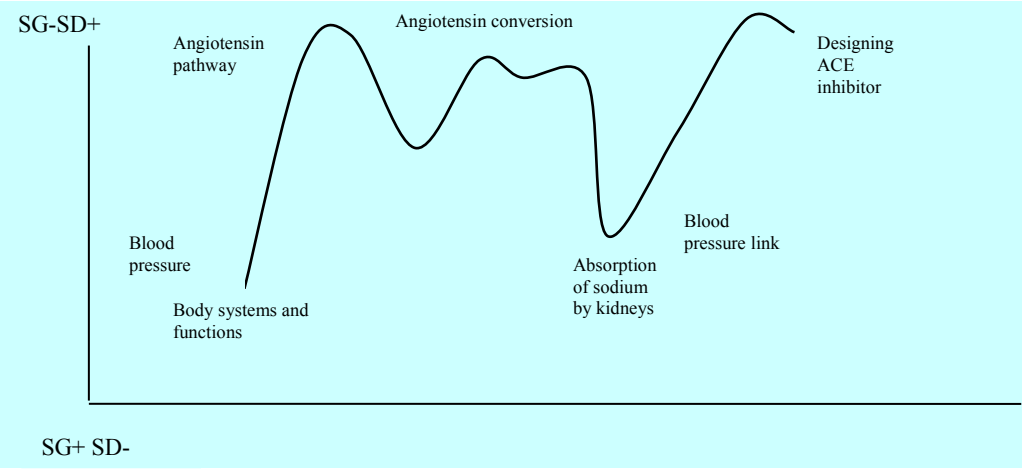


Figure 6.7: Semantic wave in Medicinal Chemistry

In teaching how to design a drug to combat high blood pressure, Alben starts from a point of stronger semantic gravity and weaker semantic density by introducing the system in the body which plays a role in maintaining blood pressure. From mentioning a system, he moves to weaker semantic density and gravity and upward towards abstraction as he delves into the angiotensin pathway and the conversion processes involved. In explaining how angiotensin 1 is converted into angiotensin 2, he weakens semantic density but not semantic gravity as the specialised disciplinary knowledge remains independent of context.

> *As you can see here the liver starting to produce angiotensin, which is turned into angiotensin 1 by a particular enzyme and then basically catalyse the conversion of angiotensin 1 into angiotensin 2, which is a very important chemical control we use in our body …. Secretion from the adrenocortyx, also it causes vasular constriction of the pathways, also it promotes….secretion.*
>
> (A/L/p1p4L7)

Thereafter, he moves downwards in the wave, strengthening semantic gravity and weakening density as he links the role angiotensin 2 plays in the absorbing sodium from the kidney and how this leads to an increase blood pressure. He thereafter discusses designing the opposing action of enzymes in order to reducing blood sugar, which is exemplary of strengthed semantic gravity before moving up the wave to greater abstraction in designing inhibitors for ACE.

> *Very important you need to know the function of each of these components. Also it activates the absorption of sodium by the kidney, so angiotensin 2 plays a very important role in controlling of the blood pressure and increasing the blood pressure. So if we are going to inhibit the enzyme which converts angiotensin 1 into angiotensin 2, now we suppressing all these components which means we are going to reduce the blood pressure. So designing inhibitors for ACE will be an important anti-hypertensive agent, ok! So we design a drug to inhibit this enzyme, we are designing a very important anti-hypertensive agent.*
>
> (A/L/p1p4L13)

6.5 Summary: Classification and framing

Higher education's role of preparing students for a life in fast-changing societies by providing knowledge and skills that can build upon through "life-long learning" is echoed for the development and specialisation of professional qualifications such as pharmacy. Most of the modules within this professional qualification demonstrate hierarchical knowledge structures and knowledge requiring cumulative learning (to be covered in greater detail in Chapter 8). Overall the majors (Pharmacology, Pharmaceutics and Pharmaceutical Chemistry) in academic year three demonstrate strong classification and strong framing, with variations noted between various components of the module. This disciplinary knowledge and content-loaded curriculum displaying strong classification and framing is what Bernstein (2000) conceptualises as a "collection code". His other ideal type known as the "integrated code" is characterised by a weakening of classification and framing and features at times within modules when case-based teaching is used. It is characterised by the curriculum featuring real world contexts, flexibility with regard to selection of material (depending on the problem addressed) and pacing. Cause (2010) highlights the value of classification and framing to education, both from a micro and macro perspective. At a micro level it reveals ways in which academics affect student learning through "control over what is and what is not transmitted through pedagogy, assessment and curriculum. At a macro level it highlights the role outside agencies play on what, how and when

content is transmitted" (Cause, 2010, p.8). The value of classification and framing and the debates around interdisciplinary knowledge shall be discussed in more detail at a later stage.

6.6 Summary: Semantic waves and the motion of unpacking and repacking

The language found in pharmacy textbooks, research articles, handouts and other resource materials, similar to other disciplines, are generally characterised by strong semantic density while simultaneously displaying weak semantic gravity. Knowledge is not limited to a particular context but instead covers abstract principles or phenomena (Matruglio et al., 2013). The technical language in Pharmacology, Pharmaceutics and Pharmaceutical Chemistry is often "unpacked" by academics in their explanation of the handout or textbook by providing everyday or concrete examples. Zeta shows this unpacking in teaching histamines and anti-histamines when she relates these concepts to bee-stings and allergies. Zeta's movement from abstract, context independent concepts and knowledge is followed by downward movements to everyday contexts. Her examples and links to "everyday" serve to facilitate better understanding of the concepts and knowledge. In strengthening semantic gravity, she associates abstract concepts by locating them within a context familiar to students and their experiences. The knowledge does not remain at this level of stronger gravity, instead she "repacks" meanings and examples, ascending and making associations with previous abstract context independent concepts (Maton, 2013).

LCT argues that for knowledge accumulation and transfer to occur, academics and students need to successfully navigate through a series of semantic waves and Zeta's semantic profiles are consistent with this. She starts off with fairly abstract concepts (low semantic gravity) as she progressively links it to a context, thereafter she moves up once again to abstraction, covering an associated or new abstract concept. In shifting language from texts and written forms into verbal lectures through paraphrasing, Zeta and other academics facilitate accessibility to material and meaning as content is presented in what Matruglio et al. (2013, p. 42) calls a more "recognisable language". Alben also illustrates this concept in designing drugs for combating specific diseases or medical conditions such as high blood pressure. These concrete examples serves to strengthen semantic gravity and weaken semantic density (to different extents) resulting in the downward motion of the wave. Maton (2013) describes this as moving away from a highly condensed symbol or term to one that involves fewer meanings.

Unpacking and repacking knowledge can be achieved through various means. Previous studies have shown the role language plays during the process of "unpacking" texts for students and how language teachers' use varies from the original sources. According to Matruglio et al. (2013) by paraphrasing, academics are "unpacking" disciplinary knowledge generally from written sources and in doing so link students' present realities with the past world, represented by the source. This links with the notion of time in cumulative learning. Matruglio et al. (2013) mentions the role of time in cumulative learning as both looking backward and forward. While this is applicable within various pharmacy modules, it also speaks to the greater undergraduate programme where ward-rounds or consolidated amounts of time (internship and externships[44]) sit between backward looking at knowledge, theory and practical know-how learnt in undergraduate years and the forward application of experiences in the working environment pharmacists will practice. Martin (2013) and Macnaught et al. (2013) attribute the use of specialised language, metaphors and technical language to mastering semantic waves. It is both time and contexts that play a role in the recontextualisation of knowledge.

In Pharmaceutics, Ami makes several references to everyday life in explaining complex, specialised knowledge but reaches this through several intermittent steps. She unpacks complex specialised knowledge into less complex knowledge and this occurs as a gradual process in the transition or recontextualisation of the knowledge. In Medicinal Chemistry, while sections in the notes are presented separately, Alben threads sections and subsections into a carefully constructed story. The story ties the different sections together, without going into the depths covered in the notes and text. This extraction (from the entire curriculum) and compilation technique is in a sense a kind of paraphrasing as it takes a subset and does not merely repeat what is contained within the notes. The step by step approach, also evident in the Pharmaceutical practical on laboratory culture, working from the unknown to the known, follows a repetitive pattern in the process of deriving the correct culture. Knowledge in Pharmaceutics is therefore unpacked using a different techniques, it is made accessible through summarising the key points and engaging students in almost a layered questioning approach where dense terms or concepts

[44] Externships are a temporary training programme in a workplace, usually offered to students as part of a course/programme of study. Externships are generally shorter than internships.

are deconstructed into less dense terms and where gravity is weakened wherever possible. The role of repetition of important information, across all three modules, reinforces the wave.

Previous research highlights the role of language in strengthening semantic gravity and weakening semantic density in the downward movement of the wave and while this is also evident in this study, the role of visual representation (graphs, diagrams, videos) in "unpacking" meaning features strongly in the Pharmaceutical disciplines. Zeta's Moodle flashcards, Ami's death curve diagram on the chalk board and Alben's video and 3D colour coded structures are just a few examples of this. Language, along with videos, graphical representation and equations unpack knowledge throughout the lesson, shifting the knowledge being expressed down the semantic scale. Matruglio et al. (2013, p. 43) describes this process of meanings such as those being translated by the teacher to form part of "constellations" pertinent to their original context. In their original context the terms condense meaningful links and references to a range of other related terms which students in their present learning environments may not yet have access. It is this issue of limited access that also provides an argument for why students should have less control over selection of content and sequencing. Academics in the study were in agreement that control should reside with them as students do not have the entire picture of what the curriculum entails at an undergraduate level and indirectly reveals support against implementing a pure PBL model. The sequencing of cases studies after the major part of lecture and after the relevant theoretical knowledge has been covered also lends support to this. Case-based teaching shall be discussed in more detail in Chapter 8.

The goal of teaching and learning is transferability from one context to another. Clarence (2014) makes the point that knowledge accumulation and transfer between and across contexts are compromised if teaching and learning focuses exclusively on weaker or stronger semantic gravity. Students will have difficulty or be restricted in applying knowledge to other contexts if teaching and learning is too abstract or too concrete. Maton's (2009; 2013) study of student work suggests how semantic waves may affect student performance or achievement. The comparison of semantic profiles of high and low achieving student essays revealed differences in patterns of semantic waves. High achieving essays covered a range of semantic waves whereas low

achieving essays exhibited semantic flatlines[45] with strongly contextualised knowledge and no upward movement to abstraction. While Maton's (2009; 2013) study is located within the field of English and in the context of secondary education, these could have implications for academic performance in higher education. While this study does not focus on student performance, it indicates the versatility and value of waves, as pointed out by Maton (2013) that semantic waves can address various situations or problems.

6.7 Summary

This chapter traced knowledge structures and their underlying organising principles within third year Pharmacology, Pharmaceutics and Pharmaceutical Chemistry. All demonstrate strong classification and framing, with the strength of boundaries differing to some extent. Stronger classification and framing are demonstrated in lectures, with weaker classification during parts of practical sessions or within particular pedagogical approaches such as case study teaching. There is agreement amongst academics for the weakening of boundaries between specialisations, which speaks to issues of collaboration, recurriculation and golden themes (covered previously in Chapter 5, section 5.2.2). Modules also varied with regard to their semantic gravity and density profiles while semantic waves within modules shed light on the relationship between knowledge, recontextualisation and pedagogical approaches. The contribution of semantic waves thus has far reaching benefits for the teaching and learning higher education field. The following chapter will follow a similar pattern of analysis, differentiated by its focus on majors located within year four of the curriculum.

[45] Semantic flatlines are faint pulses compared to semantic waves, almost following a linear pattern rather than the oscillations associated with semantic waves (Maton, 2013). Low semantic flatlines represent strong semantic gravity and weaker semantic density while strong semantic flatlines are indicative of weak semantic gravity and strong semantic density.

Chapter 7
Within lecture rooms: Fourth year disciplines and academics

7.1 Introduction

The previous chapter described and characterised the majors in the third year pharmacy curriculum. It provided insight into pharmacy knowledge within the curriculum, its structure and its journey through the pedagogic process, illuminated by code theory, pedagogic device, semantics gravity, density and waves. This chapter focuses on the fourth year majors: Pharmacology, Pharmaceutics and Pharmaceutical Care, in a format similar to the previous chapter, highlighting the underlying structures and pedagogy using the theoretical framing as well as acknowledging insights extending beyond the frames imposed. These emerging themes are covered in more detail in the following chapter.

7.2. Pharmacology

7.2.1 Background and context

Pharmacology is offered from second semester in second year and continues until fourth year. Both second and third year Pharmacology modules are required for progression to fourth year. Two major areas covered in the first semester Pharmacology curriculum are: respiratory and endocrine pharmacology and these sections are taught by two different academics. The aim of the module as described in the outline and student lecture notes closely resembles that mentioned in the College of Health Sciences Handbook (2012, p. 264). The module guide, however, goes further to include the application of knowledge. The module's translation of how this will be achieved also features in the approach mentioned within the module with specific reference to case-based learning.

Table 7.1: Illustrating the aim of the Pharmacology module

Aim of the PHRM 401 module	
College Handbook	**Module student notes**
To provide learners with clinical pharmacological concepts used in the diagnosis, prevention, rational treatment and management of certain systemic diseases	This part of the module will teach students clinical pharmacological concepts used in the diagnosis, prevention, rational treatment and management of certain systemic disorders. This will enable students to apply their knowledge when confronted with these conditions in a pharmacy or hospital.

The Pharmacology module is composed of lectures, ward-rounds and tutorial sessions (review of patient cases from hospital rounds usually takes place during this time). Within lectures and ward-rounds, recontextualisation of knowledge is accompanied by different pedagogical styles. Lectures are characterised predominantly by a didactic approach, followed by the relevant case study. Tutorials and ward-rounds, on the other hand, are composed of written submissions of clinical visits, oral presentations and feedback from the panel[46]. Ward-rounds, previously covered in Chapter 5, will not appear within the classification and framing categories discussed under Pharmacology. Instead they will feature separately in order to capture their essence in its entirety and preserve their unique nature of taking place in hospitals, which are physically removed from conventional practical sessions and campus laboratories. This separation is purely for organisational purposes within this thesis and that in reality it is a complex, dynamic, integrated component which is not restricted to fourth year Pharmacology modules only.

[46] Panel as previously described involves both academics teaching the first semester Pharmacology module and a general practitioner.

Knowledge types and structures

Knowledge in fourth year Pharmacology is dependent on the concepts and content of Pharmacology taught in year two. Fourth year Pharmacology is, however, not dependent on third year Pharmacology as they deal with different systems. Pharmacology is hierarchically structured (as previously discussed in Chapter 5), however, this is does not occur in a vertical fashion. Instead it resembles the branching of Pharmacology third and fourth year from second year, similar to branches found on trees. Interestingly these branches converge for ward-rounds, practical application and internship and the subsequent working world. For example the Pharmacological concepts of receptors, agonists and antagonists are covered in second year Pharmacology but are applied in third year (previously discussed under the section on histamines and anti-histamines) and fourth year (medical conditions such as breast cancer).

This hierarchical knowledge structure can also be illustrated using an example from the fourth year curriculum which deals with hormonal contraceptives. The topic on hormones, the menstrual cycle and contraceptives, covered in fourth year is built upon the understanding of the concepts and content from students' exposure to biology and second year Pharmacology. The concepts and content of these cycles and hormonal functions, however, relates specifically towards pharmacy, differing from the way they feature in the biology curriculum. Recontextualisation of knowledge varies from the pure or applied science as it moves towards Pharmaceutical Sciences. From a biological point of view, an understanding of the different hormones and how they change during the menstrual cycle may suffice but this knowledge of hormones and the menstrual cycle take on a different and deeper meaning as it extends to Pharmacology and the Pharmaceutical Sciences. These range from details on the designs of contraceptives using the different hormones (natural and synthetic), their mechanism of action in terms of the receptors they act on, their clinical uses, toxicity, side effects and possible drug interactions. Within a pharmacological context, oestrogen and the menstrual cycle go on to include the effects of factors such as insulin, temperature, high or low doses of hormones and the role hormonal contraceptives may play in medical conditions such as certain cancers (ovarian and breast) and osteoporosis.

Knowledge of hormones and the menstrual cycle (PHRM 401 lecture notes, 2012, p. 39), as related to clinical treatment, can be seen particularly in drug design and the mechanisms of action

of drugs such as Tamoxifena and Arimdex. These drugs are designed to prevent the spread of endocrine hormone receptor positive breast cancers. A discussion of the mechanism of action of these drugs illuminates how the drugs are designed to attach to cells preventing oestrogen from attaching in an attempt to reduce the circulation of cancer cells. This role in clinical diagnosis and treatment is also linked to the module's aim of the application of knowledge (as pointed out in Table 7.1). The biological knowledge base of the menstrual cycle and hormones are adapted for pharmaceutical purposes and how it relates to patients and clinical care. This speaks to the recontextualisation of specialised knowledge as it moves from one context to another, from parent[47] and applied disciplines towards the profession. This selection and repackaging of knowledge is in line with the point made earlier by Guile (2014) where the focus is on developing the professional nature of the discipline rather than immersing students in the discipline.

7.2.2 Classification and Framing

7.2.2.1 Classification

The boundary between "everyday" knowledge and Pharmacology knowledge

Pharmacology knowledge is largely characterised by specialised, disciplinary knowledge and although the sections on hormones, menstrual cycles and contraceptives are linked to biological and physiological experiences of women, the processes behind these require specialised disciplinary knowledge. These include knowledge on feedback pathways, mechanisms of actions, specific classes of drugs, drug names and uses and drug interactions. Strong boundaries therefore separate Pharmacology from everyday knowledge.

Between Specialisation

Strong insulation exists between the content of the curriculum and pedagogical practices between Pharmacology, Pharmaceutics and Pharmaceutical Care. This strong classification keeping sections or content across majors separate and independent is illustrated using the example of contraceptives and osteoporosis. These examples are not the only common areas but have been selected to illustrate the point. Both sections on contraceptives and osteoporosis are covered within the Pharmacology and Pharmaceutical Care fourth year curriculum. In Pharmacology the

[47] Parent discipline, as described or defined by Bernstein, includes disciplines such as biology, chemistry, physics and mathematics.

section on hormonal contraceptives and osteoporosis are covered under the broad section of drugs and the endocrine system, while the section on contraceptives features under the section of gonadal hormones and inhibitors. Osteoporosis is covered under osteoporosis and the drugs that affect bone mineral homeostasis (PHRM 401, lecture notes, 2012, pg. 52). The section on contraceptives is sequenced prior to osteoporosis in both curricula. In Pharmaceutical Care, contraceptives are covered under contraception, which falls under the broad heading of women's health where abortions and natural family planning also feature. As expected the sections on contraceptives and osteoporosis have a different focus within the modules (for example Pharmacology focusing on mechanisms of action while Pharmaceutical Care emphasising ethical aspects), however, duplication and overlap of content is noted.

Similarities in content are evident in sections such as the introduction, which includes definitions, types of contraceptives (oestrogen, progesterone, both), benefits or side effects. The section on osteoporosis in Pharmacology and Pharmaceutical Care also share several common features in terms of identifying the condition, drugs used and possible side effects. They differ regarding treatment options with Pharmacology discussing viable drug options and Pharmaceutical Care displaying treatment options which include both pharmacological and non-pharmacological options (such as weight bearing exercises). Other similar examples include the section on the thyroid and the morning after pills and issues of abortion, where Pharmaceutical Care takes social and ethical issues into consideration. Within both fourth year modules, reference or links between the two are not established despite the overlap of these sections being covered. Nardil, however, echoes fellow academics' or colleagues' views on the future role of integration amongst the majors in the pharmacy curriculum (as mentioned previously).

Within Specialisation

Topics within Pharmacology generally display strong boundaries between each other, especially when different systems are being covered, for example the respiratory and the endocrine systems. However, weakening of boundaries is evident at times within sub-topics. The section on drugs and the endocrine system contains the sub-topics on the hypothalamic and pituitary hormones and gonadal hormones and inhibitors. While these sections are taught separately, they do not

exist entirely exclusive of each other as the feedback mechanism highlights the relationship between oestrogen and the hypothalamic and pituitary hormones (Figure 5.4 from Chapter 5).

A weakening of boundaries is also evident between the sections on hormones and osteoporosis. Oestrogen and its effects on osteoporosis are covered in different places within the topic on hormonal contraceptives. A weakening of boundaries is also seen regarding the anti-osteoporosis reference to oestrogen, progesterone and later testosterone. The topic on osteoporosis is also sequenced at different times, for example after erectile dysfunction and before the section on the thyroid (covered during a separate lecture).

> *Remember HDL is the beneficial lipid protein so a small decrease in HDL and then also chronic high doses may cause a reversible reduction in bone density, so it has an opposite effect from oestrogen. Remember I pointed it out to you guys that oestrogen has anti- osteoporosis properties so progesterone is the opposite, it can cause a reduction in bone density and that can actually induce osteoporosis.*
>
> (N/L/p2p5L9)

> *Oestrogens, like I pointed out earlier to you guys can prevent osteoporosis so if the patient is in menopause or on hormone replacement therapy, it can prevent osteoporosis.*
>
> (N/L/p16p2L1)

> *Testosterone is responsible for normal male sexual development and secondary sexual characteristics… and like oestrogen it also has anti-osteoporosis properties. It prevents osteoporosis and helps to maintain normal bone density.*
>
> (N/L/p8p2L3)

7.2.2.2 Framing

Selection

Academics are responsible for the selection within the curriculum, guided by the broad outcomes prescribed by the SAPC. The content highlighted in the handbook includes treatment and management of various pathological disorders extending over various body systems (such as respiratory, gastrointestinal or endocrine). A range of diseases such as Obstructive Pulmonary Disease, Osteoporosis, Hypothyroidism and Hyperthyroidism, along with effective drug therapies are also selected with academics focusing on the application of knowledge regarding diseases diagnosis and treatment. These topics are expanded upon in the PHRM 401 student notes and the

content areas and lecture notes are compiled from multiple sources: textbooks, laboratory manuals, journal papers and web-based sources by the academics teaching the module. There is strong framing in the selection of content and material as academic members are responsible for selecting the content, with little student involvement in the process of "what" and "how" it is selected.

Sequencing

Academics are also responsible for how the content is sequenced within their modules, with little student involvement, characterising this as strong sequencing. In addition there is no change within the curriculum regarding the sequencing of content within the module from year to year. Nardil attributes this to academics being "creatures of habit" and "just sticking to something that works" (N/I/p11p1L1). Subsections were sequenced in the following order under the topic of gonadal hormones and inhibitors: oestrogens, progestins, SERMs (mixed oestrogen modulators), oestrogen/progesterone agonists, antagonists, synthesis inhibitors, hormonal contraceptives, androgens and antiandrogens. Although each subsection remains generally insulated from the next, they share similarities in the way that they are sequenced. Each hormone contraceptive is generally discussed in the following pattern: synthesis and metabolism, followed by mechanism of action, then effects, clinical uses and finally toxicity.

The mechanism of action of hormonal contraceptives is explained in terms of the effect it has on hormones which are linked to the pituitary gland and the brain, as well as the menstrual cycle. While the section on hormones does not include the menstrual cycle as a subtopic, it nevertheless refers to previous knowledge about the cycle when necessary in order to build upon these concepts. These cycles and sections were therefore sequenced earlier in the curriculum (year two), pointing once again to the hierarchical knowledge structure within Pharmacology. All female hormones are discussed before male hormones and the case study usually concludes the section. After the respiratory systems are discussed, this is followed by a case study on asthma whereas the section on gonadal hormones and inhibitors are followed by a case study on oral contraception (case study three). The sequencing of case studies after the major sections covered perhaps serves two functions, the background or introductory content is provided to assist with the case and the case study towards the end serves as a summary and an evaluation of what was

learnt. All case studies are covered prior to the class test and the lecture notes specifically mentions that a case study will be included in the test.

Pacing

Pacing in Pharmacology is strongly framed with the academic mainly engaging in a didactic pedagogical approach, except for the case study at the end of the section. Although questions are posed to students at the end of each section, very little student interaction takes place and students do not pose any questions or request any clarification. The number of Power-Point slides and content covered within each section also indicates strong pacing, where the academic is in control. Pacing also appeared strong because the lecture notes were very comprehensive and students were seen to be using these to follow during the lecture while the summary of the sections were demonstrated on the academic Power-Point slides. On the issue of the role students' play in the pacing of the lesson, Nardil indicates that it is minimal, highlighting what usually happens within time constraints:

> *I would say minimal, minimal control over that, so typically what would happen we would discuss something in class and hmm. if there is too little time in the class to go back and discuss previous concepts that students do not understand, we just encourage them to come and see the lecturers individually*
>
> (N/I/p12/p3/L1)

Evaluation

Strong evaluative criteria and detailed information regarding tests, assignments are provided. The breakdown of the type of assessment and its weighting is provided at the beginning of the module, along with the College Handbook. Details as to how students will be tested also features with particular mention of a case study appearing in the test along with Pharmacological definitions. The assessment criteria for the module and breakdown for the ward-round component were covered in Chapter 5, the assessment criteria for the module is outlined in Table 7.2.

Table 7.2: Assessment criteria for fourth year Pharmacology

Type of Assessment	Weighting	Description
Formative assessment	60 %	Calculated by averaging 2 tests 2 class tests (one per lecturer), "Class test (50 marks): The test will assess your knowledge on basic terminology (e.g. definitions) and pharmacological applications (case studies). An aegrotat test is also offered".
Ward-round and presentation	40%	15x3hrs Ward-round visits + 15 x 3 hrs ward-round presentations
Formative		1x2 hour paper
Final Mark	100%	Final Mark = 60% Examination Mark + 40% of CAM. A 40% subminimum rule will apply

Relationship between academic and students

The Pharmacology module is driven largely by a didactic teaching approach, with structured Power-Point slides, reflecting a summary of the student guide notes. There was little interaction from students in the form of engagement, comments or questions. Strong control is exerted by the academic for most of the lecture, with a slight weakening noted when students are working on the case study.

> *I try to make the interaction between me, the lecturer and the students to make it more interactive, so instead of me talking all the time I try to encourage the students to participate as well and the way that I can do that is that we recently changed one of the modules from the traditional pedagogical teaching to be case-based. So I basically give the students the opportunity to look.. to look at case studies, so they need to research it by themselves. I may give them a short introductory lecture about that but they need to do more of the work….if I can call it like that. And then afterwards before I can ….get ….them…they need to talk to me so I find out, you know so it's definitely more interactive and more participatory.*
>
> (N/I/p3p5L1)

Nardil attributes the recent move to case-based learning for a change in lecturer-student interaction, believing that this approach is more interactive and participatory as well as shifts some of the responsibilities for learning on to the students who are left to research the case on their own. The relationship between academics and students in Pharmacology varies depending on the educational context, in lectures there is a strong framing and control while ward-rounds are characterised by an absence of academics. Strong academic presence and control is, however, exerted during presentations and feedback sessions, where a distancing is noted both physically (arrangement of three assessors at the back of the lecture venue with the student alone in the

front) and pertaining to knowledge (academics are in the position of knowledge as they pose questions, guide the interaction and provide feedback).

7.2.3 Semantics

7.2.3.1 Semantic gravity and semantic density

Semantic gravity and density for Pharmacology four will be discussed together, with one example serving to illustrate the nature of both gravity and density generally found within the module. Pharmacology is characterised by weak semantic gravity, where many concepts taught cannot be related to every experiences of students but is rather technical and discipline specific. Most of the discipline knowledge is not grounded in the concrete and the hierarchical knowledge structure of Pharmacology indicates the importance of understanding the foundation and concepts which further knowledge is built upon as indicated below:

> *Important is mechanisms of action on page 44, there's several properties that you need to know: the first one is that it prevents ovulation. It prevents ovulation by reducing LH and FSH levels via negative feedback inhibition. If you go back to the schematic diagram, on page 39, I'm going to go back there as well, in blue here it says all contraceptives, so the red here means inhibit. High concentrations of oestrogen and progesterone will via negative feedback inhibition prevent the release of GnRH hormone hypothalamus and then LSH and FH by pituitary. And then you guys will also recall that FSH and LH are important for ovulation to take place so high concentrations of oestrogen and progesterone will prevent the release of FSH and LH, therefore ovulation will not take place. So that's the mechanism I'm trying to explain to you.*
>
> (N/I/p5p2L1)

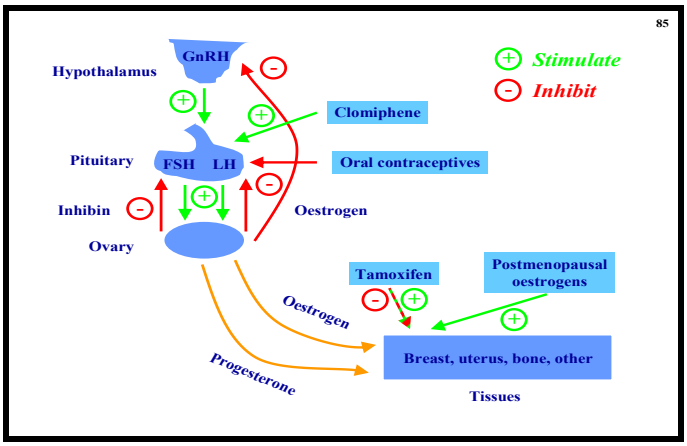


Figure 7.1: Feedback mechanism (previously seen in Chapter 5)

Mechanism of action and feedback mechanism, above (Figure 7.1), also provide examples of the strong semantic density characteristic of Pharmacology. These concepts are dense, containing many other concepts within them. An understanding of the hormones and how they function within the mechanism of action is required for understanding the relationship between hormones in the body and the brain and the nature of the opposing relationship in the negative feedback mechanism. This knowledge is required for designing drugs to inhibit/suppress normal functioning. The use of schematic diagrams and reference to these above (PHRM 401 lecture notes, 2012, p. 39) as well as the use of arrows with different colours to depict different functions in order to simplify these relationships and processes further support the description of strong semantic density.

Strong semantic density is also illustrated on the slide below (Figure 7.2), where terms such as "antagonist", "endometrial receptors" and "venous thrombosis" require further unpacking. The use of arrows, vary from their use in the diagram above showing relationships and feedback to indicate increases and decreases with regard to the effects drugs may have in terms of risk as indicated below:

Tamoxifen (Nolvadex®)

- Acts as an antagonist in the treatment of hormone-responsive breast cancers
- Prevents activation of tumour cells by endogenous oestrogen
- Prophylactic use ↓ the incidence of breast cancer in women who are at very high risk
- Acts as an agonist at endometrial receptors, causing hyperplasia and ↑ the risk of endometrial cancer
- May cause hot flushes and ↑ the risk of venous thrombosis

Figure 7.2: Power-Point slide of notes from Pharmacology 401 lecture

7.2.3.2 Semantic waves

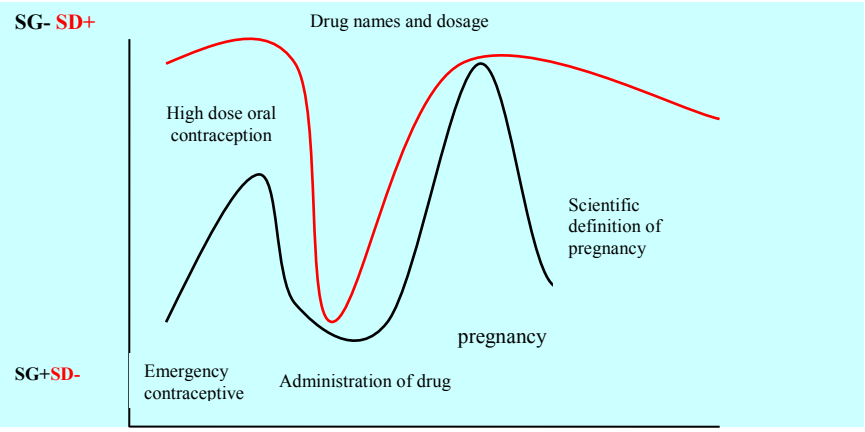


Figure 7.3: Semantic waves in Pharmacology

In Figure 7.3, after explaining the different types of contraceptives (oestrogen, or progesterone based, natural or synthetic) and how they function, Nardil moves on to the emergency contraceptive. He applies this knowledge of pills to the "working world" using a scenario involving a practicing pharmacist to concretise the concepts learnt. Nardil strengthens semantic gravity by using everyday language of practical applications of pills and the purpose they serve. The use of the words "the morning after pill" as opposed to its scientific drug name brings the content closer to everyday where the concept is easily understood. The administration of these drugs in terms of when they should be taken is also closer to everyday as it does not involve discussion of the mechanism of action at this point but rather time in terms of the when the doses should be taken.

The concept of the emergency contraceptive however demonstrates strong semantic density as within the concept, knowledge on the ingredient compounds, the mechanism of action, the side effects and so on are contained. The number of pills prescribed and when they should be taken demonstrates weak semantic density, where Nardil does not have to unpack this further. Nardil strengthens semantic gravity, making knowledge accessible to everyday by using percentages to indicate the effectiveness of the drug. Nardil weakens semantic gravity as he discusses the scientific drug names and dosage for both drugs. He also weakens semantic gravity towards the end as he discusses the importance of the dose and its administration which is linked to its

mechanism of action (although not explicitly stated in this case) and its effectiveness. He strengthens semantic gravity when linking it to pregnancies but thereafter weakens it once again in defining pregnancy in biological and scientific terms. Discussion on pregnancies displays greater semantic density as it involves complex biological processes and hormonal pathways and this is unpacked to some extent as Nardil begins to define pregnancy in biological or scientific terms and does not leave it at the level of less defined, everyday understanding.

> *As a pharmacist, patients will come to you and request the emergency contraceptive. It's basically high-dose oral contraceptive, they call it the "morning-after pill". Now there are some requirements for this contraceptive to be active. The first dose should be taken within 72 hours, followed 12 hours later by a second dose. It will only reduces risk of pregnancy by 75%, so its not 100% effective. There are two examples you can give two one-pill doses of 0.75 mg levonorgestrel/pill separated by 12 hours or two two-pill doses of 0.25 mg levonorgestrel and 0.05 mg ethinyl oestradiol per pill separated by 12 hours. So those are the two most important options. And then the last point is very important, it will not interrupt an established pregnancy defined as beginning of implantation so that's where the fertilised egg has already implanted on the uterine wall. If that has happened, it will not prevent that. It will only prevent the implantation it will not stop an already implanted fertilised egg cell. So take note of that. That's why it's important to take the first pill within 72 hours, followed by another dose 12 hours later.*
>
> (N/L/p6p4L8)

Knowledge and application of knowledge to the world of work also highlights the responsibility of pharmacist in terms of clinical counselling and advising patients where pharmacists' roles do not stop with providing the patient with the pill. Their role also extends to communication encompassing when taking the pill would not result in the desired effect (if the conditions are not met). These roles and responsibilities have been previously highlighted under the broad exit level outcomes.

7.2.4 Pharmacology ward-rounds

The background information related to the organisation, process and procedures surrounding ward-rounds were covered in Chapter 5, the focus here will therefore be on describing the underlying features using classification and framing. Knowledge is both strongly and weakly classified, the theoretical and disciplinary knowledge learnt is strongly classified and framed but

demonstrates weaker strengths when applied to practical and "everyday" medical conditions, symptoms and treatment at a level understood by most people.

Table 7.3: Classification and framing of hospital ward-rounds

Classification and Framing and Strength		Description of the relationship	Examples
Classification			
Everyday and specialised knowledge	C+-	Strong boundary between pharmacy knowledge and everyday knowledge weakens at times when clinical knowledge is applied to patient care	In communication and education of patients regarding their condition and available treatment options.
Between specialisation	C--	Weak boundary between Pharmacology and other majors.	Ward-rounds are dependent on a culmination of knowledge across pharmacy majors and modules and academic years.
Within specialisation	C--	Subsections are not kept separate but integrated	In understanding a particular patient condition, vital signs, blood chemistry, medical condition, drugs prescribed, side effects of drugs are all linked- holistic in terms of patient treatment.
Framing			
Selection	F+-	Strong academic control and weak academic control at times	Strong academic control in terms of selection of hospitals, students per groups, information required from patient files and over the presentation process. (Point 9 of housekeeping rules and format of SOAPE notes provide prescribe structured headings). Strong student control over the ward-rounds visits, students select their own patients. They select some of the information from the patient files or could choose to chat to patients directly. At all hospitals, except for the King George psych ward, students have access to patient files. They also have freedom over the selection of additional information regarding their case from their independent research
Sequencing	F++	Strong academic control	Strong academic control over the sequencing of the hospital visits and data to be collected. Academics select which students will present, the order per session as well as the clinical cases for presentation. Power-Point presentations all follow the format 1-5 of SOAPE notes and students do not deviate from this. Knowledge on the case is presented starting with subjective data and ending with discharge summary or patient education
Pacing	F+-	Strong academic control and weak at times.	Academics in control of the pacing of hospital visits, sets start and finishing times, pacing for

			the presentations stipulated as 15 minutes. Weak control evident where students have freedom over the time they spend with the patient files, although to some extent they are governed by the pick up times as they return to campus for presentations the same afternoon.
Evaluation	F++	Strong academic control	Academic stipulate the assessment criteria in the handbook, the module outline, and provide details of the marks allocated per category. The assessment is made explicit and students are aware of the criteria at the beginning of the module. Students do not have a choice over the type of assessment, weightings or selection of case study for presentation.
Relationship between academic and students	F++	Strong boundaries despite absence of academics on the ward-rounds.	Strong control exerted by academics over the entire process from the organisation of students in to groups and rosters, to the format to be followed for the SOAPE notes. Clear hierarchy between academics and students during presentation and feedback sessions. Students stand alone in the front and answer questions posed from three experts. No student engagement in asking questions to the speakers or the panel experts, no discussion or comments either. It appears unidirectional with strong control from academics.
Semantics			
Semantic gravity	SG+ SG-	Strong weak	Conducted in an "everyday working environment" of medical professionals and people suffering from various medical conditions, the hospital setting by its very nature is concrete and linked to context. Weak at times when the drugs, their mechanism of action and interaction with other drugs linked to specialised knowledge.
Semantic density	SD+	Strong semantic density is evident.	Greater condensation of meaning, for example in specific drug names, dose forms and administration abbreviated. Many symbols and abbreviated forms used for example in terms of objective data.

7.3 Pharmaceutics: Biopharmaceutics

7.3.1 Background and context

> ***What is Biopharmaceutics?***
> *Biopharmaceutics – defined as the study of how the physiochemical properties of drugs, dosage forms and route of administration affect the rate and extent of the drug's absorption.*
>
> (PHRM 421 lecture notes, 2012, p. 5)

Pharmaceutics is offered from year two to four, with Biopharmacutics as the fourth year module within the B. Pharm curriculum. The module is dependent on the prerequisites of Physical Pharmacy and Pharmaceutical Technology offered in second year semester one and two respectively. The Biopharmaceutics module is aimed at providing an understanding of the principles involved in drug development and research, as well as the influence of formulation on the availability of drugs (College of Health Sciences Handbook, 2012, p. 271). Content is based on relevant Pharmacokinetics (drug absorption and disposition, dissolution, products of biotechnology, amongst others). The module is comprised of lectures and tutorials. There are no practical components, no clinical practices or fieldwork components. Tutorials are not conducted separately but rather integrated with lectures and Zodone explains more about how these work and her pedagogical approach in tutorials:

> *Then I changed my style a bit from collecting papers all the time for marking and do a bit of actual learning in the class and to get their answers like feedback almost immediately. So I have that kind of tutorial session. Whereas in the lectures you teach them, you direct them towards your learning content for the day or for the lecture time. But in my tutorials I have a set of questions that I have answers for and that I want them to give me those answers and then mark them okay that's correct, that's not, that's right.*
>
> (Z/I/p36p1L10)

Zodone integrates her tutorials with her lectures and uses the tutorials "to test the knowledge of the students from their exposure to the lectures" (Z/I/p36p3L2).

Knowledge types and structures

Zodone shares a few lectures with guest speakers from industry (practicing pharmacists in industrial settings) and refers to the speakers as "experts" bringing in specialised knowledge from the working world. Fourie (2012) also supports information from external sources, believing that theoretical knowledge is valued more when they see its various applications. In describing the benefits and value of ties and links with industry Zodone speaks about her role in the learning process as well, exposing issues of academic control and power and the sharing of knowledge.

> *But more importantly, I'm going to take this opportunity to link up with this person to teach me what is going on in the industry as well….because some of them will be taking interns into the industry*
>
> (Z/L/p1p1L20)

Zodone's views and perceptions on knowledge, highlights issues of control or ownership of the module and the fact that teaching and learning does not take place in a unidirectional manner. Academics are also viewed as active participants and learners in this process. Zodone also talks about the profession and how she exposes students to the outside world within her teaching showing them how the topic fits in to the module or how it fits in with the work they will do.

Knowledge within Biopharmaceutics is built upon a biology, chemistry and mathematics base, indicating a hierarchical structure. Zodone's comments below supports this, along with her pedagogical style of using questions:

> *They come in with a lot of information from the second year, from the third year. In fact I referred them back to their matric time, mathematics where you talk about calculations…But where I expect them to apply themselves, I do a bit of introductions and then I start throwing questions around my lecture…*
>
> (Z/I/35/p3L3)

In addition, Zodone describes the general trend within Biopharmaceutics of building up on knowledge from second and third year and even matric[48]. She covers the importance of acquiring a science background in first year and comments on how disciplines, like physics and chemistry become directed towards pharmacy. She also states that students would not be able to cope with

[48] Matric refers to the last academic year within the secondary school education system, consisting of standard national examinations across all schools.

fourth year without the calculations and background learnt in second year, which further lends support to the hierarchical structure of Biopharmaceutics knowledge. Zodone does, however, acknowledge that not all knowledge in the fourth year Biopharmaceutics curriculum are built upon previous knowledge as new content is taught at times.

7.3.2 Classification and Framing

7.3.2.1 Classification

The boundary between "everyday" knowledge and Pharmaceutics knowledge

There is a strong boundary between everyday and specialised knowledge within the fourth year Pharmaceutics module. The content covered is indicative of this as it comprises of topics requiring the use of specialised knowledge, equations, formulae and calculations. Zodone describes Biopharmaceutics as being very specific as it not only involves the actual making of the medicine but an understanding of how the medicine will be used when it goes out of the laboratory or out of the university (Z/L/37/p7L1). She describes the science of designing medicine as resting only with pharmacists and the profession and the actual design and understanding of how it works within the body. This specialised knowledge operates in a space removed from everyday commonsense and the concrete as it takes into account content such as absorption pathways, surface areas of absorption sites and structures. Biopharmaceutics deals with the actual design formulation of medicine, whether it is a capsule or a tablet, its absorption (different sites of absorption) within the body and factors that affect the rate of absorption and dissolution (process by which a solid substance dissolves). Specialised equations and calculations also feature often within the curriculum, for example the rate of drug dissolution can be described by the Noyes-Whitney equation (PHRM 421 lecture notes, 2012, p. 107):

$$dC/Dt = DA\,(Cs-C)/h, \text{ where}$$

dC/Dt = rate of drug dissolution

D = diffusion rate constant

A = surface area of the particle

Cs = saturation solubility of drug in diffusion layer

C = concentration of drug in the GI fluids

h = thickness of diffusion layer

Her use of scenarios during her teaching and focus on the profession and how it is applicable to what is being taught in the module speaks to the way in which she relates specialised disciplinary knowledge to the working world students will experience. The bringing in of experts in the field serving to widen students' learning experience also speaks, in a way, to this bridging between the specialised and the "everyday work" as an industrial pharmacist.

Between specialisation

Pharmaceutics demonstrates strong insulation between the majors. Zodone speaks (below) about how the Pharmaceutics is related to the various majors: Pharmaceutical Chemistry, Pharmacy Care and Pharmacology, and as well as to parent disciplines such as chemistry and biology. This relationship amongst the majors largely remains in the theoretical domain as content is not integrated within the curriculum or the teaching of these modules. This trend of isolation has been mentioned previously in other modules.

> *Biopharmaceutics have a bit of which you call Pharmaceutical Chemistry but without you understanding the physical and chemical properties of a particular drug, you may not know how it is formulated and how it's going to react when it gets there so it's that chemistry. That's Biopharmaceutics, so that's biology, pharmaceutics effect of the dosage forms on the body itself and to the patient. So it's very relevant, I mean it's very related to pharmaceutical care. It's also related to pharmacology because we need to understand actually in terms of the drug development, we need to understand all the physiological studies and the physiological aspects of the drug. How will it actually work in the body or what are the side effects or the adverse effects or toxic effects that it can give and how do we avoid that so that's related to pharmacology in terms of the action of the drug, what is it doing, I mean what is it doing, what is the drug doing in the body, what are the indications of the drug, that is also pharmacology. In terms of pharmacy practice there is a lot of understanding in biopharmaceutics as to how that product should be used. How are you going to be using it? And therefore selling and education of the patients who will be using that product.*
>
> (Z/I/p39p5L2)

Zodone mentions that the various modules currently operate in isolation and while academics do not always have access to everybody's notes, the College Handbook sheds light on the content covered in the other majors or modules. Similar to previous academics, Zodone, supports integration, theme-based learning and also offers a different perspective with including team-based teaching in her vision towards integration extending the concept of theme teaching, not only across different majors or fields of specialisation but also across years of study.

> *So for me to do it with other experts in the area for example if I have a lecturer from Pharmaceutical Chemistry, a lecturer from Pharmacology and a lecturer from Pharmaceutical Care with me, we design a theme together and we will be able to teach it from second year through to fourth year. I've seen it happen in other courses and I've seen the report that I read online in terms of PBL teaching, I think it's a good idea.*
>
> (Z/I/p41p3L8)

Zodone uses her exposure to research within the field of teaching and learning, to support her view that integration amongst pharmacy majors would be beneficial, she also mentions that integration would also be in the best interests of students.

Within specialisation

The topics covered within fourth year Biopharmaceutics are covered in the following order: absorption, disposition, relevant pharmacokinetics, dissolution, bioavailability, bioequivalence, medicines registration, Pharmaceutical statistics, factorial designs and products of biotechnology (PHRM 421 lecture notes, 2012, p. 2). Zodone describes the sections within her modules as largely integrated and uses her outline to illustrate that the sections within her module are also linked through her teaching as topics flow down. She uses the section of Pharmaceutical statistics to show its weak boundaries with other sections and how it deals with the design of experiments in every aspect of Biopharmaceutics. Pharmaceutics statistics features in other sections such as bioavailability and pharmacokinetics, within the module. The last topic on products of biotechnology, however, remains relatively isolated from other topics, even though it looks at the formulation of medicines. Biotechnology focuses on medicines from biological origins (living organisms such as bacteria) which differ from chemical medicines in both their physical and chemical properties. Overall Zodone describes the topics within Biopharmaceutics as linked and integrated:

> *Overall I think they are all – yes, they are all integrated overall. Because at the end of the day it's still pharmaceutics, it's still application of pharmaceutics to the patients' management. But more importantly it's still the designing of basic forms, it's still the registration of those basic forms and the actual usage you know of the basic forms.*
>
> (Z/I/p42p7L1)

7.3.2.2 Framing

Selection

Strong selection is evident within Biopharmaceutics and Zodone makes mention of how the Act, governing body (SAPC) and the profession (type of pharmacist required by the country) also contributes, to some extent, to what is selected into the curriculum and why students do not have any control over the selection of the content.

> *At the moment I'll be honest with you I control the content because pharmacy profession is one, health profession, two, it's not – it's something that you're being guided by an Act. So what we teach them are related to the standard, the unit standard that the governing body or the registering body is asking us to teach them. That is what type of pharmacists we are looking for in the country. So the body that oversees the profession of pharmacy guides all us who wants to teach the students and we have to teach accordingly. So it's going to be very difficult for the students to control the content.*
>
> (Z/I/p43p3L1)

Zodone also mentions that teaching is linked to the unit standards (now known as exit level outcomes) and this guides the content and the notes which are aimed at addressing the unit standards. The student notes compiled by Zodone comprised of brief Power-Point slides and did not cover detailed notes expanding on the concepts discussed. These tie in with her philosophy of not providing students with everything and creating independent researchers where students are capable of sourcing information.

While selection is strongly framed within Biopharmaceutics, Zodone prepares students towards independent research in her assignments. Here students are allowed to select the drug for their assignment in which they learn how different drug formulations work and how one product differs from another. For example students investigate the differences between tablet forms, capsules, gels and the issue of patient choice regarding these options. Students have the option of selecting their drug for the research for further investigation and although this forms a very small part of the curriculum, it indicates a slight weakening of academic control over selection. Zodone has strong control over selection of not only written resources but the introduction of human resources and experts within the curriculum as she incorporates several guest speakers within the semester.

Sequencing

Topics within the module are sequenced as described in section 7.5.3, with the academic exerting strong control over the order of the sections in the curriculum. Zodone described them as flowing from one topic to another and this is possibly why they are arranged in this manner. Sequencing within the assessment lecture in dealing with the revision of test questions, was from most difficult to least difficult based on students' responses and performance. Zodone believed in spending more time on areas where students battled rather than following the order or sequence of the test itself, often skipping easy sections. Sequencing of answers within a question during the revision session also started off with the positive or correct responses, affirming students before moving to misconceptions, misunderstandings and wrong answers. She also established why responses were wrong and worked through questions in the pattern of addressing incorrect construction, deconstruction and then reconstruction.

Pacing

Zodone controls the pacing of the lectures and usually uses times (number of hours allocated per section depending on the importance of the section within the curriculum) to guide her lectures. Strong pacing was noted during the test revision lecture session where Zodone moved through the test solutions, completing each question in sufficient detail and involving students in the process of deriving the correct answers. While strong control over pacing was noted, the pace at which the lecture unfolded varied as academics constantly asking students questions and waiting for students to respond, often posing the question several times before working through the answers with students. She also used various teaching approaches and resources to go through the test solutions, writing down the equations and graphs on the overhead projector (OHP) and taking students through the solutions in a step by step fashion using calculations at times.

Evaluation

Strong academic control over assessment and details are explicit and provided at the beginning of the module, as well as in the College Handbook.

Table 7.4: Assessment criteria for fourth year Biopharmaceutics

Type of Assessment	Weighting	Description
Formative assessment	70 %	Calculated by averaging 2 tests + 30 % of individual Assignment marks. 10x3hrs tutorial sessions
Summative		1x2.5 hour paper
Final Mark	100%	Final Mark = 60% Examination Mark + 40% of CAM. A 40% subminimum rule will apply

Assessment within Biopharmaceutics is indicated through examples from Zodone's test revision lecture, her approach to assessing tutorials and how learning moves beyond assessment as students become professionals. Zodone's lecture on the test revision revealed grading and assessment bands and the consequences or implications of these different bands or tiers. The top tier were rewarded and Zodone made requests for students achieving more than 90% to see her, while the bottom tier (students' performaning in the 55% and less range) were directed towards academic counselling and monitoring to account for poor performance. The organisation of academic performance into bands reveals the hierarchical nature of performance and the consequences of being located within a particular band.

Zodone talks about how she changed her assessment during the tutorials as a result of working under the constraints of limited resources and teaching large student numbers. This change also results in a movement from delayed feedback with taking away scripts for marking to an almost instant evaluation in class which affirms correct responses and seeks to dispel possible misconceptions.

> *Then I changed my style a bit from collecting papers all the time for marking and do a bit of actual learning in the class and to get their answers like feedback almost immediately. So I have that kind of tutorial session. Whereas in the lectures you teach them, you direct them towards your learning content for the day or for the lecture time. But in my tutorials I have a set of questions that I*

have answers for and that I want them to give me those answers and then mark them okay that's correct, that's not, that's right.

(Z/I/p36p1L10)

At a later stage she speaks more about questions and answers in the tutorial sessions and how these vary depending on the nature of the question and the importance of listening to the student voice. Questions that are open ended as opposed to calculations lead to much debate and classroom discussions.

In the classroom during tutorials, I listen to students because often times you think you're giving them all the answers but sometimes they have other angles to the answers and that doesn't mean that that's wrong. ..So I listen to them and that comes from asking them a lot of questions too. And they give you the answers to that question and it's not the answer that you have. And then you go say that again! So what you do you ask another student to answer to what you're asking. Because at the end of the day if it's calculations there is no other answer, there is no other answer when it goes to calculations. But when it comes to how would I treat these patients? How would I help these patients? Or how would I make this medicine work? You may have other ways of modifying that medicine to make it work, it doesn't necessarily have to be my way.

(Z/I/p47p7L4)

Zodone, having worked in hospitals and with interns in the past sheds light about how assessment evolves along with the relationship between academic and students, where students are viewed more as "colleagues" and where students are no longer afraid to clarify scripts and medicines because:

If they are not sure, they ask you because the patient is taking the medicine away from the counter so you want to be sure whatever you are giving its 100%. Its not about your DP or your test mark now, it's about patient lives

(Z/I/p51p3L28)

Zodone makes a valuable point about the nature of assessment and her comments which points to how professional qualifications are largely governed by the academic measurements of marks and DP's during most of the academic years but as students develop into professional pharmacists, the practical implications of assessment, of understanding becomes clearer as it is related to patient lives where a prescription can mean the difference between life and death. It also speaks to the nature of their professional work and the obligations and responsibilities placed on practicing pharmacist where their actions have direct consequences.

Relationship between lecturers and students

> *I don't just go in there and do the talking. I never enjoyed that when I was a student and from reading around teaching or how you get people excited, but more importantly how generations change from one to another, I've actually picked up that you have to let people talk. I can't just go into the classroom for two hours and talk for two hours and then leave. No, no, I am – well, I thought that, I used to because that's the way I was taught, but I dropped that along the line. So I go into the classroom, I do a bit of introduction and then I start throwing questions around, I do that.*
>
> (Z/I/p35p1L2)

Zodone talks about interaction and the student voice, it also speaks about how her experience have shaped her and how her reading on teaching has also assisted her to change her pedagogical approach taking into consideration students' feelings and the changing profile and generation of students. Zodone engages students in participating in the lecture, so she is not seen as being the only person possessing knowledge. Lecture observations revealed Zodone's pedagogical approach or frequent questioning style which revealed the time between questions posed and responses. When questions were posed and students did not reply when prompted, resulted in Zodone repeating the question. She sometimes posed the question more than twice before she offered a response, so many attempts at eliciting responses from students were noted rather than the academic just providing the class with the correct answer. This speaks to the relationship between Zodone and students where she encourages them to find the answers rather than providing them. Zodone, in her interaction with students, also reveals the value she places on peer-learning and respect in the teaching and learning environment.

7.3.3 Semantics

7.3.3.1 Semantic gravity and semantic density

Biopharmaceutics is generally depicted by weak semantic gravity with specialised knowledge built on a chemistry, biology and mathematics base. Biopharmaceutics is also characterised by strong semantic density that is usually unpacked using relevant laws such as Fick's first law of diffusion to understand assessment of drug permeability (PHRM 421 lecture notes, 2012, p. 48). Mathematical formulae and calculations, diagrams and illustrations also feature strongly within the curriculum in explaining semantically dense content and numerous illustrations feature in a section towards the end of the lecture notes (PHRM 421 lecture notes, 2012, pgs. 156-164).

Calculations and rates of absorption, and dissolution are dense terms, with weak semantic gravity which are sometimes unpacked using equations and are at times applied to everyday or concrete examples. For example, Zodone unpacks the concept of absolute bioavailability (F) which is defined as the measurement of the rate and extent of therapeutic active drug which reaches the systemic circulation (PHRM 421 lecture notes, 2012, p. 118). She weakens semantic gravity by linking this concept and its equation to the drug in the milk and how the dose in the milk gets to the baby during breast feeding. In the process of unpacking the equation step by step and working through calculations with students, she also unpacks semantic density.

Zodone strengthens semantic gravity and weakens semantic density when she discusses urinary drug excretion relating the complex equation and symbols to everyday life of how a drug consumed is eliminated from the body to prevent accumulation and toxic effects.

> *We have to explain how we ascertain that the drug urine is actually indicative of the drug out. You swallow medicine it gets absorbed now it's in your blood running around to get to where it's going to be working that's a matter of fact here. But that drug has to get cleared of the body otherwise if you take another does you can get accumulation and eventually have toxic effect. So how do we measure the clearance of the drug using the urine and that gets them interested because they use the symbols of getting the unique contents of the drug at the same time measuring the ...[indistinct] content of the drug and there's a figure here that I take them to. I also find students enjoy that in that the figure here that I take them to it actually shows you here how you can actually ascertain that based on the urine output and the urine content of the drug, the drug has been cleared. Your body, not your drug, your body has been cleared of the drugs.*
>
> (Z/I/p61p7L2)

7.3.3.2 Semantic waves

Zodone is unpacking a common misunderstanding in a test question where most students did not obtain the correct answer. She starts by presenting the correct answers, followed by the incorrect answers. She differentiates between PKA and pH, which are extremely dense terms but does not unpack them completely. Thereafter she defines PKA, which illustrates a move towards stronger semantic density but remains extremely technical and specialised, therefore still demonstrating weak semantic grammar (Figure 7.1).

> *If you have written the temperature, the viscosity as well as the pH of the GI fluids that would still have been correct. If you have given me the agitation rates*

that would still have been correct. If you have written PKA of the drug, why would that not be correct? If you have written PKA of the drug, why would that not be correct? ...

It's because that's not a physiological factor, we all make mistakes there, it's a concern for the majority ...that's why I'm addressing it. (draws on the white board) Once you think of pH of GI fluids, the next thing that comes to mind is PKA of drugs, isn't it? Am I correct? But we know that the PKA of drug is not the physiological factor but we need to know what the PKA of the drug is in order to assess the pH of the GI in which the drug is going to be dissolved in. So there's that quick mix up. In the exam you write PKA and pH as the same thing. I actually have someone write PKA of the GI tract, PKA of the GI tract! That is not possible PKA is the property that is? It is a property that is only concerned with the drug itself although the state of the environment in which the drug is delivered or administered into, in this case the pH of the medium will affect the PKA of the drug. Ok! it's a risky thing to mix up.

(Z/L/p4p2L6)

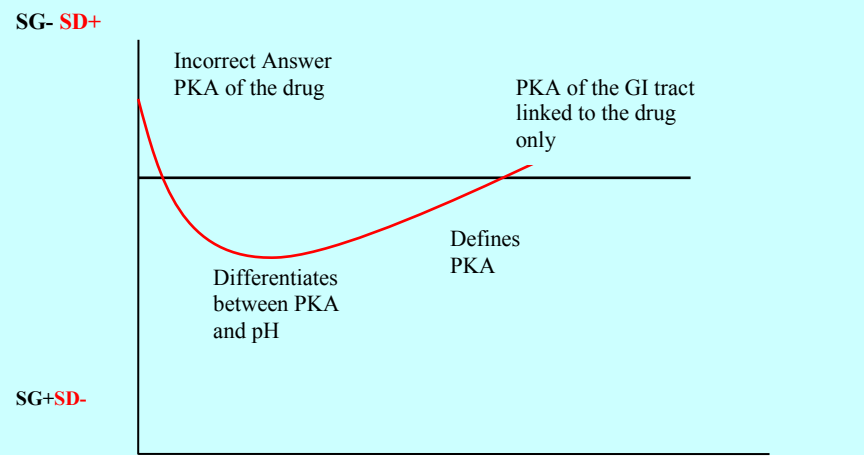


Figure 7.4: Semantic wave in Biopharmaceutics

The semantic gravity remains weak throughout as the knowledge remains specialised and removed from concrete everyday applications (as indicated by the horizontal line in Figure 7.4) whereas semantic density fluctuates. The abbreviations are also not simplified as these technical, scientific terms and concepts occur throughout the years and students are aware of what they mean. PKA is unpacked further to explain how it is only linked to the drug itself and not the GI tract whereas pH of the medium such as the GI tract will affect the PKA of the drug, indicating a strengthening of semantic density.

7.4 Pharmaceutical Care

7.4.1 Background and context

The Pharmaceutical Care module is offered in third and fourth year but is based on the prerequisites of an introduction to Pathology (which requires biology and anatomy), Anatomy and Homeostasis and the module on Integration and communication offered at a second year level. Pharmaceutical Care 1 and 2 are offered in third year in semester one and two respectively while Pharmaceutical Care 3 and 4 are offered in fourth year semester one and two respectively. Pharmaceutical Care modules 1, 2 and 3 all aim to prepare students to "provide responsible drug therapy in order to obtain optimal therapeutic outcomes" (College of Health Sciences Handbook, pgs. 270-271). The aim also mentions that the module focuses on selected body systems, taking both drug and non-drug options in to consideration in providing Pharmacotherapeutic management for patients. These body systems differ amongst the modules for example in Pharmaceutical Care one, the content focuses on the CNS, Opthalmology, ENT[49], oral health, while Pharmaceutical Care two on lower respiratory tract infections, cardiovascular systems, organ systems and blood. The content covered in Pharmaceutical Care three during the module is outlined below by Midra during the revision lecture.

> *Ok! so in our module we covered dermatology, so we covered a range of skin conditions there. We've done wound care, musculo-skeletal systems, reproductive health where we've done all different kinds of contraception, contagious diseases as well as childhood diseases and child health.*
>
> (M/L/p1p2L1)

It is should be noted that the nature of the revision lecture sets it apart from a "typical lecture", where here the content covered throughout the entire module is discussed. The reporting on how classification and framing is described may therefore be affected by this for example pacing may be faster during this session as opposed to what may take place in a lecture session during the semester.

Knowledge types and structures

Pharmaceutical Care demonstrates a combination of hierarchical and horizontal knowledge structures. The concepts and content in Pharmaceutical Care is built up through the years and

[49] ENT = ears, nose and throat

knowledge in year four is dependent on previous years indicating its hierarchical nature. Pharmaceutical Care three and four rely on a biological base of anatomy and pathology offered in second year. While different medical conditions and treatments are learnt separately, understanding diseases and clinical conditions in various body systems is dependent on previous knowledge of anatomy, physiology and pathology. The need for this foundation is reinforced by the prerequisites and Midra sheds some light on why this is the case:

> *We have prerequisites and co-requisites because everything is built on the previous year. You cannot do lets say Pharmaceutical Care, you can't do Pharmaceutical Care 3 without having done your physiology and anatomy because all disease conditions you want to have the basic knowledge of how the body works, the homeostasis and that kind of thing. You need to learn all your body systems before you can come up to the level of learning about disease conditions and how they affect the body system itself. And then anatomy is important because you need to know where everything is and how it works in order to now learn about a disease condition and how it affects the interrelationship there.*
>
> (M/I/p9p2L3)

In Pharmaceutical Care horizontal knowledge structures are evident within courses such as law and ethics or communication, where knowledge within topics developed along side each other. Within the Pharmaceutical Care four module, a horizontal structure is observed within the module curriculum where the module starts with the section on dermatology and ends with child health. These topics or sections can be sequenced in any order as understanding the section on child health is not dependent on understanding dermatology. Similarly within each section, subsections are also horizontally arranged where various conditions can exist independent of each other. For example within dermatology, you do not need to understanding dandruff before you can move on to athlete's foot.

Pharmaceutical Care exposes the aspect of patient knowledge and expert knowledge in various clinical fields. While in academic situations knowledge is generally viewed with academics and students in mind, the professional nature of pharmacists and their work illuminates the student-patient relationship in preparation of what will become the pharmacist-patient relationship after students have successfully completed their training. We are exposed to the aspect of patients'

knowledge in the role of assisting with diagnosis as Midra draws our attention to this in the section on dermatology:

> *Most often patients already have an idea of why they have this rash. What they ate, what they touched, who had a rash and now they've got it. You can get a good understanding of the rash by asking the patient what they think. Ok!*
> *(M/L/p1p3L15)*

The constant use or reference to personal pronouns "You" features prominently throughout the lesson and also points to the role and responsibility placed on pharmacists in the diagnosis and treatment of patients.

7.4.2 Classification and Framing

7.4.2.1 Classification

The boundary between "everyday" knowledge and Pharmaceutical Care knowledge

Everyday knowledge within Pharmaceutical Care encompasses both everyday understanding by a layperson (for example treatment options involving diet and exercise), as well as reference to the everyday working environment of pharmacists as illustrated by the numerous pharmacy scenarios presented during the lecture. Pharmaceutical Care demonstrates a blend of strong boundaries between everyday and specialised knowledge and at times also demonstrates a weakening between these two. Strong boundaries are generally experienced with the theoretical aspects of the content in the curriculum and weakening linked to the application of this knowledge when dealing with patients in a practical and clinical setting but at a level where everyday understanding is used. This module is also based on an integration and communication module offered in year two illustrating the importance of communicating with patients. The nature of this relationship is described by Midra below:

> *The pharmacy when you learning it theoretically how to become a pharmacist and the knowledge to be a pharmacist is that's specific you would use the terminology specific to pharmacy, knowledge and the practice thereof. But when it comes to learning patient counselling, which especially happens in the Pharmacy practice module, everything has to be related in layman's terms because you really don't want to be standing there as a scientist in front of a patient and then have a patient horrified because you are saying you are borderline diabetic. What does that mean to the patient because that does sound very serious but if you tell someone borderline they think its life and death. So we learn the terminology for our…when we speaking to the patient and we teach them these skills in our session counselling. They relate this and use their*

> *everyday knowledge sort off, all the words that you can relate to a normal layman person, not another pharmacist. So I think it's a combination of both actually.*
>
> (M/I/p6p3L4)

Students readily make links to everyday as illustrated by their spontaneous responses to the crossword puzzles where everyday conditions such as dandruff were shouted out rather than the scientific name (*Pityriasis capitis*) for the condition, despite the fact that "dandruff" didn't fit within the allocated spaces in the crossword puzzle. Blending or an almost constant switching between everyday world of work knowledge and specialised knowledge is noted. Strong links or bonds between theoretical knowledge, everyday world of work knowledge and practical application, for example specialised knowledge of clinical dermatological conditions such as Pityriasis capitis are known in everyday as dandruff. Interestingly in the crossword puzzles, students' first choice in answering the medical conditions are on everyday terms of the medical conditions rather than the discipline specific terminology, students are rooted in the everyday.

The lecturer constantly reinforced specialised knowledge with examples of work related and practical experience. Students were constantly directed to think as pharmacists and what they would do in a situation and how they would advise their patients. Apart from direct comments, there is constant reference to personal pronouns "you" in terms of "you need to ask the patient, you need to check the temperature, you need to look at the lesion". The role of student and the role and identify of practising pharmacist becomes blurred. Students are thought to think as pharmacists and the lecturer uses numerous examples throughout the lecture and throughout the different topics covered.

Between specialisation

While the content of Pharmaceutical Care may be linked or covered in the other majors, it remains strongly insulated with regards to the way the module is taught. As mentioned previously although there is an overlap with the sections such as contraception, osteoporosis and thyroid, links between the majors are not made. Interestingly, however, Midra and other academics teaching within the curriculum describe Pharmaceutical Care as the module that ties everything together. Midra illustrates this below:

> *Pharmacy practice is the only specialty, we call ours specialties right, it's the only specialty that integrates your knowledge from all your majors. Because when you are standing there with a patient, lets stay for instance at a hospital bed, you have to know your pharmacology, you have to know your pharm. chem, you have to know your pharmaceutics because of your dosage forms and which are the routes of administration, your pharmacology will tell you the thermodynamics of the drug that is being administered, your pharm. chem, you'll know the structures of the drug and things liked that. And then pharmacy practice all the knowledge we're learning about in pharmaceutical care about the different disease conditions itself. So pharmacy practice is the only one subject or specialty that brings together all the majors because that actually makes you a good, well-rounded pharmacist. You can link all that knowledge but when you are learning it from first year to fourth year, all your majors are learnt independently and they all come together when you're doing pharmacy practice.*
>
> (M/I/ p7p3/L5)

Perhaps, similar to ward-rounds Pharmaceutical Care externships work towards an integration of the majors during the practical component of the module, accounting for strong insulation during theoretical content covered in lectures. This points once again to the relationship between theoretical and practical knowledge and debates around integration.

Within specialisation

Strong boundaries exits between the major topics or sections within Pharmaceutical Care such as dermatology, musculoskeletal problems, wound care, contraceptives and contagious diseases, however weaker boundaries may be observed within subsections within these broad topics for example in contraception, different types of contraception are discussed but may be related to other conditions such as cancers and osteoporosis, depending on the relationship between the drug effect and the conditions (either prevents or causes these diseases or medical conditions). Midra's statement indicates the strong insulation between sections within Pharmaceutical Care:

> *In the notes, we have individual topics, ok, because we are dealing with specific disease conditions. There is a certain degree of relation within the topics and I think it's a very rare case where they can be related because you learning dermatology and you learning all the disease conditions that fall under dermatology. Then you learning something about women's health, its not really related to dermatology that's contraception so we're learning specific topics. But there is a link between the notes and the externship. That's where the link comes in. So even though we have individual sections in our course syllabus you know, we bring in the link between the notes and the externship and family planning seminar so everything is all linked but within its topic.*
>
> (M/I/p9p4L3)

It also highlights the link between theory and practice and shows how the different components of the module are interrelated, linked and work as one.

7.4.2.2 Framing

Selection

Strong selection and academic control is observed for Pharmaceutical Care and this is based on the selection of particular content and material for the revision lecture as well as on interview data about lectures. The revision lecture is summarised by the academic and while the range of topics are covered are an extraction from the module notes, obviously the depth and many sub-topics are not included. For example under dermatological conditions based on the notes, the following sections were taught in class: history taking for dermatological conditions, hypeproliferative disorders (such as dandruff, stretch marks and calluses), bacterial infections, insect bites and stings, parasitic infections, fungal infections and viral infections (Pharmaceutical Care student notes, p. 1). During the lecture, history taking was covered in some detail but only two or three conditions of the range of skin conditions were skimmed during the crossword puzzle activity, with the remainder assigned as self-study. Other sections such as contraception, wounds and osteoporosis were covered in greater detail.

The selection is probably based on what the academic deems as necessary or important to cover and is perhaps linked to the exam that follows shortly after the revision session. Decisions on curriculum content for inclusion may also be linked to time constraints and the large volume of content. Midra makes mention of the amount of content more than once during the lecture "we had quite a lot of content to go through in a short time" (M/L/p1p1L2) and "we just going through the important bits, Ok! its also very intensive" (M/L/p17p2L1). During her interview on what a typical lecture is about, Midra sheds some light on the selection process within her module and the decisions she makes regarding the inclusion of content into the curriculum, given the large volume of content and time constraints.

> *I brought in journal articles. Lots of journal articles in every session to complement the notes. Because we have such a short modules, we only have 6 weeks, it's a term module, there not enough time during the lecture session to cover every aspect that you could cover under every topic that is part of the course. So I do what's the core and then I add in other side topics under that*

> *umbrella. So if I'm saying for example we've done child heath, because that's the last lecture, we've done child's health and here we did like specifically like what the syllabus required but we didn't have time to deal with things like fever…All very important for child health but in terms of practicing pharmacists we also faced with parents that come in with children that come in with high fever, very common. And the fever then is also part of the immunisation, you know, post immunisation, lots of children do develop the fever and what do parents do? .how do we manage a child? So we didn't have that in our notes and I thought that was very important so I brought that iin terms of a journal article…*
>
> (M/I/p2/p3/L11)

This links to previous literature on the debate of the purpose of the lecture and what should be included and what should serve as guided self-study prior or post lecture.

Sequencing

Due to the nature of the lecture, the sequencing of the revision programme follows the content covered in the curriculum during the module. The first topic is on dermatology and the last is on child health, similar to the College Handbook. The sequencing of the curriculum is based on the topics selected for the Handbook and therefore strong ties between the two are noted. The topics covered are strongly insulated from each other and therefore the sequencing is not done so based on a hierarchical knowledge structure where section one (dermatology) must go first in order to understand the topics that follow (wound care, bones, contraceptives or child health). The sequencing, however, similar to other modules has been followed based on historical patterns. It's the way it has been done and there didn't seem to be a reason to change it. Sequencing of the content covered within the revision lesson was linked with a variety of activities, eliciting student responses such as crossword puzzles, matching, quizzes, rapid fire of questions, with some examples done in class and others to be pursued later as self study.

Pacing

Midra demonstrated strong control over the pacing of the lesson, with her moving from one topic to the next, possibly because of the large amount of content that had to be covered during the revision lecture. References in the lecture to the large amount or intense nature of content were mentioned on more than one occasion and the lecture covered all of the major sections dealt with throughout the duration of the module. Strong pacing was also evident during active student participation in quizzes, puzzles and games and class discussions that took place. Midra's strong

control was also evident in the numerous slides covered during the lecture and the pacing between the questions she posed and student responses. If there were no responses to questions, she would quickly dispense with the answer. Other modules displayed a range of approaches and a range of pacing. Lecturers varied from some affording students more time to respond, often repeating the question, with other lecturers calling students' names from the register in order to elicit a response. In some cases class discussion of the questions also ensued.

Evaluation

Assessment criteria are provided in the College Handbook (Table 7.5) and the Module notes at the beginning of the notes. Assessment comprises of the following:

Table 7.5: Assessment criteria for fourth year Pharmaceutical Care

Type of Assessment	Weighting	Description
Formative assessment	60 %	2 X 1 hour test + family planning exam+ externship manual. (Includes First Aid and family planning seminar evaluation)
Summative	40%	1x2 hour paper
Final Mark	100%	Final Mark = 60% Examination Mark + 40% of CAM. A 40% subminimum rule will apply

The extract below points to one aspect featuring within tests and exams and highlights what is required from students.

> *Everybody remembers the open and closed method? Ok! When you are faced with that question, you need to make a decision and substantiate why you chose that method, the open method or why you chose the closed method, just like you did in the exam and the test, ok! So you would have to substantiate.*
>
> (M/L/p11p2L10)

Type of evaluation is based on more than just understanding the open and closed method but applying these methods to a particular wound in a particular patient. The need to substantiate the decision speaks to issues of decision-making as a practitioner and professional and as well as indicates higher order learning where memorising is insufficient for dealing with the task. This is similar to point made by Midra regarding contraceptives, where she discusses if a patient is

purchasing a contraceptive, the pharmacists does not tell them about the pros and cons as learnt in the notes or in the lecture but rather makes a decision to select an appropriate method based on individual patient histories, profiles and lifestyles.

Relationship between lecturer and students

While the revision lecture is characterised by strong lecturer-student dynamics, with the academic in a position of power and knowledge, this may not be indicative of the relationship throughout the module. Midra's mention of student research regarding topics covered in lectures (such as child health, where she covered the whole controversy over measles, mumps, rubella and its possible link to autism) illustrates a weakening of the relationship where students have a space to conduct independent research on the topic and were given some time to do so.

> *After we go through the notes and what the important aspects are, I give them time maybe between 30-40 min, 30 min mainly and then they go through the work, well now the students are very advanced everybody has a blackberry, access to the internet like at their fingertips. I do say they are allowed during this time to leave the class, go to the library and compute room to gather all the information and come back…*
>
> (M/I/p3p1L1)

Pharmaceutical Care, similar to Biopharmaceutics and Pharmacology, exposes the relationships that extend beyond just the academic and the student but also includes patient-student relationships and student-student relationships or dynamics. These take place within consultations and exchanges during externship and ward-rounds. Students also interact with other health care facilitators and mentors, both within the context of the university (as visiting exerts: gynaecologist, nurse, first-aiders or doctor on panel for Pharmacology ward-rounds) or within the confines of the hospital (pharmacists, nurses, doctors). This increased number of interactions and sources of knowledge would also vary depending on the academic year and exposure to the practical component. In year one and two, relationship is largely restricted to academic and student, where power and control largely resides within the academics and scholars, but relationships and interactions with other professionals and individuals progresses with time.

7.4.3 Semantics

7.4.3.1 Semantic gravity and semantic density

Strong semantic gravity is displayed at times when medical conditions are related to "everyday contexts" and where information regarding medical conditions takes place between pharmacist and patients. Pharmaceutical Care is characterised by semantic dense terms such as contagious diseases. Midra firstly unpacks its density by separating sections or areas within particular categories, for example transmission, route of infection, incubation period, symptoms and treatment. Midra also discusses which organisms are responsible for the conditions and how they are transmitted from one person to the next through droplet spread (strong semantic density) and unpacks this term by asking students what it is. Students provide examples of coughing and sneezing, which she confirms to be correct and which demonstrates weak semantic gravity and weak semantic density.

> *And then we said, one important thing with contagious diseases is the incubation period This is the period, the time that elapses from acquiring the microorganism to the time of the onset of symptoms. Ok! and that is constant for each disease. Incubation period for measles will be x days, incubation period for chicken pox will be x days, ok! It's always constant for that condition. And then the stage of invasion, as the organism invades the body and after the incubation period certain toxic products are produced results in changes in the body, such as a rash. Ok! So when a rash develops you can now tell, ok you are at stage three of this condition, you've gone through the other stages, ok! So these are common concepts with contagious diseases.*
>
> (M/L/p12p3L12*)*

7.4.3.2 Semantic waves

Most medical conditions appear to follow a similar pattern with regard to the movement of a semantic wave (Figure 7.5). Initial introduction of a medical condition, especially when known by its common name, displays strong semantic gravity and weak semantic density, as people have heard of and can relate to the condition and its associated symptoms (such as coughing or rashes). This initial phase is also characteristic of the communication that takes place between pharmacists and patients, where pharmacists use "everyday language" as far as possible to explain the various conditions. This results in a strengthening of semantic gravity and a weakening of semantic density as medical conditions without the underlying specialised knowledge feature during this dialogue.

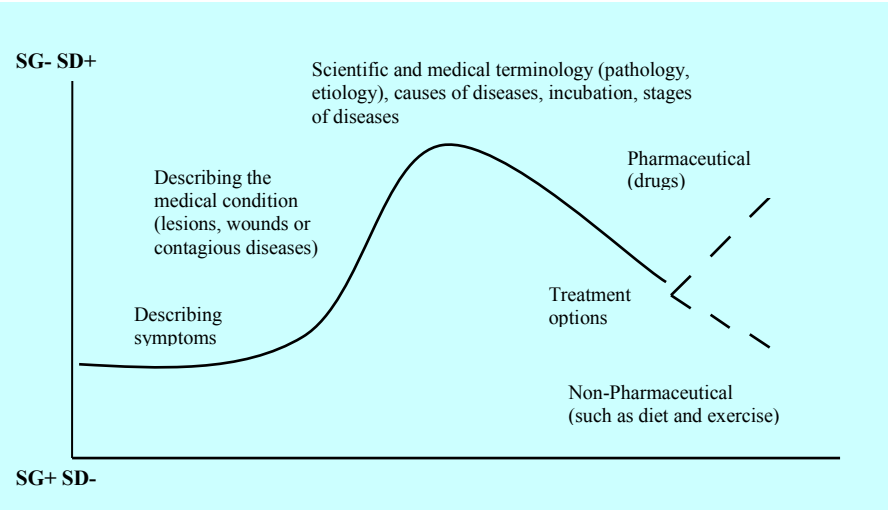


Figure 7.5: Semantic wave in Pharmaceutical Care

The following extract indicates this initial phase (in Figure 7.5) characterised by strong semantic gravity and weak semantic density, where the pharmacists uses a series of questions to obtain information in the process of making a medical diagnosis.

> *The important thing the pharmacist needs to ask the patient in order to help the pharmacists to diagnose the skin condition is as follows: you need to ask the patient when did the problem first appear? Are there any other symptoms? The occupational history of the patient, the general medical history for that patient so you know if the patient is taking any other medication for any underlying diseases that could have caused an eruption of the skin rash. You need to ask the patient if they travelled recently where they could have contracted any type of allergy or skin rash. Also ask about the family history and the contact history and then ask the patient what the patient thinks the problem could be. Most often patients already have an idea of why they have this rash. What they ate, what they touched, who had a rash and now they've got it. You can get a good understanding of the rash by asking the patient what they think. Ok!*
>
> (M/L/p1p3L5)

As Midra continues into the aspect of examining patients and moves to discuss lesions and how to assess lesions, a weakening of semantic gravity and a strengthening of semantic density is observed. The medical condition, as it is discussed in more detail, requires specific disciplinary knowledge (sometimes hierarchically structured) which moves away from everyday common understanding.

Then things to consider when performing a dermatological examination: when you are actually examining the patient's skin condition, you need to check the temperature of the surrounding skin. Ok! that will give you an idea of inflammation. You need to look at the lesion itself, assess the lesion.

(M/L/p2p1L1)

OK! What have we learnt? From all the dermatological conditions, we have learnt how to identify skin conditions and this is based on the appearance of the lesion, the location of the lesion, what the lesion look like, signs and symptoms, all right! The etiology which is the positive organism, right! This is bacterial, fungal, parasitic or viral infection and we also learnt a bit about the pathology and then we've done the treatment, either the first line treatment and if you've done the first line treatment and it didn't work then what do you do?

(M/L/p2p3L1)

Further discussion on the causes and microbiological knowledge behind them contain specialised disciplinary knowledge and use of words such as "pathology and etiology" point to an upward movement of the wave as it moves away from strong semantic gravity and weak semantic density. A similar trend is noted for contagious diseases (semantically dense) and depending on the type of contagious disease, the upward movement will cover their mode of transmission, incubation period, microorganisms responsible, stage of invasion. During the upward phases of the wave, communication of this knowledge at this level, would occur in academic environments or in the working world with fellow health care professionals, where unpacking of dense disciplinary knowledge would not be necessary. This is usually followed by a downward curve when treatment options are covered, however, there appears to be a branching or divide with pharmaceutical treatment options demonstrating weaker semantic gravity and stronger semantic density than non-pharmaceutical treatment options. Pharmacological approaches involve specialised knowledge pertaining to drugs and how they work, along with consideration of the side effects whereas non-pharmacological approaches are linked to everyday knowledge such as diet and exercise.

7.5 Summary: Classification and framing

All fourth year majors demonstrate strong classification and strong framing, with once again the strengths varying depending on several interconnected factors such as the nature of the disciplinary knowledge; the academic component of the module, the academic teaching the

module and their philosophy and practice; the role given to students and the assessment practices employed. While both fourth year Pharmacology and Pharmaceutical Care may have overlapping sections, both disciplines are strongly insulated and demonstrate different pedagogical practices. Pharmacology 401 focuses on the hormones, mechanism of actions, and side effects and these generally feature within a didactic lecture with case-based teaching towards the end of the section (concepts, background and content are generally covered prior to the case study). In Pharmaceutical Care the focus is on the ethical, moral and social aspects as well invoking the professional aspect and the decision making responsibility of practicing pharmacists. Issues surrounding contraception and abortion are discussed in a lecture format, followed by small group teaching using role-plays, debates and case-based teaching. The ward-rounds, although linked to the practical component of the Pharmacology modules, are not restricted to this discipline but rather depend on previous knowledge across and within modules.

7.6 Summary

This chapter traced curriculum, knowledge structures, pedagogy and semantics. The fourth year pharmacy modules analysed displayed similarities of strong classification and framing especially during theoretical content, with a weakening of classification and framing borders during the practical applications of externships and ward-rounds. Pharmaceutical Care demonstrated greater articulation between specialised disciplinary knowledge and its applications to the everyday working environment that pharmacists find themselves in. Knowledge structures and their underlying organising principles within fourth year Pharmacology, Pharmaceutics and Pharmaceutical Care exposed patient knowledge and aspects pertaining to the professional nature of the work (clinical diagnosis, treatment and patient care). Modules ranged in knowledge structures (hierarchical or a combination of hierarchical and horizontal) and pedagogy within the various academic components (lectures, tutorials, externship and ward-rounds). Depending on the discipline, semantic gravity and density varied resulting in the formation of varied semantic waves.

Chapter 8
Beyond lecture rooms: Pedagogy and the profession

8.1 Introduction

The previous three analyses chapters were strongly guided by the theoretical frameworks (classification and framing, and semantics from LCT) and revealed trends across knowledge, modules, lecturers and pedagogies within the B. Pharm degree at UKZN. Previous chapters (Chapters 5 to 7) have described the pedagogical approaches used by pharmacy academics as well as at times attempted to explain why these approaches are used. It described and analysed trends in largely answering research question one, what are pharmacy academic's pedagogical practices? A summary of this is first provided. Thereafter this chapter explores why these practices may have been used from analysing emerging themes from the data through the interpretivist lens. It is worth noting that Chapters 5 to 7 do not focus exclusively on question one and Chapters 8 and 9 on question two, because the pedagogical approaches used and the reasons behind the choices are closely interrelated.

8.2 Summary: Trends across pharmacy modules and academic years

Table 8.1: Summary of description of third year pharmacy majors

Year 3	Pharmacology	Pharmaceutics	Pharmaceutical Chemistry
Knowledge structure			
Knowledge structure:	Hierarchical	Hierarchical	Hierarchical
Cumulative or integrated	Cumulative physiology and biochemistry base	Cumulative microbiology and chemistry base	Cumulative chemistry base
Classification and Framing			
Everyday and Specialisation	C+	C+-	C++
Between specialisation	C++	C++	C++
Within Specialisation	C-	C-	C-
Selection	F++	F++	F++
Sequencing	F++	F++	F++
Pacing	F+-	F+-	F+-
	Strong in lectures but weak in Moodle	Strong in lectures and weak at time during pracs	Strong in lectures but less in pracs
Academic-student relationship	F+-	F+-	F+-
	Interactive at times especially during case study	Interactive, lecturers uses questioning approach to constantly elicit responses	Interactive and fairly relaxed
Evaluative criteria	F++	F++	F++
Semantics			
Density	SD+	SD+	SD+
Gravity	SG-	SG-	SG-
Pedagogy			
Teaching approach/description	Case-based teaching and group work, Moodle	Didactic	Didactic, interactive and technological driven
Resources and activities	Power-Point slides and OHP	OHP, lecture notes	Power-Point slides, video, electronic notes
Assessment			
Types of Assessment	Moodle tutorials, tests and exams	Practicals (form part of the formative assessment), tests and exams	Practical reports (form part of the formative assessment
Weightings for formative and summative	**Formative:** 70% of the average of 2 tests+ 30% of Moodle assignments **Summative**: 1x2hr paper Final mark = 60% of exam +40% CAM	**Formative:** 70% of the average of 2 tests+ 30% of practical marks. **Summative**: 1x2hr paper Final mark = 60% of exam +40% of formative assessment	**Formative:** 70% of the average of 2 tests+ 30% of practical mark. **Summative:** 1x3hr paper Final mark = 60% of exam +40% CAM

Table 8.2: Summary of description of fourth year pharmacy majors

Year 3	Pharmacology	Pharmaceutics	Pharmaceutical Care
Knowledge structure			
Knowledge structure: Horizontal or vertical	Hierarchical and Horizontal biochemistry, physiology and biology base	Hierarchical biology, chemistry and mathematics base, and previous pharmaceutics knowledge	Hierarchical and Horizontal Mixture of science and humanities disciplines
Cumulative or integrated	Cumulative	Cumulative	Cumulative and integrated
Classification and Framing			
Everyday and Specialisation	C+- (differs in lecture and ward-rounds)	C+-	C++ Differs in lectures and externships
Between specialisation	C++	C++	C++
Within Specialisation	C-	C-	C-
Selection	F++	F++	F++
Sequencing	F++	F++	F++
Pacing	F+- Strong in lectures but weaker in ward-rounds	F+- Strong in lectures but weaker in tuts	F+- Strong in lectures but weaker in externships
Academic-student relationship	F+- Interactive at times especially during case study	F+- Interactive, lecturers uses questioning approach to constantly elicit responses	F+- Interactive and fairly relaxed
Evaluative criteria	F++	F++	F++
Semantics			
Density	SD+	SD+	SD+
Gravity	SG+ SG- (differs in ward-rounds)	SG-	SG+
Pedagogy			
Teaching approach/description	Didactic, case-based teaching and group work, Moodle	Didactic, class discussions, peer-learning, expert input, use of questions	Didactic, role plays, debates, discussions, cases and researching articles
Resources and activities	Power-Point slides, notes	OHP, lecture notes, guest speakers.	Power-Point slides, notes and activities (puzzles, quizzes, games) journal articles, discussions and debates in class
Assessment			
Types of Assessment	Ward-round presentations, tests and exams	Tutorials, assignments, seminars, tests, exams	Tests, seminar evaluations and exams
Weightings for formative and summative	Ward-rounds: 15x3 hours ward-round presentations. **Formative**: 60% of the average of 2 tests + 40% of ward-round presentation marks. **Summative:** 1x2hr paper Final mark = 60% exam + 40% CAM	**Formative:** Individual assignments (30%) 60% of the average of 2 tests + 40% assignments/seminars **Summative:** 1x2.5hr paper. Final mark = 60% exam + 40% CAM	**Formative:** 2x1hr tests (60%) + seminar evaluation (First Aid, Family planning) (40%). **Summative**: 1x2hr paper Final mark = 60% exam + 40% CAM

Bernstein (2000) developed tools for conceptualising the underlying principles that generate forms of knowledge and how they develop. Studies show that different knowledge structures develop in different ways over time and lend themselves to certain types of pedagogy as well (Freebody et al., 2008). Maton (2009) points out that the way knowledge is structured has implications for semantic gravity and subsequent the type of learning (cumulative or integrative) that is possible. Pharmacy modules within the undergraduate programme at UKZN largely display a hierarchical knowledge structure (all third year modules: Pharmacology, Pharmaceutics and Pharmaceutical Chemistry and fourth year Pharmaceutics) or a combination of hierarchical and horizontal knowledge structures (fourth year Pharmacology and Pharmaceutical Care).

Generally hierarchical knowledge structures demonstrate weaker semantic gravity than horizontal knowledge structures, a pattern consistent with the findings of this study (Table 8.1 and Table 8.2). While this may be the case, as demonstrated by semantic waves across modules, this is not a constant and involves fluctuations during the pedagogical process. Problems, however, may arise if teaching is left at the level of strong semantic gravity and this also has implications for cumulative and integrated learning. Freebody, Maton and Martin (2008, p. 194) describes strong semantic gravity as resulting in knowledge that is confined or weighted in its pedagogic context, preventing transfer from taking place. Kember, Ho and Hong (2008) illustrate the other side of the continuum, where weak semantic density also proves problematic. Their study found that only teaching abstract theory was demotivating and the relevance of theory to practice and the profession was necessary. The traditional building block curriculum, which devotes substantial parts of initial modules to basic theory, could demotivate students if they could not see how the theory was applicable to the discipline or profession (Kember et al., 2008). Blackie (2014, p. 5) in describing the value of semantics in chemistry, a relatively abstract field, believes that academics have a role to play in assisting students to reach abstraction but that they need to "keep dipping back". This is in reference to ensuring stronger semantic gravity and using practical examples so students can begin to form mental associations. Highly condensed and the decontextualised concepts should be unpacked into simpler forms or at times linked to "everyday" examples. Unpacking density should also not be viewed as something negative, as pointed out by Maton (2013), what is important is that it provides a point of entry into those

meanings for the novice[50]. It serves as a "starting point for progressively strengthening its semantic density through elaborating, extending and refining additional meanings" (Maton, 2013, p. 15). Research suggests that key characteristics of knowledge building and achievement are semantic waves (Maton, 2014) which are characterised by these recurrent movements in context-dependence and condensation of meaning, which are evident across the disciplines in this study.

Different knowledges are structured and acquired differently as indicated in Chapters 5 to 7 (and Table 8.1 and Table 8.2 here), where the different pharmacy modules and trends within them have been described. This has implications for curriculum development, pedagogy and assessment (Clarence, 2014; Freebody et al., 2008; Maton, 2013). So it is not one kind of knowledge but rather mastery of how different knowledges are brought together and changed through semantic waves. The importance of studying knowledge is illustrated by Freebody et al. (2008, p. 197) who states that:

> *To ignore knowledge is to diminish the promise, practices, and social cultural and economic consequences of education. More specifically, to ignore the implications of different structurings of knowledge is to be satisfied with universalist solutions that will continue to fail some learners in some communities, work places, and societies.*

Within profession qualification, such as pharmacy, it is more than just an issue of acquiring knowledge and skills but extends to how students become part of a disciplinary or professional field. This issue and how it pertains to pedagogical practices at UKZN is discussed in the next chapter.

8.3 Emerging Themes

8.3.1 Theme 1: Case-based learning (CBL)

One of the emerging themes in this study is CBL as a pedagogical approach. However, prior to discussing CBL within this chapter, it is important to firstly consider the ambiguity surrounding CBL and the problematic nature of defining this pedagogy. Despite its existence and implementation for almost a century (originating at The Harvard Business School), consensus has

[50] Novice and experts refer to relative expertise, where anyone involved in an activity has expertise in that activity to a greater or lesser degree; the greater skilled are referred to as experts and those lesser skilled are the novices (Kotzee, 2014).

not been reached among academics and educators when it comes to defining CBL and so a single definition remains elusive (Osinubi & Ailoje-Ibru, 2014; Thistlethwaite et al., 2012).

The wide use of CBL across diverse educational disciplines contributes to CBL meaning different things in different contexts. Studies have shown the use of CBL within the social sciences, engineering, law and management, medicine, veterinary sciences, chiropractics and within the other health sciences and sciences as well (nursing, dentistry, pharmacy, speech pathology and physiology) (Kaddoura, 2011; Majeed 2014; Thistlethwaite et al., 2013).

Most studies attempt to define or describe CBL in relation to PBL, with some focusing on their similarities (being student-centered and placing more responsibility for learning on students) and others on their differences (in terms of structure vs. unstructured designs). Prince and Felder (2006) describe CBL as falling under the umbrella of inductive teaching and learning which incorporates a range of instructional methods, including PBL, project-based learning, inquiry learning and several others. Osinubi and Ailoje-Ibru (2014, p. 2060) view CBL as an "educational paradigm closely related to the more common PBL", describing CBL as a special kind of PBL or an elaborated pedagogical model of PBL directed towards a case (Osinubi & Ailoje-Ibru, 2014).

While most studies define CBL in relation to PBL, Schodt (2000, cited in Kaddoura, 2011, p. 5) defines it by comparison to the traditional lecture approach, stating that CBL uses cases as narratives, allowing students to explore realistic problems that represent clinical situations, instead of using textbooks. Cases provide the opportunity for students to find and develop their own structure or framework when dealing with cases.

Common to all definitions, is the narrative, realistic or authentic nature of the problem or "case" and Osinubi and Ailoje-Ibru (2014) distinguish between CBL and PBL on the basis of how this is presented. Different terminology is used in the literature regarding the problem/case presented in CBL and PBL. Terms such as "structured, defined or guided" are used to refer to CBL, whereas "unstructured and ill-defined" generally pertain to PBL. Most studies do not elaborate on the meanings of these terminologies in context. Just as a universal definition of CBL remains

problematic, there is also ambiguity surrounding the concept or meaning of "case". Many articles in CBL just mention the case, as if meaning is readily understood or cases are characterised largely in the literature by very broad definitions (Thistlethwaite et al., 2012). Findings in the study will however provide a clearer picture of the form of CBL and the types of cases employed in a pharmacy context within a South African institution.

8.3.2 CBL in pharmacy education at UKZN

Many third and fourth year pharmacy modules at UKZN use CBL in some form and at some point in the curriculum. Table 8.3 below differentiates between modules on the basis of whether CBL is implemented or not, while Table 8.4 provides more details on the nature of the CBL within these different disciplines. The type and implementation of CBL varies within different disciplines of pharmacy, which is not unexpected as Thistlethwaite et al. (2012) describes CBL as pedagogical approach defined in numerous ways depending on the discipline and the "case" employed.

Table 8.3: Pharmacy modules indicating whether CBL is employed or not

Pharmacy modules using CBL		Description of CBL used	Pharmacy Modules not using CBL	
YEAR 3				
PHRM 301	Pharmacology	Clinical CBL	PHRM 321	Pharmaceutics
PHRM 311	Pharmaceutical Chemistry	Drug design and development		
YEAR 4				
PHRM 401	Pharmacology	Clinical CBL	PHRM 421	Pharmaceutics
PHRM433	Pharmaceutical Care	Clinical and ethical CBL		

A possible explanation for the use of CBL within some modules, but not others could be linked to the disciplinary knowledge and how it is structured. For example Ami describes Pharmaceutics (PHRM 321) as very technical, factual, and containing a lot of content. This content dense module with tight time frames and a strong microbiology foundation may not lend itself easily to case studies. The content covered pertains largely to industrial and hospital pharmacy, involving processes and procedures as described by Ami below:

> *Well, the thing with my course is as I said it's a lot of facts, it's more factual than anything else. So it's covering microbiology, the processes that I use in the laboratorys and things. So because it's so factual I have to do kind of most of the talking and just so that they don't fall off to sleep and they are listening I do try and get a lot of interaction from them. So in between I ask a lot of questions and I wait for them to answer as well. They do, I suppose it does keep them a bit on their toes that way, hopefully.*
>
> (A/I/p19p13L1)

CBL is not used within the module, but rather a didactic approach is taken, with frequent questioning to elicit student response and engagement. Repetition of content and emphasis on particular aspects are noted, along with explanations of concepts and content using visual representations. Interestingly CBL is also not used in Pharmaceutics (PHRM 421) and Zodone mentions that her pedagogical approach consists of "scenario type question" often used during tutorials but that she does not use cases as such. Her didactic approach also tries to involve students and although she also uses a questioning technique, her approach varies:

> *I can't just go into the classroom for two hours and talk for two hours and then leave. No, no, I am – well, I thought that, I used to because that's the way I was taught, but I dropped that along the line. So I go into the classroom, I do a bit of introduction and then I start throwing questions around, I do that.*
>
> (Z/I/p34p9L10)

> *So they know this thing, if it's a new thing that I am teaching them which is a brand new concept that I will teach. But where I expect them to apply themselves, I do a bit of introductions and then I start throwing questions around my lecture. And where I feel that I am not getting enough understanding of the students in that area that I am teaching for the day then I go to my slides. And then I show them my slides or I go to my OHP…*
>
> (Z/I/p35p3L7)

Zodone's pedagogical technique was evident during lecture observations and shows that in addition to questions, her didactic approach, which is sequenced almost opposite to Ami. Ami starts with didactic teaching and uses questions, whereas Zodone starts of with a brief introductory didactic approach, places emphasis on questions and then if necessary resorts to didactic teaching. Perhaps Zodone's approach of placing more responsibility on students for learning could be linked to it being a fourth year module, where students are expected to be more mature, responsible and capable of independent learning, a point expanded upon at a later stage in this chapter. Despite the differences noted, both Pharmaceutical modules are similar to what

Stewart et al. (2011) describes as a pedagogical strategy called interactive-spaced education which functions by repeating content at paced intervals combined with testing that content. Interactive spaced education was developed and heavily used within medical education context (Stewart et al., 2011). Trends in Pharmaceutics may not demonstrate a repetition of content at paced intervals but rather at times during the lecture or towards the end of a particular topic or section.

As mentioned earlier, disciplinary knowledge in Pharmaceutics indicates a strong industrial slant while Pharmacology and Pharmaceutical Care modules reveal a strong clinical focus, possibly accounting for the easier implementation of CBL as indicated by Nardil below:

> *The good thing about that module is that it has to do with central nervous system pharmacology and obviously one can build it around a lot of case studies, from epilepsy, depression, Alzheimer's disease so its all your, your major diseases around central nervous system so you can build cases around that, so it wasn't really necessary for me to…to do the traditional didactic teaching. I could develop…develop case studies on almost all those conditions …..so I didn't have any difficulty.*
>
> (N/I/p4p1L1)

8.3.2.1 Different types of cases and CBL

Table 8.4: Description of cases within the various pharmacy modules

Pharmacy modules using CBL		Types of cases	Description of implementation
YEAR 3			
PHRM 301	Pharmacology	Clinical	Background followed by case with questions and resources, student research, class discussion and feedback. Largely implemented in lectures
PHRM 311	Pharmaceutical Chemistry	Drug design and development	Background, case with questions and resources but as a project and covering content across various topics previously covered in the module. Implemented in lecture
YEAR 4			
PHRM 401	Pharmacology	Clinical	Background, Case with questions and resources, student research, class discussion and feedback. CBL in lecture, with CBL from hospital ward-rounds in tutorial sessions. Hospital ward-rounds are based on knowledge across topics and modules.
PHRM433	Pharmaceutical Care	Clinical with focus on social and ethical issues	More unstructured, covering topics or areas of discussion. Students given journal articles to research and provided with questions or summarising task. Uses debates, discussions and feedback. Resources not always provided ahead of time and cases used during tutorial sessions not lecture based.

There appeared to be different types of cases in terms of their design and implementation. Apart from the different disciplinary fields accounting for these trends, the intended purpose of using cases might also play a role. For example in Pharmaceutical Care cases are presented during tutorials, in addition to cases found in student notes, and these cases are based on research or journal articles which explore content and issues not covered in lectures. They therefore serve as an extension of aspects that were not covered in lectures but considered important in understanding the topic holistically. Resources for cases in notes are provided ahead of time but generally journal articles on additional topics are not given ahead of time. These cases serve as catalysts to promote discussion and debate.

> *Ok, so like under child health we did breast feeding, infantile colic and we did immunisation. All very important for child health but in terms of practicing pharmacists we also faced with parents that come in with children that come in with high fever, very common. And the fever then is also part of the immunisation, you know, post immunisation, lots of children do develop the fever and what do parents do? How do we manage a child? So we didn't have that in our notes and I thought that was very very important so I brought that in terms of a journal article and I brought in a patient page from the Journal of the American Association. So what I did was I divided the class into groups, which I do every lecture, I divide them into groups and then I give them case studies that are included in their notes and then the groups that are not assigned case studies I give them articles to review. So I source these myself, I take them to the class so the students have not been sensitised to that case at all.*
>
> (M/Ip2p5L16)

> *So they go away, they come back with the information after 30 min and I will either set a question for them on the topic of the article and say answer aspect one and two or I will say summarise article one and two because these are important points for you to know. So for this child heath, topic fever, I brought in the whole controversy over measles, mumps, rubella and its link to autism because lots of parents don't want to vaccinate their children, don't want to immunise them because of their children becoming autistic, So we know we've dealt with that.*
>
> (M/I/p3p3L11)

In Pharmacology cases were clinical in nature, often following the end of a particular topic or section whereas in Pharmaceutical Chemistry the case study on drug design and development was sequenced after several topics that dealt with the designing drugs and Alben describes the case as serving as "an application of theoretical knowledge" (A/I/p6p1L11).

Prince and Felder (2006) talk about different types of cases and their designs based on their intended pedagogical purposes, which may be useful in understanding why academics use CBL and why cases vary as seen above. "A case might include descriptions of what happened and what led up to it, the problems and challenges, the resources and constraints under which solutions could be sought, the decisions that were made, the actions that were taken, and the outcomes" (Prince & Felder, 2006, p. 132). Lynn (1999) in Prince and Felder (2006) distinguishes between a "research case" and a "teaching case". In research cases, information presented is complete and contains both the problem and solutions. It is generally presented ahead of time allowing students the opportunity to familiarise themselves with the material for when the case is later discussed (this may even take place in a lecture setting). In teaching cases,

however, circumstances of the case are presented but the decisions taken are missing so that students have the chance to present their views (Prince & Felder, 2006), also allowing for more than one interpretation.

The cases encountered in most of the pharmacy modules follow the pattern of incomplete teaching cases, where patients present symptoms of medical conditions and requiring clinical treatment and pharmaceutical advice. These cases, however, share features of research cases as they are largely presented before hand and take place in lectures and not necessarily small tutorial groups with a facilitator. Ward-rounds are also characterised by clinical cases but the aspect of diagnosis that accompanys cases makes it a more closed approach, lending itself to being a research case as well. The nature of structure when it comes to cases within pharmacy modules therefore varies with some modules implementing closed ended questioning types and others with a more open debatable format. Generally these are linked to the nature of the discipline with pure and applied sciences following the former very structured format and more social, ethical based modules following the latter.

The structured format in CBL extends beyond only the problem as CBL operates in a guided inquiry manner containing the problem, questions based on the problem and the provision of resources, where PBL only presents the problem (Osinubi & Ailoje-Ibru, 2014). This description of CBL is similar to that observed in the majority of pharmacy modules implementing CBL, where in addition to the problem being presented, resources and structured questions are provided to guide the student.

> *What I typically try and do is I have two double periods a week so in the first double period I give a little bit of background, telling the students what the topic is, a little bit of background on the topic, what the objectives are and giving them their reading material. Then I give them the case and for the rest of the period, they start working on the case. There are specific questions that they need to answer, I do give them the reading material but they're also free to go and read up on that. In a second double lecture they come back and they give feedback on the questions and for each question that they give feedback, I give a little more information maybe.*
>
> (Z/I/p2p10L9)

The questions in the case study linked to lesson and the structure of the questions mirrored the order in which the aspects were discussed in the class for most of the pharmacy modules offering CBL. Tarnvik (2007) believes that this direction of learning is one of the most distinguishing features separating CBL and PBL with self-directed learning featuring in PBL as opposed to lecture-directed learning in CBL. This distinguishing feature of CBL and the structured format it offers may be the reason for its selection within pharmacy education.

8.4 Why do pharmacy academics use CBL?

Reasons emerging for the use of CBL have been grouped under the two main categories:

1. **Active learning**
2. **Preparation and the profession**

8.4.1 Active learning

Pharmacy academics use CBL for the purposes of engaging students in active learning and the benefits it affords such as increasing student participation and interaction, improve and deepen learning and move students beyond passive recipients. Based on constructivist learning theory, active learning is seen as a process where students build, organise and construct knowledge for themselves (Baeten, Dochy & Struyven, 2012). While currently pharmacy academics use a variety of active learning strategies during their modules (as per Table 8.5), there is however, growing use and preference for CBL over other active learning strategies or in combination with other approaches. One possible reason for this may be linked to the structured nature that CBL affords.

Table 8.5: Examples of active learning strategies employed in pharmacy education in the United States and in South Africa at UKZN (Table adapted from Stewart et al. (2011, p. 3 Table 2)

Curriculum Type in US	Active learning strategies in US	Active learning strategies in SA (UKZN)
Traditional	PBL including case-based learning	CBL and "Modified CBL"
Somewhat integrated	Discussion based learning	Discussion based learning, Team-based learning
Completely integrated	Team-based learning	Mainly didactic and CBL together.
Somewhat problem-based	Audience response systems/Clickers	Clickers/Moodle
Completely problem-based	Patient simulation	Role-play (patient simulation), ethical debates
Other	Traditional laboratory experiences	Traditional laboratory learning
	Interactive web-based learning	Interactive web-based learning
	Inquiry/discovery learning	Inquiry/discovery learning
		Externships and hospital ward-rounds with clinical cases
	Interactive spaced education	Somewhat interactive spaced education….combination of repetition and use of questions

Nardil expresses his reasons for selecting CBL, as it allows for greater interaction, student participation and learner responsibility.

> *Ok, I try to make the interaction between me, the lecturer, and the students, to make it more interactive, so instead of me talking all the time I try to encourage the students to participate as well. And the way that I can do that is that we recently changed one of the modules from the traditional pedagogical teaching to be case-based so I basically give the students the opportunity to look at case studies, so they need to research it by themselves. I may give them a short introductory lecture about that but they need to do more of the work…*
>
> (N/I/p3p3L4)

The structured nature of CBL is evident across pharmacy modules, observations of how CBL unfolds within lectures and from academics' descriptions of their teaching approaches.

Considering the structure of the field of pharmacy, it is not surprising that CBL, which sits on the continuum between traditional lectures and unstructured PBL is preferred. Although pharmacy is a field made up of a combination of sciences, applied sciences and social sciences, common across the programme is its highly organised and structured nature (illustrated in Chapter 5 which covered how curricula is translated from the College Handbook into individual modules, module outline and detailed student notes). The need for structure extends across the components of the modules, from lectures, tutorial session, practical sessions and even includes the hospital ward-rounds that extend beyond the physical confines of the academic institution. Perhaps a lecture-directed approach is linked to the level of teaching and learning in the undergraduate programme and the level of learner responsibility. While most pharmacy academics are in favour of independent student learning, this is not without any control:

> *If we going teach them to be dependent on us, give them everything, spoon feed them then we're not going get independence but if we throw them in the deep end and we actually assist them. You know, I am all for independent learning and everything else but I also feel that you need the support structures*
> (R/I/p16p2L2)

Sodhi-Berry and Iredell (2010) state that undergraduate students are still in a transitional period of development regarding knowledge acquisition and are not completely responsible for driving their learning yet. This is in support for the argument of incorporating CBL in pharmacy education rather than PBL. Zeta implements different pedagogical approaches to teaching CBL in year two and three of the curriculum, varying her approach and giving more responsibility to students as they mature within the qualification.

> *So its not long now that I have tried to incorporate the case based teaching and I try to. I teach second and third year groups, now for a third year group what I typically try and do is I have two double periods a week so in the first double period I give a little bit of background, telling the students what the topic is, a little bit of background on the topic, what the objectives are and giving them their reading material. Then I give them the case and for the rest of the period, they start working on the case. There are specific questions that they need to ask, I do give them the reading material but they're also free to go and read up on that.*
>
> *In a second double lecture they come back and they give feedback on the questions and for each question that they give feedback, I give a little more information maybe. Last year I did not teach the second years because I was…, I had teaching relief. What I want to try and do this year is with the third years I*

> *gave them the case first and then we had feedback. With the second years I want to try and do a little bit more of a background in a lecture and all of that and then give them the case, a sort of swopping around because they are getting into it. So that they first have some knowledge, not everything, and know what to go and look for because pharmacology in second level is quite daunting, so that you just don't just throw them in. There are things that you need in place so that was my idea behind it. But I don't do the second and the third level exactly the same. I can't tell you that there is anything published, or anything remember I'm not an educator there's no basis for it, it was just my own feeling that that's the way I would like to do it.*
>
> (Z/I/p2p10L7)

While Zeta claims that her approach is not based on the literature, her practice contains elements that are in line with current research where CBL is structured, dependent on background knowledge and uses resources. The case study approach covered in particular modules in both years three and four (such as Pharmacology three and four and Medicinal Chemistry) display similar formats in the sequencing of the case after the lecture content upon which it is based.

The problems presented within the case is often followed by a series of directed questions, based on content covered as well as at times extending students knowledge and application. The structured nature of questioning observed within CBL in Pharmacology and other Pharmaceutical disciplines is not commonly described in CBL literature. The type and nature of questions are not discussed in detail, however these are mostly "guided" CBL is more aligned to what Nkosi and Thupayagale-Tshweneagae (2013) calls a modified case-based learning method. "It provides small student groups with a case and specific relevant questions about that case in order to stimulate clinical decision making" (Nkosi & Thupayagale-Tshweneagae, 2013, p. 2). The modified CBL method shares many of the characteristics or features of CBL such as fostering student collaboration, critical thinking within a structured problem-solving structure or design. This approach has been implemented in medicine and other health science fields.

This modified CBL approach shares features of being based on relevant, realistic and real-world professional contexts as described by Jeggels, Traut & Kwast (2010) but differs at times with regard to the "small groups" structure of CBL. In most pharmacy modules, CBL featured largely within a lecture format, which may be influenced by the constraints of resources and the ever increasing student numbers. Srinivasan, Wilkes, Stevenson, Nguyen & Slavin (2007) characterises CBL as a guided enquiry approach which provides more structure in small groups

(Srinivasan et al., 2007; Williams, 2005) but research has shown that CBL is not confined to small group teaching. CBL caters for larger numbers of students, compared with PBL, therefore sharing similar time issues within traditional lectures as opposed to PBL (Tarnvik, 2007). At UKZN a combination of smaller group teaching tends to take place within lectures and lecture room set ups when CBL is used in Pharmacology, Pharmaceutical Chemistry and at other times in smaller groups during tutorial sessions in Pharmaceutical Care. CBL as an active learning approach carried out in larger settings makes it more of an attractive and feasible option, possibly contributing to why pharmacy academics employ CBL over PBL within the pharmacy curricula at UKZN.

Pharmacology, Pharmaceutical Chemistry and Pharmaceutical Care modules share the structured nature of CBL and sequencing, which Zeta described above which consists of: background information or lecture, cases with specific questions and resources, time for students to research, followed by class discussion and feedback. The need for this structure and directed learning is perhaps why CBL is preferred over PBL as the direction serves not only to guide students but within a content dense and intense programme, limited by time and resources, allows for focused and directed learning. Perhaps Shulman's (1986) point that case knowledge cannot be independent of theoretical understanding also explains the need for this. Tarnvik (2007) describes PBL as stimulating the exploration of knowledge needed to understand a phenomenon whereas CBL offers opportunities for familiarisation and deepening of knowledge already acquired through lectures and other sources, which could account for why cases follow background and introductory content.

Both CBL and PBL emphasise depth of understanding just the way this understanding is reached varies, with CBL being expert or lecture directed while PBL is self generated (Tarnvik, 2007). Baeten's et al. (2012) study highlights the importance of lecture directed learning and the implementation of CBL, with lectures providing the contextual factual knowledge, background or foundation and then gradually "making way for CBL". Their quantitative content analysis, although in the context of teacher education, revealed that students appreciated the variation in teaching methods. This is supported by other studies (Khan et al., 2013; Sodhi-Berry & Iredell, 2010; Tarnvik, 2007) favouring a combination of lecture and CBL. CBL draws on the strengths

of the didactic approach which provides students with background knowledge and a thorough understanding of the basic concepts. Thereafter, CBL encourages students to apply and reinforce acquired knowledge by relevant discussions and applications (Sodhi-Berry & Iredell, 2010; Tarnvik, 2007), a trend noted in pharmacy modules. Zeta's case study on histamines and anti-histamines is one such example where she provides all the theoretical knowledge and background on the topic before approaching the case study and usually ending with discussion and feedback.

> *I also try and bring it in that that student can answer but he can also talk to the other students and ask a question. And then not telling the student you are right or wrong but then going from what he has said and then leading that into a discussion.*
>
> (Z/I/p10p5L8)

> *Yes, that would be a discussion with the whole class. So that is after they've done their group in the first double they come back in the second double they give feedback and for every feedback there's a response or a discussion. We discuss a certain topic and give more information. These are what they have said, if they've said enough it's fine. But if they haven't said enough then you redirect them or that you if they, yes that you just give them a little more info.*
>
> (Z/I/p10p7L1)

Class debates, discussions and the role of feedback in CBL are in line with guidelines for effective use of case studies (Kaddoura, 2011). The summarisation of key points is essential to ensure that students take away the most important concepts. It appears that cases function to build on prior knowledge, integrate data, and consider application to future situations, all pointing to the cumulative nature of the knowledge structure and pedagogy.

8.4.2 Preparation and the profession

During professional education students develop through a continuum, moving from novice to expert (Gallagher, 2011). Perhaps CBL as a pedagogical approach facilitates this progression and transition. Health professional education, such as medicine and pharmacy, use patient cases where social and clinical sciences are viewed in relation to the case. CBL, along with PBL and other inductive approaches, function along a constructive approach to knowledge where students learn by "fitting new information into existing cognitive structures and are unlikely to learn if the information has few apparent connections to what they already know and believe" (Prince & Felder, 2006, p. 123). Alben points to the use of case studies that are relevant to practice.

> *The way I present for example the cases studies, I need to make sure that these cases studies are collated and help students in whatever route they will choose in research, in the market or whatever. So I need to make sure that my cases study is applicable and will aid students in their future chemistry, which could be research or medical service or whatever.*
>
> (A/I/p16p3L1)

This could possibly account for the more structured CBL forming a link between content covered and cases and the role cases play in training students of professional qualifications. Prince and Felder (2006) believe that in analysing and solving complex, authentic cases, students are exposed to the dilemmas that they will face in their professional lives where they gain both theoretical and practical understanding of their disciplines. Fitzgerald et al. (2007) points out that the experiential component and practice opportunities are one of the most important components of a Pharmacists undergraduate training. Within the pharmacy curriculum case studies in lectures and hospital ward-rounds provide this. It is during this period that students are exposed to "the most powerful example of what it means to be a pharmacist, how the profession works, how knowledge is applied, how to act in a professional manner etc., in a real setting" (Fitzgerald et al., 2007, p. 36). Midra's comment below echoes this:

> *Many times students when they're on the ward-rounds they see drug interaction, they pick it up and then that's excellent exposure for them because you will never learn that in the classroom and the cases they see are very random…almost every patient in a public hospital is HIV plus something so although its HIV plus something and you look at all the drug interactions, other stuff, other medication, so they look at that, they see what case is available when they go there. So it's not something that they can pre-prepare for.*
>
> (M/I/p5p3L1)

8.4.2.1 Decision making and multiple options

CBL exposes students to clinical decision making and justification for the decisions they make, preparing them for their profession. Self-directed learning and accountability are just some of the lessons that are imbedded in the pharmacy curriculum and pedagogy as indicated by the Pharmaceutical Care modules below:

> *So then we've done breast feeding but just the basics in our notes and then I brought in a journal article on the effects of feeding and formulae feeding on the effects of transmission of HIV.*
>
> (M/I/p3p5L9)

> *So then again the question there was to breastfeed or not to breastfeed. So then they had to then debate that within their groups and then say why they were in support of breastfeeding if the mother was HIV positive and why …so they had to bring the science behind that and evidence. They had to refer to this journal article and then they had to say why. They had to substantiate their decision. And then we brought it to the floor and everybody had their say and why they said yes or no.*
>
> (M/I/p3p5L1)

Riza's case study below also indicates multiple responses to a particular case, stating that there are no real "right answers". Students respond to cases in various ways depending on their personalities, backgrounds and values. Riza illustrates in her approach below, how she deals with these varying approaches:

> *If it's abortion, you'll find that people have varied opinions so so what happens that in a group now you'll have some people with one opinion and somebody will tell you something else but there are no real right answers. Because I mean, some people will promote abortion and may say ok if somebody comes in for the pill, the morning after pill they will sell I it. Whereas somebody else will tell you that they won't sell it because it's against their religion, their belief or whatever. So so you weigh the both and see what's best for the patient, you know. Or and then and then you'll try and direct them that at the end of the day its always the patient's interest so if you have those type of reservations its not to actually be judgmental on the patient but rather to refer them if you don't want to do it.*
>
> (R/I/p3p4L11)

Kaddoura (2011) points out that CBL provides a learning platform that mirrors the decision-making process required in the clinical environment, thereby assisting students to realise that learning extends beyond the goal of learning for purposes of assessment (which echoes Zodone's comments in Chapter 7 about pharmacy education linked to lives and goes beyond just assessment). Khan et al. (2013) also shares a similar view, believing that cases based on real-life, authentic examples which are closely linked to professional encounters prepares students for what is expected in the future. It also results in an appreciation for clinical and practical aspects prior to fully entering professional life.

Maton's work on professional education, authentic and cumulative learning may provide insight into the relationship between real-life, authentic cases and learning as mentioned above by many authors. According to Maton (2009) professional education has been affected by "authentic"

learning, where it is believed that in order for students to transfer their knowledge to contexts beyond education, they need learning tasks that represent the realities of practice. A similar point is made by Thistlethwaite et al. (2012, p. 434) where CBL is defined as preparing students for clinical practice, through the use of authentic clinical cases which link theory to practice through the application of knowledge to the cases. Their systematic review of 104 studies in the professional field, however, is heavily weighted in the field of medicine (70% medically related professions) with only two pharmacy studies included. While the majority of cases in pharmacy may lend themselves to being clinical in nature, pharmacy curricula consist of clinical, pure science and social components as previously covered.

Related to the aspect of CBL and decision making is the outcome and responses to CBL. Kaddoura (2011) mentions that one of the strengths of CBL is that it allows students to critically assess situations and evaluate and propose several solution, rather than reaching one correct answer. Kaddoura (2011, p. 13) points out the need for well designed cases, where problems are an accurate representation of the "complexity and ambiguity of the practical world". CBL provides an opportunity for students to engage in questions, responses, discussions and debates in various situations, as seen, in Pharmaceutical Care and Law and ethics where ethical debates around issues of abortion or immunisation take place, which does not usually result in a single correct answer.

> *I always believe that when it comes to them telling you what drug it is that can be can be very many drugs on the market…choice and empirical management and that's what doctors will do. No two doctors may give you the same antibiotics but in terms of us now when it comes to our students the one thing I will always tell them is as long as you don't kill a patient you will not get it wrong and you know you can justify rationalise why you gave that drug to the patient is fine.*
>
> (R/I/p12p4L5)

8.4.2.2 Integration of knowledge

Numerous of the pedagogical practices in the pharmacy modules serve to create an authentic learning environment through different components of the module (lectures, tutorials and practicals) and using a variety of resources and approaches. Common to other approaches, CBL shares in strengthening the link between theoretical knowledge and its practical application. Khan

et al. (2013) talks about how active learning and enquiry based learning such as PBL and CBL have resulted in more integration and blurred lines between the way theory is taught and practiced. They attribute advances in medical and pharmaceutical sciences for the change in clinical practice, teaching methodologies and the move towards PBL and CBL (Khan et al., 2013). While classroom-based teaching allows for the presentation of factual material in a logical manner to stimulate critical thinking, it has also been criticised for passive learning and limited communication, making way for PBL and CBL *(*David & Dianne, 2009*).*

Osinubi and Ailoje-Ibru (2014) make a similar point, describing CBL as promoting the integration of knowledge and practice and facilitating collaborative and team-based learning, in both their academic and professional lives. Authentic cases increase the chances of students transferring their learning from one setting to another (Weiss & Levison, 2000). Case-based learning therefore affords lecturers the opportunity to combine pharmacological concepts pertaining to diagnosis, prevention and treatment in a holistic approach in preparing pharmacists for professional training. Case studies in lectures address diagnosis, prevention and treatment, similarly or mirroring this in the practical component of ward-rounds and the thread continues through to SOAPE notes and presentations of clinical cases. The format taken in SOAPE notes and presentation follow diagnosis (which is then further separated into objective and subjective data), treatment and management. CBL extends beyond the present case to include knowledge learnt about drugs, adverse effects, best route of administration, as well as impact on human health and how the various systems in the body function. It requires a deeper understanding of the medical condition and evaluation of prescribed medication in assessing the best treatment and management of the individual. This follows closely the seven integral steps described by Lynn (1999) in Prince and Felder (2006): 1) review of the case content 2) statement of the problem 3) collection of relevant information; 4) development of alternatives; 5) evaluation of alternatives; 6) selection of a course of action and 7) evaluation of solutions, and possibly review of actual case outcomes.

8.4.2.3 Communication, confidence and team players

Academics believe that CBL improves communication skills, boosts confidence and allows students to become team players. Through the use of CBL students are exposed to situations which require verbal responses that require a combination of disciplinary knowledge and language and the communication skills to use this in practical settings with patients and in teams with other health care professionals.

> *You don't always know the language of the discipline and in that way they learn the language of the discipline. In that you refer to because students might think in some way and then they say something and you understand what they mean but it's not correct when they go out there and talk in that way. So they have to learn to use the language correctly when they interact with other professionals. So and that it is also I think because of the case because they talk and they learn how to talk in that way.*
>
> (Z/I/p10p1L8)

> *Then for the tutorials we generally ask students to present on that case. The role of the supervisor or the lecturer in that regard is then to listen to the presentation, ask questions about that specific case and then also to guide the student, to make sure that the student understands the case completely. It also allows student to learn to speak in front of other people, to learn to speak in a scientific sound way.. and I would also then say to gain self-confidence to talk about a case because when they go out to do their internship and comm. services they're exposed to these cases all the time, not necessarily in the pharmacy but when they go on ward-rounds with somebody else because they are the experts on medical usage, they also provide the input there.*
>
> (N/I/p4p3L8)

Training pharmacists for communication has been identified as an area requiring more attention by the FIPEd Global Education Report 2013 and plans are underway to address this issue with the possible aim of incorporating components dealing with communication day-to-day skills for practice, human relations and customer service within the pharmacy modules provided. Ofstad and Brunner (2013) also call for the implementation of these skills into the curriculum and classroom rather than waiting for them to develop later in the working environment. Although CBL is not a formal communication module, it does provide some development of communication skills and exposure to oral presentations of clinical cases prepares students and strengthens their confidence.

8.5 Towards a description of CBL within pharmacy education at UKZN

Given the variations of "cases" and the nature of CBL based on disciplinary knowledge or pedagogical purpose within modules in pharmacy education alone, perhaps a universal definition of case or CBL may not be possible or practical but rather a description of CBL within a particular context may prove more useful. A single description within the pharmacy terrain may not encompass all pharmacy specialisations or disciplines (as these have been shown to vary, ranging from very structured approaches to less structured types) but will at least provide a starting point. To this end CBL in pharmacy education at UKZN is characterised by being a structured active learning strategy, containing authentic, real-life cases or problems which mirror the world of work in order to develop students for decision making, cumulative learning and professional practice. The cases vary depending on the discipline, pedagogy and how they are employed, stretching across the continuum between structured and unstructured, extending beyond confines of physical spaces (lectures, tutorials, or hospital ward-rounds), student numbers (small group sizes or within lectures) and clinical focus.

8.6 Theme 2: Integration in pharmacy

8.6.1 What is integration?

Pharmacy as a field comprises of applied sciences built on the foundation of numerous individual science disciplines which are often kept separate. Husband et al. (2014, p. 2) describes this curriculum design as not being "naturally" integrated as the various disciplines spread out in terms of content and pedagogy. There is growing support for an alternate approach which involves integration (Husband et al., 2014; Ratka, 2012; Speedie, Baldwin & Maine, 2012). Husband et al. (2014) describes integration as the strategic combination of individual disciplines to form a cohesive whole while Speedie et al. (2012) views integration more as a threading together of biomedical and clinical science knowledge with appropriate application throughout the curriculum (Speedie et al., 2012). Speedie et al. (2012) also introduce a technological dimension in their conceptualisation of integration describing integration as curricula which combines basic sciences, clinical science, humanistic studies and technology for covering core knowledge and small group application exercises. Waterfield (2010) views integration from the perspective of breaking down boundaries between pharmaceutical science and pharmacy practice, with integration enhancing relationships and "cross border links" between society and science.

Boschmans (2014) from NMMU shares a similar view, defining integration in the curriculum as the removal of discipline barriers allowing students to make links across the curriculum. Macleod (1996) in Katajavuori, Lindblom-Ylanne and Hirvonen (2006, p. 457) describes theoretical knowledge as being "embedded in the practical context and becomes part of knowing-in-practice" pointing to their interrelated dynamics and inherent integration already. Growing support for integration would see the move away from the existing pharmacy curriculm characterised by strong classification and framing (collection code) and towards an integration code which sees a weakening of boundaries/insulation between classification and framing.

While the term "integration" is widely used and supported in the literature, there are multiple meanings and interpretation as demonstrated above. Husband et al. (2014) distinguishes between vertical and horizontal integration, along with providing theoretical paradigms (constructivism, andragogy and meaningfulness in learning) that possibly underpin curriculum integration. In the case of horizontal, integration takes place within the same level of the programme[51], while vertical integration functions as a process of starting at one level which is extended through other levels of the program (Husband et al. 2014). Vertical integration can also be used to link a topic between academic years as pointed out by Nelson et al. (2013) in their use of the example of hypertension which is first introduced in year one and revisited and expanded on in year two. This concept of vertical integration also extends to the relationship between fundamental, discipline specific knowledge and professional practice (Husband et al., 2014). It is believed to assist students through constant and cumulative knowledge building to move beyond their novice beginnings towards expertise (Nelson et al., 2013). Harden (2000) does not differentiate between horizontal and vertical integration but rather presents a more detailed taxonomical account of integration with his eleven step integration ladder. This organising or categorising tool highlights the continuum between disciplines and integration. While the ladder was developed from a medical perspective, it has merit and applications in other fields as it describes features of disciplines and changes as they move along the integration continuum in terms of their identity, boundaries and relationships.

[51] For an example of horizontal content integration refer to Nelson et al. (2013, p. 558).

8.6.2 Why integration?

The field of pharmacy (as previously discussed in Chapter 5) is affected by external and internal factors or a combination of both. The FIPEd Global Education Report (2013, p. 27) promotes an integrated undergraduate curriculum, believing that this will allow professionals to contextualise their learning and apply their knowledge in practice. In South Africa, while the SAPC directive for curricula change set in motion curriculum evaluation and the generation of ideas for curriculum change, integration and prescription of how integration would unfold did not feature. However, some higher institutions within South Africa offering the B. Pharm degree used the opportunity to move towards a more integrated approach. This differs from other countries and contexts, where external forces dictate the move towards an integrated curriculum such as in the United Kingdom where integration is driven by the General Pharmaceutical Council's 2010 education standards that specifically calls for the implementation of integrated curricula (General Pharmaceutical Council, 2010). In the sections to follow, academics share their views on curriculum integration in terms of disciplinary content and at times pedagogy.

8.6.3 Integration at UKZN

Trends in integration in pharmacy at UKZN will be explored, ranging from current practices and types of integration to possible thematic integration in the future, along with the vision of team-based integration. Integration at UKZN has been grouped under the following sub-themes and it is acknowledged that these do not exist as separate or isolated categories in practice but are interrelated. Academic accounts of the current curriculum and reasons for the move towards integration will feature within these subthemes.

8.6.3.1. Integration within major pharmacy disciplines

Historically higher education has viewed theoretical knowledge and practical knowledge as being opposites, with the norm of higher institutions favouring scientific knowledge and skills over professional knowledge (Katajavuori et al., 2006). More recent debates and discussions in pharmacy, despite being about integration, have also evolved around whether emphasis should be placed on the science or practical application of the sciences (Husband et al., 2014) rather than seeing them as complementary or supporting the "use and applicability" of each other (Katajavuori et al., 2006, p. 441). While scientific knowledge is core in pharmacy education, it

can sometimes be considered less important than practice and professional (clinical patient practice) component of the curriculum (Waterfield, 2010). This, however, was not the case at UKZN, where academics valued both. There is agreement amongst academics about the role of the scientific foundations and linking theoretical knowledge to practice. While Young and Muller (2014) point out that to make a divide or distinction between knowledge and action, especially relating to professional knowledge would be counterproductive, the separation of knowledge and practice here emerged from academics' personal accounts of how they see these operating or the nature of their relationship. Therefore in order to maintain the integrity of the data, these have been described as separate. Pharmacy academics at UKZN have made references to theoretical knowledge and its applications within their respective modules on numerous occasions. One such an example is illustrated below:

> *Today I'm going to show you how to use our theoretical knowledge of the chemistry, drug design concept, to apply such knowledge into a real drug design case, so by the end of today, you guys, have a plan for designing a potential drug.*
>
> (A/L/p1p1L3)

Pedagogy in pharmacy is based on practical applications of theoretical knowledge and the way the modules are taught reflect this, with largely didactic lectures followed by tutorials and laboratory work for practical application. The move towards CBL, as discussed earlier, is an example of integrating theoretical and practical application within lectures and weakening the boundaries that usually separate them, through pedagogic intervention. This type of integration was also observed and also confirmed through academics as a common practice in which they try to integrate theoretical knowledge with opportunities for application. These opportunities presented themselves within lectures (CBL) as well as other components of the module (practicals, counselling sessions, externship and internships) and served to strengthen theoretical knowledge. Both these types of integration can be described as horizontal, as they work across the same level, within a module and sometimes across the components of a module. Examples presented previously from third year Pharmacology and fourth year Pharmaceutics display this more integrated approach between the traditional components of modules, by combining lectures and tutorial sessions possibly indicating the intertwined and connected nature of knowledge and practical applications.

Loughran and Berry (2011, p. 75) warn against a "routinised approach" of practical work which results in a loss of engagement and thinking. They call for a reconceptualisation of practical work to move students beyond perceiving these activities as tasks but rather inculcating enquiring minds and viewing the practical component as an important learning experience (Loughran & Berry, 2011). Although their study is in the context of secondary schooling science, it exposes the dangers of integration for the sake of integration within higher education.

8.6.3.2. Integration between major pharmacy disciplines

Current trends at UKZN show little to no integration between the Pharmaceutical majors of the curriculum. As previously mentioned (in Chapter 7), while there are overlapping content, or sections these are dealt with independently within modules, each with its own perspective, content and pedagogy. The overlap of topics or sections within topics in Pharmacology and Pharmaceutical Care (presented in Chapter 7) illustrated this. This type of integration on the continuum can be characterising by the first two steps on the bottom of Harden's (2000) integration ladder: isolation and awareness (Appendix 20). Isolation, as the name suggests, is depicted by separate delivery and assessment with each discipline or subdiscipline. Each discipline displays autonomy rather than focusing on the composite picture or entire curriculum. Awareness differs from isolation in that although the disciplines are kept separate, there is awareness about what is covered in other disciplines and cross referencing may occur preventing repetition (Harden, 2000). Currently at UKZN integration does not take place to this extent and while certain academics may be aware of what is covered in other modules, it is not for the purpose of cross referencing and removing duplication. Instead academics, like Zeta (below) indicate a preference towards greater integration, citing that this approach is what is needed in order to avoid repetition.

> *I feel that I have to do, teach them things twice and I think other people as well. If I teach them drugs used in the making of migraines I have to teach them what a migraine is but when the other person in Pharmacy Practice teaches them how to manage a migraine she also teaches them about the drug used. So you know we both do the same thing double and it's a waste of time so if we have one topic say pain and inflammation, I teach them the drug, she teaches them the rest and we have extra periods that makes more sense to do it in that way.*
>
> (Z/I/p5p5L1)

Pharmacy academics responses for the movement towards integration is driven by the need for students to see the relationships and interrelated nature of knowledge, the big picture while at the same time avoiding duplication and saving time for higher order learning. Guile and Ahamed (2010, p. 13) found that students felt that they were unable to link their academic training together because the different disciplines were taught in "silos" and without cross referencing in teaching or assessment. Stull and Carter (2002) highlight the benefits of integrating curricular content which include illuminating the concept studied in relation to a theme or problem. Zeta's example indicates this integration under the common theme of pain and inflammation. Zeta's comments also highlight a related form of integration, pointing to team-based integration which will be discussed in more detail later.

Integration focuses on both the vertical and horizontal relationships (between disciplines on the same level and at different levels) rather than isolated modules or disciplines operating within silos. Integrated curricula are beoming popular in pharmacy curricula and are believed to allow students to make links between various disciplines and foster and develop inquisitive pharmacists capable of scholarly thinking (Speedie et al., 2012), which is in line with pharmacy wanting to create professional pharmacists who are independent, active researchers and life-long learners. van Dyk (2014) from the North-West University believes that students who complete their revised and more integrated curriculum will be capable of functioning as seven-star pharmacists (care-givers, decision-makers, leaders, managers, communicators and life-long learners and teachers).

8.6.4 Integration during experiential learning

Most academics at UKZN claim that individual modules move towards integration during Pharmacy Practice.

> *Pharmacy Practice is the only specialty, we call ours specialties right, it's the only specialty that integrates your knowledge from all your majors. Because when you are standing there with a patient, lets stay for instance at a hospital bed, you have to know your pharmacology, you have to know your pharmaceutical chemistry, you have to know your pharmaceutics because of your dosage forms and which are the routes of administration. Your pharmacology will tell you the thermodynamics of the drug that is being administered, your pharmaceutical chemistry, you'll know the structures of the drug and things liked that. And then pharmacy practice all the knowledge we're learning about in pharmaceutical care about the different disease conditions*

itself. So pharmacy practice is the only one subject or specialty that brings together all the majors because that actually makes you a good, well-rounded pharmacist. You can link all that knowledge but when you are learning it from first year to fourth year, all your majors are learnt independently and they all come together when you're doing pharmacy practice.

(M/I/p7p4L5)

If you are presented with a script that your job starts the moment someone hands you a script and then from there you start with the law basically because you're looking at the authenticity of the script and then you go on to evaluate the script for, you know, for therapeutically. So you do a therapeutic evaluation, you'll check for the appropriateness of the drug to give relief, then you'll look at all the number of drugs, you'll look at the drug interaction, using your pharmacology, you know. Then you'll check for the route of administration, the dosage form, that's your pharmaceutics, you know, so when you're practicing as a pharmacist, you're using all your knowledge. Pharmacy Practice brings the law together.

(M/I/p7p5L5)

This account of the role of pharmacy practice bringing together the various disciplines or majors is evident from ward-round observations and student presentations thereafter. Asiri (2011) described the purpose of the pharmacy practice component (experiential learning, externships, internships or rotations) as serving to familiarise pharmacy interns with certain practice skills. These rotations include: inpatient pharmacy, outpatient pharmacy, drug and poison information centers, patient counselling, clinical pharmacy practice, quality control of pharmaceutical products and industrial pharmacy. Shulman (2005a) describes how pedagogical approaches are linked to professions and how hospital rounds are characteristic of medicine, a similar trend which is noted here for pharmacy which is not unexpected considering the clinical role of pharmacists and their responsibilities in terms of patient care.

The topic of integration raises several issues, one of which is how to best achieve the multidimensional goal of integration and join together the foundations from science, the social and behavioural sciences, skills and the application of theoretical knowledge. According to Husband et al. (2014) this would be characterised by a combination of horizontal and vertical integration, especially in terms of the knowledge and professional practice.

Integration of knowledge and practice or experiential learning varies (Appendix 1) with regard to not only when it is sequenced within the curriculum but also with regard to its duration and

where implemented. Some studies are supported by theoretical underpinnings for rationalisation of early experiential learning while others do the same for late experiential learning, which demonstrates a traditional design and perhaps adherence to this design can be attributed to its historical use. Guile and Ahamed (2010) refer to two different practical experiences terming these single practice placement (SPP) (where practical experience occurs at the end) or dispersed practice placement (DPP) where practical experience is spiralled through the curriculum occurring at different time and lengths, Typically these varied approaches are grouped into two models of experiential integration for convenience in this study: early and late experiential integration, with the former including not only early introduction but the continuous integration or threading of practical training throughout the curriculum.

8.6.4.1 Early experiential integration

Early experiential learning is characterised by some form of externship, internship or practical application commencing to some extent in year one or two of the curriculum and threaded throughout the degree. These experiential or practical learning sessions can take place in a variety of settings including hospitals, pharmacies, clinics, community projects, schools or in individual homes. A literature review over the past decade showed that pharmacy colleges and schools have employed numerous methods of early or introductory practical experiences and these include: practice site visits, patient visits/interviews, blocks of practice experience shadowing and inter-disciplinary experiences to name a few (Stevenson & Brackett, 2011). While the pharmacy curriculum at UKZN mainly used ward-rounds, these appeared towards the latter of the curriculum.

Pharmacy academics at UKZN, however, indicate support for early and continuous integration threading throughout the years, a more vertical integration approach. Intertwined in these discussions is the aspect of professional development. Stull and Carter (2002) advocate for basic science, application and professionalism to be intertwined very early in the curriculum and that application and professionalism are ineffective if only applied towards the latter of the curriculum or during the experiential component of the curriculum. Fitzgerald et al. (2007) also shares a similar view that apprenticeship or externship should not be restricted to the end but rather support periods of practice and training being integrated throughout the programme. This is based

on their belief that a positive practice experience serves as a catalyst for increased student learning. Kember et al. (2008) and Guile and Ahamed (2010) also favour early periods of exposure to professional practice in professional programmes.

Speedie et al. (2012) are also in support of early and continuous experiential education which spans across different practice learning environments. They believe that learning and professionalism can develop from exposure to experienced practitioners in a variety of environments dealing with patients. While their work involved pharmacy at the doctorate level, some lessons can pertain to undergraduate pharmacy curriculum (Speedie et al., 2012). Katajavuori et al. (2006) expressed a similar view years earlier stating that experts need to work in different contexts and their study of the undergraduate pharmacy curricula showed how early practical training in Finland fostered learning and provided a basis for expertise development in the working environment. Their study also highlighted the effects of changing and splitting the training six month practice period from the end of the degree into two three month periods. One of these experiential periods or practical exposure was moved to the end of year one (Katajavuori et al., 2006). The inclusion of practical training into almost the middle of theoretical studies would provide students with the opportunity for application of knowledge, development of skills and expose them to the relevance and significance of practical application of theoretical knowledge (Katajavuori et al., 2006). Brown et al.'s (2009) innovative patient care project in the United States is one such example. The project was implemented early in the curriculum and provided students with the opportunity to focus on a specific patient and apply knowledge learnt in the classroom (Brown et al., 2009). Results from the study revealed an improvement in students' perceptions of the integration of knowledge to patient care as well as improved their emotiveness with patients.

Professionalism is believed not only to take place through experiential learning, with some institutions offering formal modules early in the curriculum to introduce students to professional aspects, these are introduced as early as year one, alongside the basics and applied sciences, with threading of experiential learning from year two through to year four (Anon, 2008).

8.6.4.2 Late experiential integration

Currently the undergraduate pharmacy curriculum at UKZN can be described by what Speedie et al. (2012) refers to as the layered approach or also known as the front-loaded curriculum. This approach sees the scientific foundations being firstly laid, followed by a period of application. Experiential integration generally takes place towards the end of the curriculum. This is similar to the undergraduate pharmacy curriculum in the United Kingdom as described by Husband et al. (2014) which comprises of the fundamental sciences at the beginning of the curriculum. Pharmacy practice features to a small extent in the early years which gradually increases as science content decreases with the progression of the qualification.

Pharmaceutics, Pharmacology, Pharmaceutical Chemistry and Pharmaceutical Care at UKZN are largely taught separately and generally come together in year four of the curriculum. Nardil's response to Pharmacology and its relationship with the other majors further confirms the current separation between Pharmacology and the other majors, while also pointing out the impending move towards integration, providing an example of how this may be translated in the future.

> *Currently they are quite distinct and kept separate but I know with the new curriculum that we are developing, we are trying to make it more integrated. Lets say in pharmacology we might teach the students about antibiotics, so if we want to integrate with other disciplines, we can for example bring in pharmacy practice to point out the practical aspects of lets say somebody is taking an antibiotic, the law in terms of the scheduling status of the antibiotic, pharmaceutical chemistry, the chemical aspects of the classes of antibiotic, the chemical structures, ability, synthesis and pharmaceutics the dosage forms. So, Ja, we are trying to move in that direction, where it is more integrated.*
>
> (N/I/p6p11L1)

While pharmacy practice is believed to integrate the majors, this takes place in terms of students making the connections rather than a formal approach. Integration at Rhodes University, which generally takes place in year three and four of the curriculum uses a more structured and varied approach to integration. In year three, all majors are taught in an integrated manner with biostatistics, whereas in year four the majors are taught separately in semester one, with integration taking place in semester two in the form of the Pharmacotherapy module (Walker, 2014). The extent of integration across majors or the type of integration receives no elaboration so it is not clear if a thematic approach is used.

8.6.4.3 Integration concerns

Inter-disciplinary degrees and degrees that support professional education are faced with concerns about integrating theory and practice within the curriculum (Guile & Ahamed, 2010). Researchers have recently identified that most degree programmes are based on two assumptions: one being curricula design and the other the outcomes of learning (Guile & Ahamed, 2010), with the former characterised by the "front-loaded" curriculum and the latter by the notion of transfer of learning.

The front-loaded curriculum has, however, been criticised for students' inability to make the relevant links between theory and practice. Nelson et al. (2013) however makes the point that there is evidence that an understanding of the basic sciences results in an improvement of clinical knowledge and also positively impacts on the accuracy of patient diagnosis which supports integration of experiential learning later in the curriculum. Brown et al. (2009) raises the issue of increased emphasis on the clinical side creating difficulties for students to connect the foundations (pharmaceutical sciences) to patient care. Concerns have also been raised about the risks of integration being superficial and occurring as a result of the sacrificing disciplinary depth (Husband et al., 2014). This view is also shared by Leng (2010) whose personal account of integrating disciplines, in a South African context, is described as sacrificing depth and detail. He argues that integration is a skill that cannot be taught but rather develops through students researching and compiling different resources in creating mental links that will solve the problem.

8.6.5 Towards Theme-based integration

This is largely described in the literature in terms of theoretical content, which in the case of UKZN would be the four pharmacy majors. During the time of the study, majors within the B. Pharm. curriculum largely operated individually, in a silo fashion and occupying the bottom steps of Harden's (2000) integration ladder (Appendix 20). Despite this design, most pharmacy academics in the study have mentioned, suggested and supported the move towards a more integrated curriculum in general and thematic integration in particular. Zeta and Zodone demonstrated strong support for integration not only of content but pedagogy as well, describing

a sharing of expertise across modules. This issue of team-based integration will be discussed in the following section.

Other South African institutions have adopted integrated themes in the curriculum at varying times and to varying extents. SMU and TUT adopted a thematic, integrated, PBL approach years ago (Enslin, 2008) with externships sequenced at the end of each academic year to link knowledge learnt for that particular year with practice. The thematic approach, however, has not been detailed. More recently in response from the SAPC other South African institutions have embarked on curriculum reform involving integration at times.

An integrated curriculum with team teaching has been adopted by NMMU and the design involves the integration of the four majors (pharmaceutics, pharmacology, pharmaceutical chemistry and pharmacy practice) into clinical pharmacy modules. Integration follows the threaded design starting from year one through to year four, with academics from traditional disciplines presenting the module together (Boschmans, 2014). North-West University (Potchefstroom campus) has adjusted their curriculum to increase integration between the various modules, in addition to introducing a fully integrated Pharmaceutical Care module in year four, second semester (van Dyk, 2014). This module uses case studies and scenarios requiring students to integrate their abilities and knowledge in order to solve the problems posed (van Dyk, 2014).

Zeta's example of integrating knowledge of migraines (below) is similar to the integration design at NMMU which integrates knowledge using disease states and associated management approaches (Boschmans, 2014)

> *And our main aim is that when I teach you about drugs used for migraine for instance in Pharmacology that the person in Pharmacy Practice teaches you how to treat a migraine, these are the signs and symptoms, this is the drug, they don't tell you about mechanisms of action but you know the drug already, that this is the dosage form. The person in pharmaceutics will tell you, you use that dosage for a migraine because of these and these things or reasons and chemistry feeds into pharmacology in that you give that dosage because its of its lipid solubility or it passes straight through the system so you can't give it orally or something like that. So that is the idea that we should start integrating it.*
>
> (Z/I/p5p3L3)

Pharmacy academics, however, support an integrated approach which covers themes of organ systems and diseases, similar to the approach used in medical education. Riza gives her account of both integration within Pharmacy Practice and the thematic approach which revolves around organ systems.

> *In pharmacy practice the divisions should come together because in pharmacy practice whatever they teach them in pharmacology you suppose to use that background knowledge to do an application in pharmacy practice. Whatever they learn in pharmaceutics in terms of formulations in drugs, tablets and all of that you are suppose to be using that in practice. Because they have to use all that knowledge in order to practice pharmacy but you find that the way we teach, we keep them separate, right! And we are now trying to go into a thematic approach whereby we are we are saying that you rather teach them in themes ..in the gastrointestinal system: pharmacology you learn the drugs for it, pharmaceutics, you learn maybe what kind of drugs interaction, all of these things, biokinetics you understand the kinetics which are both pharmacology and pharmaceutics, the chemistry is what type of molecule, what's the storage? What's the stability? Things like that so we trying to do the thematic approach.*
> (Z/I/p5p9L1)

While several academics have mentioned or referred to thematic integration, these could mean different things as various types of thematic integration exist. Husband et al. (2014) presents a more detailed and categorised approach to what thematic integration may encompass and these include discipline themes, organ system themes and problem-based themes. Currently UKZN falls within the discipline themes, comprising of separate subjects within the curriculum. Husband et al. (2014) points out that this traditional model is not void of integration and that this could vary within depending on the horizontal integration between disciplines. The types of integration UKZN academics have proposed sees a move away from individual disciplines to a more organ systems (gastrointestinal) or disease states and pathology (migraines).

Currently integration with regard to diseases or medical conditions and patient care take place during ward-rounds. Integration across various modules is evident in hospital ward-rounds where the details of the inner workings of the disease, symptoms and treatment are weakly classified as pharmacist access accumulated disciplinary knowledge and apply it to individual cases and patients. In the ward-round environments, which are recreations of the working worlds, specialisation between subjects are weakly classified, with no clear boundaries. Pharmacists in

ward-rounds have to access their intra-disciplinary and inter-disciplinary knowledge in addressing medical conditions, diseases and treatment options. The boundaries between Pharmacology, Pharmaceutics, Pharmaceutical Chemistry, Pharmacology and Pharmaceutical Care become more fluid as knowledge is extracted from each of the fields and recontextualised to apply to the case on hand. Knowledge no longer resides in compartmentalised sections or topics within the curriculum depicting a weakening both between and within specialisations. These weak boundaries are evident in comments made by the medical practitioner during feedback regarding issues of cholesterol or diabetes in patients as these underlying conditions have implications for treatment options. Blood sugar levels therefore moves beyond just objective data on the patient chart to its application in the holistic well being of the patient, affecting diagnosis and treatment.

Young (2010, p. 28) argues against a "non-subject-based curriculum" based on themes which results in the loss of discipline perspectives. In an interdisciplinary module, integration is to the extent that there is no reference to individual disciplines or their individuality expressed in the timetable, as is largely practiced in curricula today. Young (2010, p. 24) criticises this curricula approach on the grounds that it "explicitly blurs the curriculum/pedagogy distinction". Young believes that themes selected would be done so largely arbitrarily and may be reflective of teacher subjectivity and bias, rather than the specialist subject knowledge of teachers and researchers developed over time.

8.6.6 Team-based integration

Theme-based and team-based integration, although presented here as separate sections, do overlap at times. Extending to pedagogical approaches integration can also feature team-based teaching, an issue raised by Zodone in the study and a practice which is not uncommon in the literature.

> *Integrated learning for the students, collaborative teaching with other peers for your students is the best way to go.*
>
> (Z/I/p67p1L12)

> *For me in terms of where learning, the general learning and life is going I think it would be in the best interests of the students to have an integrated one. To have all our modules have a common feel where we can now bring each others expertise into the theme and teach this thing so that it's not abstract and it's not isolated.*
>
> (Z/I/p41p3L1)

Research based on analysis of poster abstracts published in the American Journal of Pharmaceutical Education revealed researchers and academics favour the integrated approach to learning with the specific integration of core basic and clinical science instruction in team-taught modules (Speedie et al., 2012). While UKZN pharmacy academics favour integration between the basic and clinical sciences, few envisioned and spoke of integration to the extent of incorporating team-taught modules.

> *So for me to do it with other experts in the area for example if I have a lecturer from pharmaceutical chemistry, a lecturer from pharmacology and a lecturer from pharmacy practice with me, we design a theme together and we will be able to teach it from second year through to fourth year… I think it's a good idea.*
>
> (Z/I/p41p3L8)

Zodone's comment contains all of the major integration types in pharmacy: theme-based teaching, team-based teaching as well as integration through the threading through curriculum covering both horizontal and vertical integration.

> *Maybe you have pharmaceutical chemistry and then you throw in some chemical issues that come from the drug. The pharmacology person I will bring in the toxicology perhaps or side effects from pharmacology can look at. And then you have the pharmaceutics that can look at either the design or the redesigning of the product rather not to cause the trouble or the effect that it's causing. And then of course you will have the pharmacy practice who will bring in how to counsel the patient you know about using that. So you have all their own experts to create a theme and that will allow the students to see oh okay this is how this entire programme links, this is me as the pharmacist not as the pharmaceutical person, as the pharmacology person or as the pharm. chem person. Because at the end of the day the majority of the pharmacists we are training they go to the hospitals there to practice. So for me integration is good for the benefit of the students practice. When they want to specialise in this, they need to come back to the area where they want to specialise but as a general pharmacist I believe integration could be good and I love it.*
>
> (Z/I/p41p3L18)

While team-based teaching has highlighted the role of content and pedagogical integration amongst academics, taking integration to another level, integration involving students and integrated models of collaborative care also feature within a pharmacy and medical context and is commonly referred to as interprofessional education or IPE. IPE involves either modules or year long collaborations with other medical professional students and often include integrated forms of assessment, indicating that integration is no simple matter but rather involves complex, interconnected relationships at various levels with an array of stakeholders.

8.6.7 Integration and assessment

Not all integrated content and pedagogy is accompanied by integrated assessment. While many studies have demonstrated integrated content across disciplinary fields, assessment does not necessarily include a blend or mixture of the disciplines. At UKZN while projects undertaken in the final year may require an integration of knowledge across disciplines, integrated design and marking of these projects do not take place. Perhaps with the move towards integrated majors, integrated assessment may also feature. Currently while ward-rounds may involve accessing interdisciplinary knowledge, assessment takes place within Pharmacology where ward-rounds are situated. At NNMU integrated assessment accompanies their integrated clinical module, where cross discipline knowledge in a practical setting is assessed (Boschmans, 2014).

Brown et al.'s (2009) year long study in pharmacy at a doctorate level reveals the workings of an integrated assessment in the form of almost a two step process project comprising of a series of continuous assignments culminating in the compilation and presentation of a poster which tied all the individual assignments into an almost whole (Brown et al., 2009). This collaborative, integrated project included ten academics from across eight disciplines with the team of academics assessing the assignments and the poster. Stevenson and Brackett (2011) described IPE implementation and assessment in the form of a rubric, along with detailed grading criteria across the integrated disciplines. Other forms of integrated assessment features compilation of professional portfolios (Anon, 2008) or reflective journals.

8.6.8 Moving towards integration

Most authors, either from the perspective of the challenges they faced or the limitations surrounding their integrative curriculum, provide words of caution. There are similarities in these messages, despite country and institution with most echoing the need for careful planning, sufficient resource provisions which are largely underestimated either in terns of human resources, time or financial implications. UKZN can learn from the research of others which have identified problematic areas with regard to integration (Pearson & Hubball, 2012). These include times, content and selection of content, issues of assessment and demands and workloads of staff involved. With the combining of academics from various interdisciplinary fields, the possibility of power struggles emerging also enters the mix. Like with the introduction of many other educational approaches, extracted from a different context, the lure and promise of greater, deeper learning and understanding needs to be carefully planned and designed before leaping into implementation.

8.6.9 Integration at UKZN: Present and the future

There is no empirical evidence to support claims that an integrated curriculum produces better graduates or professionals, however, there is overwhelming support within medical education and certain Health sciences for teaching and learning to promote integration (Husband et al., 2014). Currently at UKZN, there is limited integration taking place but growing support for its inclusion in future curricula is noted. With the various ways integration can take place as demonstrated in this study, it is more than an issue of integrating different knowledge types (science and clinical) and experiential learning or the sequencing of experiential learning in the curriculum, but how best to achieve integration in the minds of students. This type of integration occupies the top of Harden's (2000) ladder in what he calls "transdisciplinary integration" which speaks to the issue of professional development, where students are immersed in a practice situation and must integrate material from individual subjects in their own mind in order to demonstrate competencies (Husband et al.'s 2014, p. 4). Curriculum design and structure is important for integration "but ultimately integration takes place within the student's mind" (Husband et al.'s 2014, p. 1) raising questions on how academics and higher education can make this happen.

8.7 Summary

This chapter captured pharmacy academics' practices of case-based and team based learning and how these contribute not only to active learning but preparing students for practice and the profession. It exposes them to multiple decision options and working with other healthcare professionals. The theoretical and experiential relationship also featured strongly, along with academics views on why integration should take place. The issue of how integration could take place exposes the various ways and forms of integration within a pharmacy context, both locally and globally. These explored "front-loaded" curricula, "sandwhich" curricula and the early and threaded approach, concluding with an account of the extent to which integration takes place at UKZN and its possible expansion in the future.

Chapter 9
Developing the pharmacist and the professional

9.1 Introduction

Academic accounts of what students should know, possess, demonstrate, apply, be and become encompass a combination or web of complex, interconnected factors. This chapter will discuss what pharmacy academics at UKZN deem as being essential for students to possess or acquire as professional pharmacists. In addition, this chapter engages with the literature in more detail, discussing themes arising from participant accounts and moving beyond to touch on wider related issues. Pharmacy academics at UKZN have identified the following as playing major roles: knowledge and its application, communication skills[52], researching, and being a life-long learner, and being a team player. In addition, personal and professional attributes and values such as demonstrating empathy and ethics also featured. For simplification purposes, these factors have been grouped into two categories: knowing (knowledge and knowing) and possessing and displaying (skills, competencies, personal and professional attributes). Some issues such as those pertaining to knowledge and its application as well as aspects on professionalism, have featured previously. They are, however, a recurring feature in academic discussions on students' journeys from university education to the profession, and so they warrant consideration once again, with the focus here on developing professional pharmacists.

9.2 What does it mean to be a professional?

9.2.1 Knowing (Knowledge and knowing)

Several pharmacy academics at UKZN placed great emphasis on knowledge and its application as being one of the key components to becoming a pharmacist and a professional. They also made the point that it was more than just gaining or acquiring knowledge, but ultimately how it is used in pharmacist-patient interactions. Similar to Barnett's (2004) knowledge and knowing domain, reference to knowing here encapsulates more than just knowledge and includes the active engagement with knowledge presented (Noble et al., 2011), as well as its application in professional practice. Zeta's example below highlights this point, along with the interrelated relationship that exists between knowledge and skills.

[52] This study does not distinguish between language and communication.

> *You can't become a pharmacist without the knowledge that we provide. That's an integral part of being a pharmacist because you need to know the drug in order to treat the patient. Or you need to know the drug in order to know how the patient must take it. What we are teaching in pharmacology is applied, integral. I mean every part is integral but this is integral in managing treatment of the patient.*
>
> (Z/I/p14p4L1)

The importance of knowledge is shared amongst various researchers. Young (2010) believed that knowledge needs to be at the centre of concern if education is valued or has meaning in a knowledge society. Professions, by nature, are defined by the use of a well-defined body of knowledge and skills that are not offered elsewhere (Abbott, 1988). The nature of this knowledge was described by Abbott (1988) as academic and abstract, and by Tran and King (2011) as theoretically grounded and abstract in terms of its description and application to work. Jungnickel, Kelley, Hammer, Haines and Marlowe (2009) argued that societies awarded status and privileges to professions based on members within professions possessing this specialised knowledge and using their expertise to serve the best interest of the patient.

Waterfield (2010) highlighted the interwoven relationship between pharmacy knowledge and the profession, where these should not be seen as separate entities. He also made the point that knowledge associated with the profession cannot be accessed or developed without training and experience. Members of a profession are therefore in a position of having exclusive access to this "knowledge" and "skills" through qualifying examinations and regulatory boards (Tran & King, 2011, p. 282). This is consistent with the pharmacy profession where the educational process both introduces members to specialised disciplinary knowledge, technical know how and the profession, but graduates are only fully recognised after complying with SAPC rules and regulations, specifically the successful completion of the pre-registration examination.

In conceptualising knowledge and its role in higher education in general and professional qualifications in particular, it is important to remember the evolving nature of knowledge and the changing student demographics, and how these impact on pedagogical practice as illustrated below:

> *I mean the way we're teaching now is because of the students we getting Students change, knowledge changes. I expect in a few years time the knowledge the student comes in will be totally different from the knowledge that students*

> *are coming in with now. What's available to us, in terms of knowledge systems, now we have Moodle, we have the internet, who knows what we have available in the future. Like I said I love gadgets. I can't think that I would teach the same way in 10 years. It's very difficult for me to say how my teaching will change. It will obviously be influenced by a lot of things: how pharmacists change or the profession changes, my knowledge generation, what's out there, will we still have the internet. If we don't have the internet but a chip in our heads then I will teach differently…*
>
> (Z/L/p13p7L1)

Zeta's comment also raises the issue of changes in teaching and indirectly points to the discussion on teaching skills and competencies for the future pharmacists (which will be discussed further in 9.2.2). Katajavuori et al. (2006, p. 439) spoke about professionals and the pressure they are under to "continuously reconstruct their expertise and use their theoretical knowledge in the working environment". The development of expertise is a long process, during which theoretical, practical and metacognitive (self-regulated) elements of expert knowledge are integrated. This is in line with several researchers who agree that the purpose of pharmacy in higher education is to develop a competent pharmacist who possesses a combination of knowledge, competencies and skills, personal values, attributes, emotions, and professionalism (Motycka, Williams, Hogan, Gray & Hartman, 2014).

9.2.2. Possessing and displaying (skills, competencies, personal and professional attributes)

Two decades ago, Koda-Kimble (1995) described the successful pharmacists as the alphabet "T" indicative of both breadth and depth; breadth in terms of the range of skills that they would possess which overlaps with other health professions, but also depth with regard to their unique expertise in pharmacy. Today this is still relevant as seen above in terms of knowledge and the unique expertise that is required, along with the relevant skills and competencies[53]. Speedie et al. (2012) define competencies as learned abilities, which practitioners develop as a result of their education. Koda-Kimble's (1995) reference to a medical context includes the habitual use of knowledge, communication, skills and reasoning, values, emotions and reflection, believing that both scientific and clinical competence are necessary for clinical care.

[53] Skills and competencies are used interchangeably

Pharmacy academics at UKZN identified communication and interpersonal skills, research and life-long learning skills, emotive skills and being a team player as being important skills. The skills and competencies identified here are also consistent with numerous official exit outcomes and competency frameworks. Pharmacy education has numerous and a growing number of competency frameworks to define the core domains of knowledge and competencies which learners should possess (Speedie et al., 2012). Aretz's (2011, p. 610) table on global physician competencies covers many of these arising themes: expert knowledge, skills in communication and interpersonal relationships, professionalism which includes ethics and functioning or leading a team, and life-long learner. Similar skills are also covered under the CanMEDS frameworks, which outlines the roles of physicians and includes knowledge expertise at the centre, accompanied by role of communicator, collaborator, health advocate, manager, scholar and professional. The FIP Global Competency Framework also covers communication skills and professional and ethical practice under the broad category of Professional and Personal Competencies. In addition, the FIP framework covers three other major categories: Pharmaceutical Public Health Competencies, Pharmaceutical Care Competencies and Organisation and Management Competencies. The CAPE outcomes reflect the roles of educators, and collaborators, problem solvers and even managers (Ensley, 2013). Their reference to broader administrative and managerial roles or knowledge about health care systems, economics and public health, however, were not identified in the present study.

While many frameworks, studies and policies emphasised the importance of skill, Winch (2014) made the argument that skills are often misused to reflect any kind of practical ability and that the context in which it is used matters. He defined skills as the ability to perform a task in contextually relevant conditions, which is affected by restricting factors and circumstances. He also went on to distinguish between skills (almost mechanically carrying out a task) and transversal abilities (which include details of care and attention in performing tasks, unassisted). Winch (2014) believed that professional expertise or what he termed "occupational capacity" is developed through progressing from technique, skill, transversal abilities and project management abilities, but that not all of these steps necessarily occurred or followed a linear fashion. Knowledge is an integral part of all of these components and Winch (2014) believed that

it is the use of this theoretical knowledge to inform action, make decisions and demonstrate judgment that defines professional expertise (Winch, 2014).

In covering skills and competencies within this sub-theme that emerged, the focus was not on the exhausting debate around skills and competencies or covering the endless checklist of all those valued by the pharmacy profession. Rather the focus was on discussing the most important factors contributing to the development of the professional pharmacists from an academic perspective. Their importance is also linked to the way that they are also currently taught in the curriculum.

9.2.2.1 Communication and interpersonal skills

Communication is recognised as being an important skill for pharmacy students by most pharmacy academics at UKZN. Different countries and educational systems have different definitions of "communication skills", along with varying guidelines pertaining to their integration into the pharmacy curriculum (Wallman, Vaudan & Sporrong, 2013). Despite these differences a common trend emerging is that counselling patients appears to be crucial in all pharmacy programmes. Zeta draws our attention to this point below:

> *I think once again a pharmacist is someone who knows his patients and how to deal with patients. Because you sometimes get these brilliant students on the system but they don't have any interpersonal skills. I mean you can know everything, you can learn them like the bible but you may not be able to interact with patients, where a student who got through with 49.5 may have patient interaction. So I think that's what's important and we also try to teach them. Some of the pharmacy modules, the Pharmaceutical Care they do script reviewing where they talk to or have a mock patient …they talk to their patient. I think that you have to have the knowledge. I said they can pass with 49 but that's not actually true. You have to have the knowledge. Once again to my teaching, where I think my teaching is important is always to be willing to learn. To keep updated because if your knowledge becomes outdated, you will not be able to treat your patient to the best of your ability.*
>
> (Z/I/p13p1L2)

Zeta also highlighted the role of interpersonal and communication skills and competencies. This is in line with the changing roles of pharmacists, where counselling and patient education now

feature strongly as compared to previously. Ami indicated this transition when talking about her personal experience as a student and current trends:

> *It's changed quite a bit from our time as it has become more patient orientated and more counselling orientated I think. So I assume that it would carry on that way, it would be more towards like I would say primary health care, patients, you know things like doing more practical work with the patients as well.*
>
> (A/I/p28/p14L1)
>
> Interviewer*: When you say practical work with the patients?*
>
> *Like taking, you know with the blood pressure, you do blood pressure, HIV screening, things like that, cholesterol testing, I suppose we could go on a bit more if…[indistinct] would be given more space to do superficial skin diagnosis and simple things like that.*
>
> (A/I/p28/p14L6)

Ami highlighted the link between communication, skills and working with patients. Wallman's et al. (2013) research indicated that from a range of studies that the most common practice to reinforce pharmacy communication skills is the use of simulated or standardised patients. They also believe that this teaching tool of using simulated and standardised patient interactions remains underutilised in teaching pharmacists and developing their communication skills. While communication and interpersonal skills are important for developing professionals and these are mentioned widely in the literature, the term is rather broad and encompasses various stratifications. Wallman et al.'s study (2013) captured these differences quite well, dividing communication skills into oral and written. The category of "written" communication skills was thereafter subdivided into three subcategories: academic, clinical and reflective. At UKZN, ward-rounds, SOAPE notes, and written assignments, patient counselling sessions, and case-based learning exposes students to the former two types of written skills, however the reflective component is not strongly expressed.

Oral interpersonal communication skills are most common in patient interaction and counselling but pharmacists also require clinical writing skills (Wallman et al., 2013). Pedagogical approaches for these included patient interactions (stimulated or standardised) and pharmacy practice modules or experiential learning, such as those seen at UKZN. Pharmacy practice experience is an activity that features in most pharmacy curricula and always contains

communication skills training (Wallman et al., 2013). Communication with patients on ward-rounds at UKZN, however, is not stipulated or compulsory so practice varies amongst students, with generally limited interaction and communication. Some students engage in conversation with patients to further ascertain any relevant medical data (that may not be present in the charts), but most do not.

Shulman (1999) believed that learning thrives when it is in the open and shared in a communal fashion. He believed in the value of vocalising and exposing what students thought they knew in the presence of their peers. This process of testing, examining and challenging knowledge probably takes place before re-examination and internalisation occurs. Perhaps pedagogical approaches such as experiential learning components (ward-rounds and role play) provide not only the opportunity for developing communication skills and confidence, but should allow for an open and shared approach to learning. To some extent, this peer learning took place in ward-rounds and clinical presentations. Currently ward-rounds at UKZN does not exploit this sufficiently, as peer interaction is limited with only the presenters, and academics and health professionals commenting, while students watch passively. While time and resources are constraints, it does warrant further consideration in the future.

According to Thompson, Nuffer and Brown (2012), written and oral communication skills are considered to be two of the five considered important entry requirements for many American colleges and pharmacy schools. Their value spans from entry into the programme to outcomes within the programme and continues to be of importance in the workplace and clinical interactions. Wallman et al. (2013) argued for both the integration between different learning activities and progression within the pharmacy curriculum in order for communication skills development to being successful. Kovačević, Parojčić, Miljković and Bates (n.d.) indicated that several countries (United States, Canada and the United Kingdom, the Netherlands and Australia) have implemented curricula changes focusing more on patient care skills, communication, clinical assessment and disease management. Thompson et al. (2012) revealed that practising pharmacists employing graduates place great value on good communication skills and adaptability. Wallman et al. (2013, p. 1) described the role of the pharmacist as a

"communicator" of information and advice between patients, other healthcare practitioners, and the community as being a vital component of the responsibilities of a practicing pharmacist.

Midra illustrated the importance of this in the workplace and clinical interactions as well as highlights the multi-faceted role pharmacists play as communicators and educators, and also speaks to their social responsibility.

> *Everything is aimed at is the profession. It's not just having that knowledge but how to get that knowledge across because one of the most important roles of the pharmacist is patient education. Patient education is one of the most important roles because diabetic patient and you are now going to put that patient on chronic medication. It is now your responsibility to monitor that patient, to educate that patient on all aspects of diabetes, their diet, exercise, lifestyle, monitor them, teach them about if you got patients that are on insulin, teach them about the insulin pen, teach them about diabetic coma, diabetic foot ulcers so it's its patient education comes as one of the things at the forefront.*
>
> (M/I/p19p6L1)

Williams (2007), however, made the point that professional action entails a shift from pharmacists acting on behalf of patients, to acting with patients in dealing with therapeutic outcomes in the face of uncertainty and associated risks. Patient education, in a cooperative relationship with patients (convenantal relationship), is then about supporting and working with patients through their medical conditions, rather than just informing or directing them on how to take their medication (Williams, 2007). It points to the active involvement of patients and their role in the treatment process. Ensley (2013) believed that students must take on the roles of educators and advocates in the medical world, where knowledge of an interaction serves little purpose unless it results in change and educates a patient about the problem and treatment. Robinson (2004) took this role of educator a bit further, believing that it needs to be incorporated into formal channels, to the extent of exposing students to educational principles as they progress through their academic careers to assist with professional development.

9.2.2.2 Team player

> *You've got to be a good team player because the life of that patient is not only in your hands as a pharmacist, it's also in the hands of the nurses and the doctors and the physiotherapists, everybody around. So if there is anything that you feel wow this patient really needs in order to get better and not just get better, but get well, you've got to be able to contact those people that can help that patient.*
>
> (Z/I/p52p3L36)

The issue of strengthening relationships in teams has been proposed by many researchers in a medical and pharmacy context. The fundamental principles of IPE is that health professions students who learn together at the beginning of and throughout their training will be better prepared for an integrated model of collaborative clinical care after entering practice (Buring et al., 2009). Thistlethwaite (2012) shared a similar view, believing that part of the IPE rationale is to prepare students for navigating through professional roles and relationships within health care systems prior to graduation. Aretz (2011) placed this responsibility on education curricula to bring together health care professionals and relevant stakeholders in order to strengthen working relationships that benefit patients and health care. Thistlethwaite (2012) agreed, making the point that if students are expected to be familiar with teamwork, professional roles, and collaboration, then this needs to be built into the curricula, along with appropriate and effective pedagogical practices (Thistlethwaite, 2012). The WHO Framework for Action on Interprofessional Education and Collaborative Practice provides a plan for how interprofessional practices can work in a global context to transform health care systems. The framework is based on research evidence and examples of practices from around the world, and sends the message that in the current global climate, it is no longer sufficient for health workers to be professional, they now also need to be interprofessional (WHO Framework for Action on Interprofessional Education and Collaborative Practice, p. 36).

While IPE features widely in the pharmacy literature (Bridges, Davidson, Odegard, Maki & Tomkowiak, 2011), it does not form part of academics' pedagogical practices at UKZN and undergraduate pharmacy students do not work in interprofessional teams[54]. At UKZN, "group work" and "team players" were largely used to describe the relationship between students and their peers within the B. Pharm qualification. Pharmacy academics however, talk about

[54] Interprofessional teams are not to be confused with interdisciplinary teams.

interprofessional healthcare teams in the workplace context, particularly when referring to the importance of communication skills.

While recent trends show a move towards team-based learning, Guile and Ahamed's (2010) study from a student perspective revealed that they felt inadequately prepared for professionalism, working in teams and with other health care workers. Students attributed this to a variety of factors such as the way they were taught, their limited interaction with other health professionals, the limited practical experience and the lack or limited direct contact with patients throughout their training at university (Guile & Ahamed, 2010). While the ward-rounds at UKZN expose students to the practical context, they do not fully exploit interactions with other health professionals and patients. With the growing emphasis being placed on pharmacists for being members of health care teams, there is a need for greater interaction between academics, practicing pharmacists and other professionals as well as patients. This could take the form of collaborative ventures or a more conservative, consultative process, whereby academia does not have to relinquish any control or power but rather explore the benefits that greater or stronger links might bring.

Pharmacists' positioning between science and society and their relationships within interprofessional health care teams, serves not only to share knowledge and expertise, but creates the opportunity through practice and evidence-based research for pharmacists to contribute to knowledge production itself (Waterfield, 2010). Waterfield (2010) believes that this opportunity needs to be translated into the academia and higher education professional training, so that students are equipped with knowledge and skills to describe discoveries and integrate them into practices.

9.2.2.3 Research skills and life-long learning

Academics felt that being a researcher and capable of self-directed learning play a crucial role.

> *They need to have the research skills, they need to develop that during their years here because pharmacy is just not about dispensing because we have people that are in posts where they need to research a topic and present it. They need to have counselling skills, they need to have some type of psychology training because they are dealing with people all the time. Then they need to*

> *have I said good research skills, they need to have good communication skills when they're talking to their patients, they need to have good listening skills when they are listening to their patients when they're taking patient history and things like that. They need to have a scientific knowledge, when they're reading they need to know how to be able to extract important information, they need to be able to read something scientifically and understand the science in that context.*
>
> (M/I/p13p9L5)

Midra pointed out the need for research skills, as well as covers communication skills (discussed previously under 9.2.2.1), focusing also on the importance of listening skills and their role in patient counselling. Zeta highlighted the pace at which knowledge changes and that learning extends beyond academic qualifications, requiring life-long learning.

> *I think what's most important for me is the willingness to learn. As I said most probably why I teach the way I do because as I sit here there's always things that come up, new things in pharmacy, in pharmacology. I can't keep up to date with all of that and I can't teach them all of that. They learning now and in three years they are out there and things have changed already so if you can instill in them that they are life-long learners, I think for me that's the most important that they become life-long learners.*
>
> (Z/I/p8p5L3)

Jungnickel et al. (2009) believed that pharmacists will require a lifetime of self-directed learning in order to be viewed as pharmacotherapy experts by other health care professionals. Speedie et al. (2012) shared a similar opinion, stating that a continuum of learning and competencies includes being inquisitive learners and problem solvers.

Alben also raised the issue of the changing face of teaching and learning, as well as the influence of technology, in particular, on academic-student relationships, students' future roles and the curriculum.

> *You know at my time when the lecturer presents some topic we don't even have the access to have more understanding on the topic. So our vision was very limited and hence our contribution was very limited. But nowadays when you explain some topic to students they go the library, they surf the internet and they come up with new ideas, new topics and that's the way the students contribute to you. So it's different now so it's very important to have the students' contribution.*
>
> (A/I/p15p11L2)

Pedagogy and technology enable students to develop the ability to be researchers and life-long learners who do not depend on their lecturer for everything. Williams et al. (2013) supported the view that exposure to a range of teaching and learning activities at an undergraduate level (as seen at UKZN), has implications for career development. Consensus amongst education experts points to blended models of learning as being most effective, especially when they optimise digital access to content and provide students with continuous opportunities to apply knowledge in active learning and include reflection (Speedie et al., 2012). Ya-hui and Li-yia (2008) also made the point that life long-learning is about the practical value and application of knowledge and skills in relation to the evolving world, where skills go beyond being technical to include reflection and judgment.

In line with pharmacists as researchers and life-long learners, perhaps what is important or needed is a shift from all that students should possess and do, to how they will perform under uncertainty once their academic support and structure is removed and they find themselves in the working work world, making decisions that affect patients' lives?

9.2.2.4 Empathy and ethics

True professionals go beyond just knowledge and practice to incorporate a sense of personal and social responsibility which is characterised by integrity, responsibility and ethics (Shulman, 2005b). There is a move towards outcomes in the affective domain, which seeks to define the more intangible qualities that are important for pharmacy practice and for graduates to be successful pharmacists (Ensley, 2013). This is best described by exploring the caring dimension; as Peabody (1927) in Aretz (2011, p. 612) stated that "the secret of patient care is caring for the patient". Nimmo and Holland (1999, p. 1983) in Williams (2007), highlights the "moral dimension" as a characterising feature of being a member of a caring profession such as pharmacy. They described professional competence as the sum of skills, professional socialisation and judgment (Nimmo & Holland, 1999). It is the exercise of this professional socialisation (comprising of attitudes and values) in decision making that distinguishes professionals from technicians.

Hassali et al. (2011) believed that behavioural sciences and health psychology are necessary for future professional pharmacists in light of this increasing interaction with patients. Future health care will revolve not only around the clinical origin of disease and treatment options, but also the accompanying social and behavioural dimensions. Empathy is one of the attributes that Zodone believed to be extremely important for professional pharmacists:

> *Yes, be able to show empathy because when a patient walks into your pharmacy and for me I look at my students from …[indistinct] If I am that person how would I want to be treated. How would I want to leave this pharmacy, do I want to leave happy, fulfilled…*
>
> (Z/I/p53p3L1)

The value of empathy and ethics in developing the professional pharmacist has been identified and covered within global competency frameworks, and is also a key concept within the communicator role in the CanMEDS Framework. Katajavuori et al. (2006) revealed that apart from good communication skills, students believed empathy and understanding were key when counselling patients and clarifying their symptoms for proper diagnosis. This was supported by Speedie et al. (2012) who also cited empathy amongst social responsibility, team work and leadership as being crucial to the development of professional clinicians. Thompson et al. (2012) indicated that the characteristics of being patient and empathetic are particularly valued in retail pharmacy, and in varying degrees in other pharmacy settings. Brown et al. (2009) believed that inter-professional education increases students' ability to demonstrate empathy with patients. Although Vogt and Finley's (2009) study was based on the doctoral degree in Pharmacy, they also made valid points regarding the humanistic values of the heart in pharmacy.

Zodone indicated that professionalism and aspects such as ethics are not something that is formally included in her lecture notes, but they are something that she tries to instil in her students. Motycka et al. (2014) also said that professionalism is not something that can be learnt from a theoretical perspective only or from textbooks, and argued that the first years of pharmacy academia are vital for developing professionalism (Motycka et al., 2014). Professionalism is also best developed through practice, experience and exposure to role models. Jungnickel et al. (2009) claimed that experiential education develops professionalism through observing and participating with pharmacist role models and other health professionals.

Riza took a different, more formal, approach to teaching ethics, as she spoke about arranging her content around themes to cover issues of ethics and confidentiality required for professional pharmacists:

> *Like say I will tell them. I'll give them different themes. So lets say I am doing something in ethics or maybe I am doing something on confidentiality and talk about a case where there is a pregnant women or somebody I mean that is coming in for a pregnancy test or an HIV test and whether you would share that knowledge with somebody else without the consent from the patient.*
>
> (R/I/p3p4L2)

There is general consensus amongst pharmacy academics at UKZN regarding the belief that most skills, competencies and behaviours can be learnt, thus suggestions from Motycka et al.'s (2014) and others may have some merit and spell different pedagogical practices to address this. These include students reading four short stories that focus on professionalism, followed by subsequent group discussions on their relevance to practice (Bumgarner et al., 2007). Another approach for cultivating professionalism early in the curriculum includes the introduction of Introductory Pharmacy Practice Experiences (IPPE) within an actual health care environment. Brown (2009) believed that the application of learning in IPPE will create a better understanding of professionalism and improve self-confidence. Grace (2014) argued for an inclusive education, featuring compulsory programmes which tackle the political, social, moral and ethical dimensions related to professional practice in order to develop professionals. An education that narrowly focuses on technical training will reduce professionals to functional technical experts who are void of ethical and moral responsibilities (Grace, 2014).

Guile and Ahamed's (2010) work from students' perspectives revealed that they experienced difficulty in relating theoretical knowledge to practical contexts from modules offered such as law, ethics and communication which raises questions about the best way to incorporate these into the curriculum. Should these be embedded within scientific and clinical modules, partially embedded or kept separate? It is thus more than just identifying a skill, but seeing how it fits into the curriculum and the pedagogy best suited to teach it.

9.3 Academics, pedagogy and the profession

Similar to the discussions and divergent viewpoints around when to introduce experiential learning in the curriculum, the question arises when and how to incorporate the aspect of professionalism in the pharmacy curriculum. Equally vague is who is responsible for developing professionalism in students. Some believe that this hefty task lies in the hands of academia, while others believe that *in situ* contexts provide the best learning and growing experience in a community of peers and practice. Yet another group feels that it is in the collaboration and links between academia and industry that professionalism can flourish. Few studies consider the role of the student in the process and holding them accountable for playing an active part in their professional development (Motycka et al., 2014). While pharmacy academics may be responsible for teaching and conveying professionalism, Motycka et al. (2014) placed the responsibility on students to cultivate and display professionalism acknowledging that it is a process and that students must continually strive to display the traits of professionalism.

Pharmacy academics at UKZN teach aspects of professionalism to their students in isolated pockets within their modules, as well as formally within avenues such as debates and counselling sessions; it resembles almost a patch work of different aspects with no united plan. Certain professional practices, are however, covered in the Pharmaceutical Care modules.

> *In terms of attitude, in terms of care, in terms of ethics, without your patient there will be no product. So that is now more in pharmacy practice, the way you are now practicing the art of pharmacy. How do you function, do you want to function by just pushing a product down the patients' throats or do you want to function by knowing your patients, by coming down to the level of your patient, by understanding what is really wrong with your patient. By understanding who your patient is so that you can sell your products to the right patients.*
>
> (Z/I/p64p5L1)

A mixture between the role of academics and students in developing the professionals is evident at UKZN, with a strong leaning towards power in academia over workplace. The ward-rounds are organised and implemented by the academic institution, with little input from workplace settings, along with few team-based activities or interactions with other health team members. Pharmacy students seem to largely rely on academia and staff for building their conception and developing professionalism. Another key factor of professionalism is reflection, which takes an indirect form

in the assessment of ward-rounds and student presentations where students are forced to think about their clinical cases and the decisions they made during the questioning session in the presentations. But does this provide sufficient time and place for reflection?

The question of how pharmacy colleges and schools can develop professional character in students leads to much debate. Some are of the opinion that students cannot be taught these traits and that they are already present upon entering higher education (Jungnickel et al., 2009). Jungnickel et al. (2009) acknowledged that while this may be the case, the process of professional socialisation however, requires that students are exposed and learn the professional behaviour, values and traits that accompany the academic component of the qualification. Based on historical longitudinal studies in nursing and the medical field, the socialisation process was influenced by role models and the environment in which they learned, along with the prior traits and values students brought with them (Jungnickel et al., 2009). The authors used this research to make the argument that professionalism should be included as an essential part of pharmacy programmes, and that the development of professionalism can take place through various pedagogical approaches outlined by the white paper on pharmacy student professionalism through educational and experiential practice (Jungnickel et al., 2009).

Jungnickel et al. (2009) supported early exposure to experiential learning in the curriculum because participation in patient-centered care has a much greater impact than observation and passive learning on professionalisation. Motycka et al. (2014) shared a similar view, arguing that students should be introduced to professional practice in the early part of their curriculum, rather than the traditional approach where the majority of experiential learning takes place towards the end of the curriculum. They also recommended formulating a concise definition, perhaps unique for each institution, but which serves as a common understanding for both academics and students preventing mixed signals regarding what constitutes professionalism. This was supported by other studies, for example Guile and Ahamed (2010) revealed that academics felt that the concept of professionalism required further exploration and understanding.

Academics need to address professionalism with students, because while professionalism is a broad concept, it encompasses all aspects of a pharmacist duty ranging from generic routine tasks

to taking the initiative to assist patients in their medical needs. Motycka et al. (2014, p. 94) therefore believe that professionalism needs to be "woven into either environment". At UKZN and within the various modules observed, professionalism is an issue that arises but it is largely covered informally and to varying extents and degrees in particular modules. It is also acknowledged that what it means to be a professional in pharmacy will vary depending on the context and from the perspective of academics, pharmacists in the workplace or student.

9.4 Developing professionalism in pharmacy education

Different studies, however, place emphasis on different aspects or categories but most are in agreement that a combination of factors is necessary. The combination of these takes many shapes and forms, a few examples of these relationships can be found in Collins and Kotzee's three dimensional concept of expertise space, Motycka et al. (2014) professional wheel, or Guiles (2014, p. 88) representation of continuous recontextualisation (covered at a later stage).

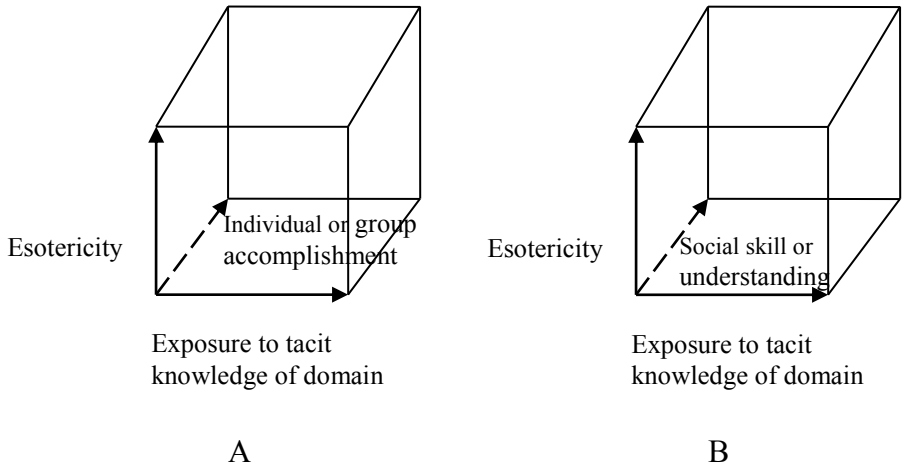


Figure 9.1: Expertise space diagram, A = Collins (2013), B= Adapted expertise space diagram (Kotzee, 2014, p. 72)

In exploring the relationship between professional knowledge and professional expertise, Collins (2013) presented a three dimensional view of professional expertise and how these are affected by the degree to which expertise is "esoteric" (widely distributed is confined to a particular group of people) and the degree to which an expertise requires tacit knowledge (which is known as the expertise space diagram). The journey from novice to expert occurs as they move from the front towards the back along the z axis and become a member of the group but these are not mutually

dependent on each other. Greater expertise does not necessarily signify greater esotericity or greater tacit knowledge (Kotzee, 2014). The model can be used to trace the journey from grade 12 student to pharmacist and the process from novice to expert, which sees students moving from low to high on the x, y and z axes. Developing the professional pharmacist requires the development of all three forms of capabilities (esoteric knowledge, tacit knowledge and social skills or understanding).

Kotzee (2014) highlights the educational implications of the model and the need for academics to understand the link between forms of expert professional practice and the direction or movement (represented in the adapted expertise space diagram) to achieve it. If an expert profession, such as pharmacy, demands a certain mix but educational exposure only delivers some of these (too theoretical or too practiced focused) or in the wrong proportions this will result in what he refers to as a "badly aligned" professional education (Kotzee, 2014, p. 74). On the other hand, an educational qualification that combines the right combination (knowledge and socialisation) and trajectory will be well aligned. Kotzee (2014) acknowledges that different professions with different forms of expertise will occupy different spaces in the expertise space diagram.

Motycka et al. (2014, p. 97), on the other hand, uses the analogy of a bicycle wheel (Figure 9.2) to represents the duties, activities and traits of professional pharmacists which include patient care, professional service, leadership, scientific discovery, application, scholarship and teaching. The spokes of the wheel cover the tenets of professionalism such as responsibility, honesty and integrity, respect for others, commitment to excellence and care and compassion while the hub covers the core values of a pharmacist (the convenantal relationship with patients, altruism and beneficence) (Motycka et al., 2014). While direct or explicit reference to knowledge is not made in the diagram, its value, application or relationship in being a professional pharmacist is considered by the authors.

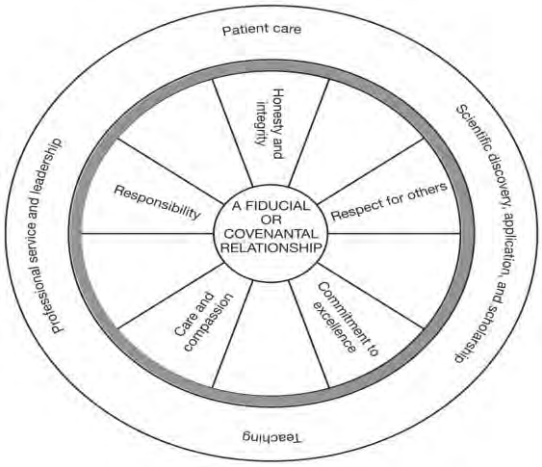


Figure 9.2: Model of "being a professional" (Motycka et al., 2014, p. 98)

9.5 Being and becoming (uncertainty, unpredictability and judgment)

Anderson et al. (2012) mentioned that while there is a need to prepare students for varied and uncertain futures, educationalists are not moving fast enough to make this happen. Decades ago Shulman (1999, p. 15) described the core of any profession as being unpredictable or with "inherent and inescapable uncertainty". Shulman (2005a, p. 20) also spoke about signature pedagogies[55] as being routine, yet never the same, habitual yet pervaded by uncertainty, a point which is evident in case based learning and ward-rounds in pharmacy education. While the routine of the organising structure may follow a set pattern or approach, it is in the unique nature of each clinical case that presents uncertainty. By nature, one can never completely resolve uncertainty in any profession but Shulman (1999) felt that by making uncertainty the focus of study it could provide a better way of dealing with this challenge.

Shulman (2005a) described professional education as serving the role of developing pedagogies to join knowledge, ideas, practices and values under conditions of uncertainty which requires exercising judgment as well as remaining aware of the consequences of ones' decsions and actions. In times of uncertainty, professionals need to learn from experience (Shulman, 1998; Shulman, 2005a). Noble et al. (2011) believed that social learning theories provided insight into the type of person students were developing into as a result of their learning experiences.

[55] Signature pedagogies as defined by Shulman (2005c, p. 52) 'These are types of teaching that organise the fundamental ways in which future practitioners are educated for their new professions. In these signature pedagogies, the novices are instructed in critical aspects of three fundamental dimensions of professional work- to think, to perform, and to act with integrity'.

Noble et al. (2011) also agreed that professional curricula needed to address the issue of uncertainty and provide opportunities for students to be experience these as they were characteristic of the working environments pharmacists will find themselves in. Barnett (2004) dealt with uncertainty and incompleteness in relation to curriculum and pedagogy. He viewed uncertainty in two ways: uncertainty from the complexity of the world and our understanding of it or uncertainty on a more personal individual level (Barnett, 2004). Linked to preparing graduates for dealing with uncertainty, Barnett (2004) raised the question of how we could anticipate and prepare students for learning in such contexts. The role of education is to prepare students to deal with the world and its complexities as they make decisions in the face of incompleteness either as a result of time limitations, insufficient information or because the outcomes cannot be predicted (Barnett, 2004). At the same time learning is also about coming to the position of dealing with multiple interpretations as seen in case-based learning, where more than one possibility of treatment can exist. These are issues that surfaced in the pedagogical approaches of case studies and experiential learning during ward-rounds, both making decisions with incomplete circumstances as well as arriving at multiple interpretations. Ofstad and Brunner (2013) however indicated that the lack of a single correct answer is often frustrating for students as their historical pedagogical exposures often involved learning facts and being tested for single correct answers. As a result students have limited exposure and ability to deal with discriminating between multiple answers and selecting and rationalising their choice (Ofstad & Brunner, 2013).

Shulman (2005b) showed that through the pedagogy of using medical ward-rounds (which include a pharmacist in the team) for experiential learning, elements of training for uncertainty featured as graduates were faced with patients that were difficult to diagnose. While a conclusive answer may also not exist for all patients in hospitals, the process students undergo in attempting to find the answers shows their approach to dealing with uncertainty (Shulman, 2005b). Winch (2014) also highlighted professional judgment as part of what it means to be a professional, where this ability to use their specialised knowledge into effect in professional judgments in workplace contexts (Winch, 2014). It is in this ability that defines professionals, as Hurly (n.d.) uses genetics to describe skills of a discipline as its genotype and the interpretation and incorporation of these skills into practice as its phenotype.

Winch (2014), similar to authors above believed that professionals need to be trained to work in uncertainty and that issue of critical thinking, reasoning and decision making skills are also linked to the notion of preparing graduates for uncertainty (Winch, 2014). The FIPEd Global Education Report (2013) also called for undergraduates to be taught with new methodologies to assist them with adapting to the challenges at work. In considering new approaches, it is important to consider the role uncertainty, incompleteness and judgment plays in developing professionals.

Some researchers believed in generic skills, while others focused on trying to anticipate and prepare students for future roles by projecting future practice competencies, along with cross cutting abilities (Jungnickel et al. 2009) but are generic skills the answer for learning for an uncertain future? Barnett (2004) disagreed stating that skills, even generic skills are a dead-end. Rather the way forward lies in construing and enacting a pedagogy for human beings where "learning for an unknown future has to be a learning understood neither in terms of knowledge or skills but of human qualities and dispositions" (Barnett, 2004, p. 247).

Noble et al. (2011) described curriculum in terms of developing students into certain types of people carrying out the role and responsibilities of a pharmacist, which include developing the distinctive way pharmacists should think, reason and practices. Based on social learning theories, they argued for a different approach to curricula, one that developed a kind of person and went beyond what students should know and cover in the curriculum. They argued for the focus to be on the experiences the curriculum provided and what students were most likely to derive or take away from these. This is similar to Barnett and Coate's (2005) notion of curricula for the changing world, where the integration of knowing, acting and being are essential or Hurly's (n.d.) belief that the development of the student's inner self completes knowledge, skills and attributes. Dall'Alba (2005) also argued that a focus on epistemology (theory of knowing) at the expense of ontology (theory of being) prevents higher education from reaching their goals. The transformation expected from student to pharmacist, doctor, engineer or teacher indicates that knowledge and skills in themselves are insufficient. Knowledge and skills acquisition does not ensure skilful practice. This is not to deny the importance of knowledge and skills but rather to

argue that their acquisition is insufficient for enacting skilful practice and for transformation of the self that professional education inevitably involves (Dall'Alba, 2005).

Guile and Ahamed (2010) believe that a starting point to understanding professional development lies in recontextualising the theory practice relationship using the concept of recontextualisation[56]. It refers to the changing nature of concepts and practice as professionals use them in different contexts and settings and classify four interrelated types: curriculum, pedagogic, work place and learner recontextualisation (Guile & Ahamed, 2010). Their conception may shed light on tracing content, pedagogy within pharmacy and some academic pedagogical approaches seen, for example particular pedagogical practices can assist students in the process of transitioning between education and workplace such as shadowing, ward-round clinical visits, case-based learning (Guile & Ahamed, 2010) .

Hurley (n.d.) believed that in preparing students for dealing with this incompleteness and the use of resources, knowledge-based, technical, technology or human resources in the form of fellow health care professionals is a step towards moving students out of comfort zones and dealing with the risks they would ultimately face in clinical decisions and patient care. The pedagogical changes to be effected have basis in Bernstein's (2000) classification and framing as a loosening of the control may have some merit in preparation for uncertainty (Hurley, n.d.).

In viewing developing the pharmacist as a practitioner and professional, perhaps the combination of knowing, acting, and being can provide a more composite picture and inform professional curricula. Professions shape identity, not only of the individual but of them in relation to and with members of their community of practice and patients. With an ever evolving world, changing roles of pharmacists and continuous development, it is also no longer about being and existing but also becoming and evolving which cuts across domains of knowledge, action and self.

[56] Recontextualisation in the context of Guile and Ahamed (2010) varies from Bernstein's use of the same term.

9.6 Summary

Many of the factors identified by UKZN pharmacy academics: knowledge, communication skills, being a team player, researcher and life-long learner, demonstrating empathy and ethics are similar to those outlined in the FIPEd Global Education 2013 Report as being requirements for pharmacist to possess in order to deal with their working worlds. These themes and sub-themes arising from what makes a student a pharmacist and professional indicates a focus on the first two of Barnett's (2004, p. 254) domains: understanding (knowledge), acting (skills), with less emphasis on being (self). It is argued that preparing students for uncertainty goes beyond knowledge and skills but ultimately depends on the latter, being which encapsulates "critical reflection and self development through knowledge and actions" (Barnett & Coate, 2005, p. 78).

Chapter 10
Conclusion

10.1 Introduction

In this chapter, I reflect upon the research questions, raised in Chapter 1, which provided the framework for this study and show how data through the theoretical lens and deeper level analyses answer these questions. I also provide insight into how this study has contributed to understanding pharmacy academics and their pedagogical practices, not only in a higher educational context but in one that is responsible for developing future practitioners and professionals. Limitations are considered. While the study provided rich and illuminating data, it was not possible to explore all avenues and so the roads untravelled present themselves as opportunities for further research.

10.2 Pedagogical practices of pharmacy academics

Pedagogical practices are complex and deep issues, best described in terms of a mixture of factors affecting both the field of pharmacy education and academics' pedagogical practices. These factors originate within the field of pharmacy education (internal factors) but also include those parameters external to the field. For simplification and reporting purposes, these factors have been grouped into macro, meso, and micro factors.

Macro factors affecting the field of pharmacy education were outlined in Chapter 2 and highlighted global and local influences, the changing needs of society, the changing role of pharmacists, and the role of regulatory bodies on professional academic qualifications and curricula reviews, which ripple through meso and micro layers. Curricula reviews, along with the journey knowledge takes from production to academic curricula and pedagogical processes, were covered in Chapter 5, and show how curriculum and practice are affected across macro, meso and micro groupings. The SAPC (macro) guides curricula at UKZN through broad prescribed exit level outcomes. These filter through university and college (meso) structures, which then direct academics, to some extent, in terms of selection of content for inclusion within the curriculum and the undergraduate programme. Pharmacy academics' accounts of the role of the SAPC in Chapter 5 provided some insight into how this affects their curriculum and teaching practices, at the same time reflecting the control over implementation and incorporation of exit level

outcomes, along with module goals, objectives and outcomes into curriculum design and pedagogy.

The combined use of a strong theoretical and conceptual lens with a more exploratory interpretivist approach provides insight and understanding into pharmacy pedagogical practices. The theoretical framing, which includes classification and framing, the pedagogic device and LCT (Chapter 3) provided insight into understanding issues at a micro level and in lecture rooms, where pedagogical practices are enacted. Classification and framing exposes the underlying structure of the various forms of knowledge and reveals pedagogical practices at a third year level (Chapter 6) and a fourth year level (Chapter 7) for the major Pharmaceutical disciplines - Pharmacology, Pharmaceutics and Pharmaceutical Chemistry in year three and Pharmacology, Pharmaceutics and Pharmaceutical Care in year four. Chapters 8 and 9 tracked the emerging themes, which shed light on pedagogical practices such as integration, CBL and professional components of the pharmacy curriculum. Table 10.1 indicates the contribution made by the theoretical framing of the study and those by thematic analysis, which together show the role of knowledge, its structure as well as the relationships intertwined in pedagogical practices.

Table 10.1: Combination of theoretical frame and emerging themes

Theoretical Frame	Themes	Sub-themes
Knowledge types and structure	CBL	Different types of CBL and cases within CBL
Classification (knowledge) Framing (Pedagogy)	Integration	Experiential learning integration Theme based integration Team based integration
Semantics (Pedagogy) Gravity Density Waves	Developing the pharmacist and the professional	Knowledge and knowing Possessing and displaying Communication and interpersonal skills Team player Researcher and life-long learner Empathy and ethics

Both the theoretical framing and thematic analysis highlight the importance of the specialised, disciplinary knowledge that characterises the undergraduate pharmacy qualification. It however, did not stop at the identification of knowledge as being a key factor in academics' pedagogical practices, but also revealed the presence of many different types of knowledge. These differences

are not restricted to individual disciplinary majors such as Pharmacology, Pharmaceutics, Pharmaceutical Care or Pharmaceutical Chemistry but also within these disciplines, within topics, sub-topics and different components of the module (lectures, tutorials, practical sessions, experiential learning).

Knowledge structures reveal similarities and differences within disciplines, across disciplines and across academic years. Most of the Pharmaceutical major disciplines were characterised by hierarchical knowledge structures, strong classification and framing, but also demonstrated different knowledge types and differing strengths between boundaries.

Differences on various levels:

Classification and framing varied amongst the major pharmacy disciplines, with the knowledge structure playing a role. The more science and applied science fields (such as Pharmacology, Pharmaceutical Chemistry and Pharmaceutics) demonstrated stronger classification, which was also accompanied by stronger academic control over how the content was taught (strong framing), whereas the more clinical discipline indicated strong classification but weaker framing at times. Pharmaceutical Care, lent itself to greater flexibility in teaching approaches and strategies, with more interactive and participatory tasks featuring such as counselling sessions, debates, role-plays and weaker pacing and student relationships. Other aspects of framing such as selection, sequencing and evaluation, however, remained strong.

Pharmaceutical Care also demonstrated greater articulation between specialised disciplinary knowledge and its applications to the everyday professional working environment that pharmacists find themselves in. Knowledge structures and their underlying organising principles within fourth year Pharmacology, Pharmaceutics and Pharmaceutical Care exposed patient knowledge and aspects pertaining to the professional nature of the work (clinical diagnosis, treatment and patient care). Modules ranged in knowledge structures (hierarchical or a combination of hierarchical and horizontal) and pedagogy within the various academic components (lectures, tutorials, externship and ward-rounds). While most disciplines revealed isolated functioning, there was agreement amongst pharmacy academics that the boundaries

between the various disciplines were blurred and weaker when it came to pharmacy practice and experiential learning.

The different forms knowledge takes within the curriculum were also based on the structural organisation of the module and its compartments of lectures, tutorials, practical sessions and experiential learning. Pedagogical practices also showed signs of variation within these, with traditional lectures largely demonstrating stronger classification and framing, and tutorial, practical and experiential sessions displaying weaker classification and framing. These, however, were shown to vary under certain circumstances for example when more active and participatory forms of pedagogy were introduced into lecture spaces, this lead to weaker parts of framing. The pedagogy of CBL, within lectures, indicated a weakening of pacing and academic control, but not a weakening over selection, sequencing and evaluation.

These indicate the relationship between knowledge and pedagogy and how certain forms of knowledge lend themselves more to particular pedagogical approaches. The value of lectures in such a technological age have been debated in the literature, but the present study indicates that there is still value in lectures and the way that lectures are conceived matters. While largely synonymous with passive learning and strong academic control, lectures in pharmacy education serve to provide background and foundational material, as seen in lectures introducing a topic or preceding case-based learning. Lectures and technology should also not be viewed in opposition to each other, as the use of videos provide a visual background to content within the spaces of lectures, further indicating that active learning can take place within lectures and serve to direct and guide learning. Based on the fact that most of the Pharmaceutical modules are based on hierarchical knowledge structures, academics also use lectures to revisit some of the relevant concepts covered previously or thought to have been covered previously (when outsourced such as the basic sciences in year one) indicating the dynamic nature of knowledge.

Abstract, everyday and workplace knowledge

Bernstein classified knowledge into abstract and everyday knowledge but this study exposed that between these two sits workplace knowledge, especially in a professional qualification such as pharmacy education. It is for these reasons that academics use examples from practice to

deconstruct high levels of abstraction into lower levels for greater accessibility and understanding, so that students can relate to these in as much as everyday examples serve to provide lived experiences that students can relate to. The use of semantics illustrates this constant movement, with the pattern of waves taking on different shapes depending on the discipline, concept or topic within the discipline or space in which it occurs (lectures, tutorials or experiential learning). Common across pharmacy modules, and active and clinical driven pedagogical approaches, is the trend of pharmacy academics attempting to shift students between the everyday and the specialised, moving them into Winch's (2014) occupational capacity dimension.

Frames and waves

Framing and semantics provides insight into how academics move within the pedagogic space, showing how their selection does not end with the choices they make in terms of the curriculum but also extends to the selection of their pedagogical strategies, their resources, their affinity to technology and their relationships with their students. Their use of illustrations, equations, videos and graphs serve to assist students into shifting between different types of knowledge (everyday and abstract) and levels of complexity. Semantic waves track the motion of packing, unpacking and repacking knowledge. Academics use a variety of pedagogical approaches to achieve this, ranging from written or electronic notes to verbal communication, in terms of linking content to lived experiences in making the abstract more accessible. Depending on the discipline, semantic gravity and density varies resulting in the formation of many different semantic waves. Semantic gravity and density profiles and semantic waves shed light on the relationship between knowledge, recontextualisation and pedagogical approaches, and also have implications for cumulative learning and knowledge transfer.

Structure of pharmacy curriculum

The structure of the pharmacy curriculum as a whole demonstrates a combination of hierarchical and horizontal knowledge structures, almost resembling a tree. The roots are the basic sciences, the trunk is the major disciplines that move upward and the clinical and horizontal structures are the branches of the tree. The leaves, which resemble all the personal and professional details, complete what it is to be a professional pharmacist. The focus of the pure sciences within the

professional qualification is on their application to the Pharmaceutical sciences, rather than greater immersion within the pure sciences themselves. This proves problematic to an extent, as first year modules are largely outsourced, leaving pharmacy academics little control over the content covered, whether it is covered in the pharmacy context and whether necessary foundational structures are in fact covered. Pharmacy academics' pedagogical practices therefore cover and sometimes revisit basic sciences on the journey to preparing students for the future.

The major disciplines are largely autonomous - aware of their counterparts yet distinctly operating in their own space in terms of the structure of knowledge and the pedagogical practices academics use in making the knowledge accessible. Each of the four majors largely operates in an isolated fashion, yet all display hierarchical knowledge structures, interconnected and related to knowledge learnt previously. They also exist alongside more horizontal knowledge structures in a curriculum such as Law. The way horizontal modules work in combination with the majors was beyond this study; they are only mentioned to highlight that the curriculum is not entirely comprised of hierarchical knowledge structures.

Relationships

Bernstein's (1996; 2000) classification and framing described the relationship between academics and students or teachers in terms of strong or weak based on hierarchy and interactions. But in a professional qualification such as pharmacy education, this relationship takes on a more complex form. This relationship is no longer restricted to academics and students in the equation, but extends to include other key role players or actors in the field that impact on the teaching and learning dynamics. Students are learning from peers, from other pharmacists, and from other healthcare professionals, especially medical practitioners, nurses and patients. Pharmacists are required to navigate through the spaces between highly specialised disciplinary knowledge and everyday understanding in their communication with patients, so that the knowledge of diseases and drugs are recontextualised for the patient. Pharmacists, similar to academics, strengthen semantic gravity and weaken and unpack semantic density into simpler forms in their communication with patients.

The concepts raised in the course of this research such as TBL and IFP support this web of relationships, amongst which the value the GP adds to the ward-rounds presentation and feedback sessions. Academics use experiential learning in making these links more visible in exposing students to hospital visits; they interact with other practicing pharmacists, although interactions with other health care professionals are limited, along with patient interaction. TBL is also largely identified as an important vehicle in uniting health care professionals in the best interest of the patient. CBL provides the opportunity for TBL in the case of students and integration across modules, while co-teaching provides the opportunity for TBL amongst academics.

CBL

The use of CBL also signals the need to bridge the theoretical life of academia with the practicing world of work. It also exposes students to the decision making process that pharmacists are faced with and their role in clinical diagnosis and treatment. We also further see the move away from PBL and a generic conception of CBL and what it entails with the search for a deeper level of understanding of CBL within the context of pharmacy. While the forms of CBL vary depending on the discipline and its intended purpose, similar patterns are noted within its structural design, distinguishing CBL in pharmacy from the more widely used PBL. Academics use this pedagogical approach to expose students to clinical cases, diagnosis, and treatment, and engage them in active learning without relinquishing control over framing. In describing what CBL looks like in a variety of modules and what CBL means in the context of pharmacy education at UKZN, I provided a starting point for further exploration and refinement.

Theory and practice

Theory and practice were originally thought of as two separate entities. With time their relationship was viewed in terms of existing on a continuum and now the concept of recontextualisation presents a new option, where knowledge changes depending on the space it occupies and its context. The implications of viewing the theory practice relationship in a different way opens up many possibilities for curriculum structure and pedagogy, extending to debates on experiential learning and their sequencing within the curriculum. Front-loaded curricula are based on the premise that theoretical knowledge and understanding must first be covered before so-called “practical applications” can take place. Seeing theoretical and practical

forms of knowledge coexisting makes it easier to understand the sandwich approach to integrating experiential learning with theoretical components of the curriculum.

Integration

Integration is an issue that appeared both within the frame and the emerging themes. Experiential learning takes a wide range of shapes and forms, both in an international and local domain, (Chapter 2) which highlights discussions about integration and the options available for the inclusion of experiential learning within the curriculum (Chapter 8). This raises questions about which is the best position for experiential learning, yet provides no conclusive answer on how this can be achieved. UKZN, like many other institutions, follows a more traditional format or front-loaded curricula, with the bulk of experiential learning taking place towards the end of the programme. Through the theoretical lens integration would see a weakening of classification, where academics are in favour of moving away from stand alone disciplines, towards collaborating and teaching in teams. Academics believe that the recurriculation process and the concept of golden themes would pave the way for this. Pharmacy is mostly characterised by Bernstein's (1971) collection code (strong boundaries isolating the major disciplines), while the integration of a thematic approach would see a move towards an integrated code with both the curriculum and pedagogy becoming more permeable.

The professional pharmacist

The essential requirements for developing pharmacists for professional practice indicated by academics were explored. This contributes to understanding pharmacists and their professional role and in the process identified several generic skills and attributes such as communication and interpersonal skills, empathy and ethics. It does, however, raise questions about which of these to include into the curriculum, and the best way to do this so that they yield beneficial results. Perhaps the professional pharmacist needs to be conceptualised much in the same way as basic sciences; yes they form the foundation of pharmacy, but their relevance is made in terms of professional pharmacy practice, not an immersion into the science disciplines themselves. Developing the professional pharmacist therefore needs to conceptualise both – what does it mean to become a professional pharmacist? This sees the move away from generic professionalism to exploring professionalism in the context of pharmacy.

10.3 Tracking the research journey

The study set out to explore and describe pharmacy academic's pedagogical practices at UKZN, with a focus on what these practices are and why they are used. Through a combination of strong theoretical framing and thematic analysis, these two questions have been answered, with the "what" and "why" of pedagogical practices sometimes overlapping. Knowledge structures and pharmacy academics' pedagogical practices in each of the majors have been described exposing similarites and differences between majors. Most majors were characterised by hierarchical knowledge structures, strong classification and framing, with strong semantic density and weak semantic gravity. Knowledge structures and pedagogical practices employed were inextricably linked to external and internal factors (macro, meso and micro categories) discussed in this chapter. Pharmacy academics at UKZN use particular pedagogical approaches (such as CBL, TBL and IPE) in developing the professional pharmacist towards practice.

10.4 Limitations

As previously mentioned my position within the research as an outsider to pharmacy but an insider to education could be viewed as a limiting factor. As the study nears completion, this concern was once again raised. While it is acknowledged that as an outsider, I may have gained and presented a different perspective from that of an insider, it is also worth noting that as an outsider I was able to overcome many of the shortcomings associated with insider research. As someone new to the field and unknown in the department, without a history or relationship to the participants, my experience and encounter with participants was much easier and richer. While disciplines may separate us, academia unites us. Pharmacy academics in an institution of higher learning are confronted with similar challenges, and pressures, and understand the value of research and its contribution to extending boundaries and expanding knowledge. Participants opened their lecture rooms and practices to be a part of this study, contributing and furthering an understanding of pedagogical practices in their field.

10.5 Future studies

The study raised many interesting avenues for further research opportunities:

1. This study began when the wheels of recurriculation were set in motion (by the SAPC directive and subsequent college intervention). It would present an interesting opportunity to engage with the new curriculum investigating how these impacts on the knowledge structures, classification and framing observed here. It also opens up the opportunity for comparative studies.

2. Given the importance placed on team work, collaboration, working with experts and IFP, it only seems natural to explore the experiential learning component of the pharmacy curriculum further in conjunction with practising pharmacists and also during internship programmes. Perhaps future studies with practicising pharmacists can shed more light on the relevance of particular content in the curriculum and, being a professional pharmacist, and spark the pursuit of new direction and relationships between academia, practice, students and patients. Linked to the above, studying the knowledge structure of ward-rounds and experiential learning in greater detail would also prove useful, as they have shown to demonstrate differences from more theoretical modules.

3. CBL can be explored in more detail in terms of its link to student learning and assessment. The different types of CBL can also be explored in more detail, along with how the structure and timing of CBL within the curriculum can affect or impact on learning? Exploring the different ways that CBL can be presented, as well as how the different components of lectures, tutorials and practicals can come together to use CBL. What are the best ways to assess CBL? The actual process that students undergo to make sense of cases and solve them also warrants further investigation.

4. Experiential learning and internship training requires further investigation, especially in terms of developing the professional pharmacist. A deeper understanding of the underlying structures and pedagogical practices by various key players can assist in maximising these learning experiences for professional development and growth.

5. Integration and its role within pharmacy programmes also warrants further investigation, along with theme-based teaching and TBL, and how the "more horizontal" disciplines of the curricula can be integrated. The issue of how graduate skills and competencies are identified and developed within academic programmes and workplace contexts also requires further attention.

10.6 Concluding remarks

Through the lens of paradigms, theoretical and conceptual frameworks and the eyes of pharmacy academics, a picture of pedagogical practices in pharmacy education emerges, along with underlying reasons for its implementation. The nature of the pharmacy field (inter-disciplinary, profession and patient orientated); its underlying knowledge structures and composition; the macro, micro and meso factors affecting the field; and the vast array of interconnected relationships and dynamics all contribute to the pedagogical practices in pharmacy education and towards the development of the professional pharmacist.

While the picture painted has its fair share of dichotomies and boundaries between academia and work; sciences and humanities; lecture centred, student-centered teaching and learning approaches; theory and practice; and professional and interprofessional perhaps what is needed is the revisualisation of previously separately conceived worlds in working together in the face of an ever evolving uncertain world. As societal changes redefine the roles and responsibilities of professional pharmacy, these will ripple through to academic institutions of higher learning, academics and pedagogical practices that develop future pharmacists. Knowledge, competencies, skills, abilities, expectations and conceptions of what it means to be a professional pharmacist will change. While the core of knowledge and knowing; possessing; being and becoming are all encompassing and

hold for now, in the face of evolution, it will no longer be enough for pedagogical practices to merely adapt but rather to innovate, reinvent and continue to evolve themselves, rising to the challenge of uncertainty.

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Appendix 1: B. Pharm curriculum structure

Country	B.Pharm degree structure	Duration of B.Pharm	Externship/service training	Postgraduate studies	Source
Australia	Based on UK curricula	4 yrs	1 yr internship	+ 2yrs = Masters	Wheeler et al., 2013
Canada	1 yr of pre-pharmacy courses, 4 yrs of academic study	5 yrs	16 weeks of clinical training	Doctorate (obtained after further 2yrs of advanced clinical pharmacy practice)	
France		6 yrs	1 yr of internship completed in yr 5 (called) 'university hospital year'	Doctorate (9 yrs). Thesis required for both 6yr and 9yr programes	Bourdon et al., 2008
Germany	Course work and clinical	4 yrs	1 yr internship Clinical experience in yr 2 (8 weeks long)		
Ghana	Based on Scotland university curriculum	4 yrs		Doctorate	FIPed Report, 2012
India	No standardized B.Pharm curriculum across the universities in India.	4 yrs		Masters and Doctorate	Basak & Sathyanarayana, 2010
Japan		6yrs	22 weeks		
Kenya		4 yrs			Anderson et al., 2012

New Zealand	Based on UK curricula	4 years	1 year internship		Wheeler et al., 2013
Saudi Arabia	Follows U.S and Europe curriculum – more clinically oriented	5yrs called Bachelor of Pharmaceutical Science'		Doctorate	Asiri, 2011
Singapore	coursework, practical and clinical experience	4 yrs but called Science in Pharmacy degree	clinical rotations (completed in yr 2)	Masters and Doctorate qualifications offered	
South Africa		4yr	1 yr internship	Masters programmes with specialities in Radio-Pharmacy and Clinical Pharmacokinetics	
Uganda	based on prototypes from India, Kenya, Egypt and Tanzania				
United Kingdom	3-6 month research component built into curriculum	4 yr Masters degree (MPharm			Wheeler et al., 2013
United States	-	-	-	Only Doctorate in Pharmacy	
Tanzania	Based on UK curriculum	4yr			
Zimbabwe		4yr			

Appendix 2: Turnitin Originality Report

Turnitin Originality Report

vanessa phd by Vanessa Singh

From vanessa phd (Vanessa)

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   Submitted to University of KwaZulu-Natal on 2011-10-06
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   http://www.nu.ac.za/handbooks/2008/Fac45Handbook2008.PDF
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   http://www.legitimationcodetheory.com/pdf/2012Arbee_PhD.pdf
4. < 1% match (Internet from 02-Apr-2010)
   http://www.ukzn.ac.za/joe/JoEPDFs/joe%2040%20hoadley.pdf
5. < 1% match (publications)
   Merton, Robert K.. "Insiders and Outsiders: A Chapter in the Sociology of Knowledge", American Journal of Sociology, 1972.
6. < 1% match (Internet from 13-Dec-2009)
   http://www.ajpe.org/view.asp?art=aj7307120&pdf=yes
7. < 1% match (Internet from 10-May-2012)
   http://www.mm3admin.co.za/documents/docmanager/0C43CA52-121E-4F58-B8F6-81F656F2FD17/00011437.pdf
8. < 1% match (Internet from 01-Apr-2009)
   http://www.cheeps.com/karlmaton/pdf/MatonMuller.pdf
9. < 1% match (Internet from 08-Apr-2013)
   http://www.ncbi.nlm.nih.gov/pmc/articles/pmc2865416/
10. < 1% match (Internet from 07-May-2010)
    http://www.ukzn.ac.za/handbooks/2005/HESC%20Handbook%202005.PDF
11. < 1% match (Internet from 22-May-2014)
    http://www.legitimationcodetheory.com/pdf/2013Semantic%20wave%20packet.pdf
12. < 1% match (Internet from 24-Nov-2009)
    http://human-resources-health.com/content/7/1/45
13. < 1% match (Internet from 16-Dec-2012)
    http://fyl.org.ua/?p=313
14. < 1% match (publications)
    Suellen Shay. "Curriculum formation: a case study from History", Studies in Higher Education, 2010
15. < 1% match (Internet from 27-Apr-2014)
    http://www.legitimationcodetheory.com/pdf/2010VorsterPhD.pdf
16. < 1% match (student papers from 08-Apr-2012)
    Submitted to University of Ulster on 2012-04-08
17. < 1% match (student papers from 29-Jul-2010)

Appendix 3: Gate keeper permission

29 September 2011

To: Prof. Sabiha Essack
Dean of Health Sciences
University of KwaZulu-Natal
Westville Campus
Private Bag X54001
Durban
4000

Dear Madam

PERMISSION TO CONDUCT RESEARCH AS PART OF A PhD DISSERTATION

Name: Vanessa Singh
Student No 941320164

Dissertation Topic: **Pedagogical practices of lecturers in pharmacy education**

It is a requirement for a PhD degree that all students undertake practical research. You are kindly requested to permit access to the lecturers within the School of Pharmacy so that they may participate in the following study. Data in the study will be produced through the use of research instruments such as interviews, observations, focus groups and documentation analysis. Permission is also sought for access to and use of relevant documentation, for example information pertaining to curriculum, course material, student assessment, reports etc. Please be assured that all information gained from the research will be treated with the utmost circumspection.

Confidentiality and anonymity will be strictly adhered to at all times and all confidential documents will be securely stored and eventually destroyed. Your assistance in allowing access to physical spaces, lecturers and documents within the School of Pharmacy is most appreciated.

Yours sincerely

VSingh
Vanessa Singh

29/09/2011
Date

1

CONSENT

I, (full name) Sabiha Yusuf Essack the undersigned have read and understand the above information. I hereby grant permission for lecturers in the School of Pharmacy to be approached to participate in the study. I understand that participation is voluntary and that they may withdraw at any stage of the process. I am also aware of the fact that observations will be either video or audio recorded, subject to approval from individual lecturers. I also grant permission for Ms. Singh to have access to lectures, tutorials, practicals and documentary evidence for modules within pharmacy for purposes of the above-mentioned research.

SYEssack	29/9/11
Signature	Date
Dean of Health Sciences/Head of School of Pharmacy	

2

30 September 2011

To: Prof Fatima Suleman
Head of School: Pharmacy and Pharmacology
Westville Campus
University of KwaZulu-Natal
Private Bag X54001
Durban
4000

Dear Madam

PERMISSION TO CONDUCT RESEARCH AS PART OF A PhD DISSERTATION

Name: Vanessa Singh
Student No 941320164

Dissertation Topic: **Pedagogical practices of lecturers in pharmacy education**

It is a requirement for a PhD degree that all students undertake practical research. You are kindly requested to permit access to the lecturers within the School of Pharmacy so that they may participate in the following study. Data in the study will be produced through the use of research instruments such as interviews, observations, focus groups and documentation analysis. Permission is also sought for access to and use of relevant documentation, for example information pertaining to curriculum, course material, student assessment, reports etc. Please be assured that all information gained from the research will be treated with the utmost circumspection.

Confidentiality and anonymity will be strictly adhered to at all times and all confidential documents will be securely stored and eventually destroyed. Your assistance in allowing access to physical spaces, lecturers and documents within the School of Pharmacy is most appreciated.

Yours sincerely

VSingh
Vanessa Singh

29/09/2011
Date

1

CONSENT

I, (full name).....PROF FATIMA SULIMAN.....the undersigned have read and understand the above information. I hereby grant permission for lecturers in the School of Pharmacy to be approached to participate in the study. I understand that participation is voluntary and that they may withdraw at any stage of the process. I am also aware of the fact that observations will be either video or audio recorded, subject to approval from individual lecturers. I also grant permission for Ms. Singh to have access to lectures, tutorials, practicals and documentary evidence for modules within pharmacy for purposes of the above-mentioned research.

Signature
Group leader for Pharmaceutical Sciences

19/10/2011

Date

2

Appendix 4: Biographical data of research participants

Biographical Data

Please could you provide the following biographical and background data

1. Age: _____
2. Race: _____
3. Sex: ☐ Male ☐ Female
4. Universities attended for: Undergraduate Qualification_____
   Postgraduate Qualification_____
5. Where did you complete your internship _____
6. Please provide details of your post-university activities/employment:
   _____
7. Have you worked as a pharmacist in the public/private domain?
   _____
   _____
   _____
8. How long have you been employed at UKZN?_____
9. What is your current academic position? Lecturer/Senior lecturer/Associate Professor/Professor/ Other _____
10. How many years of teaching experience do you have in pharmacy in Higher Education?_____
11. Do you have any formal teaching qualifications?_____
12. What is your area of specialisation and why did you choose this?_____
    _____
13. What is your particular research area within your specialised area of pharmacy?_____
    _____
14. Do you provide conduct research and/or publish any work in pharmacy education? (if yes, please provide details)_____
    _____

Appendix 5: Semi-structured interview questions

Research instruments: Semi-structured interview questions

1. **Background questions**
   1.1 Can you tell me a bit about your background?
   (Explore pharmacy academics' backgrounds in terms of their education, academic careers, choice of specialisation, and work experience)

2. **Typical classroom sessions**
   Can you describe a typical classroom session in your module?
   - What are the roles of lecturers and students?
   - Describe pharmacy knowledge in terms of everyday and specialised knowledge
   - *Ask questions on academics' teaching approaches*

3. **Exploring pharmacy structure and majors**
   - What is the relationship between the different majors in pharmacy?
   - Are the different disciplines brought together or kept apart during teaching? How are modules taught?
   - Do you see the various sub-sections within your major or particular module (separate or brought together?)
   - How do you teach the various subsections?

4. **Curriculum Issues**

   - Who controls the content that is taught and learnt? (lecturers or students)
   - To what extent and why? (Would you allow your students some control over the selection of what to do in the lesson?)
   - Do lecturers or students control the way the content is arranged in the pharmacy curriculum?
   - Who controls the amount of time spent on the different parts of the content material? (lecturers or students)
   - Would you allow your students some control over the pacing of the lesson?

5. **Assessment**
   Who controls the assessment of students' knowledge and to what extent?
   - How clear are the criteria according to which students are assessed?
   - Is assessment different in lectures/tuts/pracs and why?

- Would you allow your students some control over evaluating what needs to be understood?
- What are the most common types of assessment in your course?
    a) Do you use a case study approach in your teaching? If yes, why?
    b) If no, what do you use- examples, illustrations, etc.?
    c) Could you please explain more about your approach to designing clinical cases?
    d) How do pharmacy students solve complex clinical cases?
    e) What is the best way to assess students' answers to case type questions within pharmacy?

6. What is the nature of the relationship between lecturers and students?

7. What forms of knowledge/skills/values/attributes do you believe are most important for a pharmacy student to acquire?

8. How much is teaching within pharmacy affected by external forces?

9. How do you make this knowledge accessible to students? Give me an example of a concept that students understand easily? Why do you think this is the case? (everyday vs abstract)

10. Give me an example of a difficult concept/one that students grapple with? Why do you think this is the case? What strategies do you employ to teach students new/difficult concepts?

11. Do you use symbols, examples, illustrations, cases etc in your teaching?

12. How much meaning is condensed within symbols, terms, concepts, phrases, within your field in pharmacy?

13. How is content knowledge different in your course over the years?
    Could you please comment on how the modules are arranged with the pharmacy programme.

14. How does your teaching prepare students for the professional aspect of becoming a pharmacist?

Appendix 6: Observation schedule

Lecture details (date, time, place, student no.)		**NOTES**	
Lecture Environment			
Venue description (Size, layout, audio, lighting)		**Describe lecture environment, student participation, student interaction, work ethic, curriculum content and class discussions**	
Lecturer Resources/Technology			
Teaching equipment			
Student notes			
Describe the curriculum and pedagogy in terms of strong, weak or combination			
Classification	**C^+**	**C^-**	**Comments**
Inter-discursive	Strong boundaries between pharmacy disciplines and everyday knowledge	Weak boundary between pharmacy discipline and everyday knowledge	Observe boundaries between the specialised Pharmacy disciplines and everyday Listen for conversations about everyday and the frequency of use.
Inter-disciplinary	Strong boundary between pharmacy discipline and other subject areas	Weak boundary between pharmacy discipline and other subject areas	How does the present dsicpline and its content link with the other majors. Are there any references? How often? When during the lecture?
Intra-disciplinary	Strong boundary between different topics within pharmacy discipline	Weak boundary between different topics within pharmacy discipline	How do the topics link together in the particular section observed? Which topic comes before and which comes after?
Framing	**F^+**	**F^-**	**Comments**
Selection	Lecturer controls selection of content (strong)	Lecturer allows students some control over the selection of content	Describe the nature of control and the extent.
Sequencing	Lecturer controls the sequencing of content	Lecturer allows students some control over the sequencing	Does the sequencing change and by whom?
Pacing	Lecturer controls the pacing of content	Lecturer allows students some control over the pacing of content	Describe pacing, does lecturer maintain control, describe questioning and interactive sessions.
Evaluative Criteria	Evaluative criteria is explicit	Evaluative criteria is implicit	
Relationship between lecturer and student	Lecturer makes formal the social relations between lecturer and students	Informal relationship between lecturer and students	Describe the relationship between lecturer and student in terms of power, who has authority?
Knowledge structures	Vertical	Horizontal	How do the different parts fit together? What is the relationship between old and new knowledge
Semantic gravity	**SG^+** = Meaning is concrete	**SG^-** = Meaning is specialised and abstract	
Semantic density	**SD^+** = Meaning is condensed, more than one meaning held within the term, concept	**SD^-** = Meaning is less condensed	

Appendix 7: Ethical Clearance approval document

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

Research Office (Govan Mbeki Centre)
Private Bag x54001
DURBAN, 4000
Tel No: +27 31 260 3587
Fax No: +27 31 260 4609
Ximbap@ukzn.ac.za

29 November 2011

Ms V Singh (941320164)
School of Education and Development

Dear Ms Singh

PROTOCOL REFERENCE NUMBER: HSS/1252/011D
PROJECT TITLE: Pedagogical practices of lecturers in pharmacy education

EXPEDITED APPROVAL

I wish to inform you that your application has been granted Full Approval through an expedited review process:

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the school/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

.....

Professor Steven Collings (Chair)
Humanities & Social Sciences Research Ethics Committee

cc Supervisor – Professor Wayne Hugo
cc Professor Sabiha Essack
cc Mr Sugen Reddy

1910 - 2010
100 YEARS OF ACADEMIC EXCELLENCE

Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

Appendix 8: Sample of informed consent form for academics

UNIVERSITY OF KWAZULU-NATAL
Faculty of Education

Dear Participant,

PhD Research Study
Researcher: Vanessa Singh (031 260 1356)
Supervisors: Prof. Wayne Hugo (033 260 5535)
Co-Supervisor: Prof. Sabiha Essack (031 260 8048)

I am a PhD student in the Education Faculty of the University of KwaZulu-Natal and my name is Vanessa Singh. You are invited to participate in a research project exploring the pedagogical practices of pharmacy lecturers.

Through your participation I hope to gain insight into how lecturers prepare pharmacy learners to become professional pharmacists. The results of the survey are intended to contribute to a deep understanding of lecturers' pedagogical practices in a higher institution and in a developing context. It aims to explore what knowledge is valued in pharmacy education, how it is structured and how it is communicated.

Your participation in this project is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequence. Confidentiality and anonymity of records identifying you as a participant will be maintained and securely stored at the University.

If you have any questions or concerns about the interview, observation or focus group participation or about participating in this study in general, you may contact me or my supervisor at the numbers listed above.

The interview process should take between 30-45 min. I hope you will take the time to complete this survey.

Sincerely
Vanessa Singh

---------- ----------
Investigator's signature Date

1

CONSENT

I, (full name)..... the undersigned have read and understand the above information. I hereby consent to participate in the study outlined in this document. I understand that participation is voluntary and that I may withdraw at any stage of the process. I approve / do not approve of the observation sessions in lectures, tutorial and/or practicals being video recorded. I approve / do not approve of the sessions being audio recorded.

--- ---

Signature of Participant Date

Appendix 9: Sample of informed consent form for students

UNIVERSITY OF KWAZULU-NATAL
Faculty of Education

Dear Participant,

PhD Research Study
Researcher: Vanessa Singh (031 260 1356)
Supervisors: Prof. Wayne Hugo (033 260 5535)
Co-Supervisor: Prof. Sabiha Essack (031 260 8048)

Ethical clearance number: HSS/1252/011D

You are invited to participate in a research project exploring the pedagogical practices of pharmacy lecturers. Through your participation I hope to gain insight into how lecturers prepare pharmacy learners to become professional pharmacists. The results of the survey are intended to contribute to a deep understanding of lecturers' pedagogical practices in a higher institution and in a developing context. It aims to explore what knowledge is valued in pharmacy education, how it is structured and how it is communicated. Your participation in this project is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequence. Confidentiality and anonymity of records identifying you as a participant will be maintained and securely stored at the University.

If you have any questions or concerns you may contact me on the above number.

Sincerely
Vanessa Singh

---------- ----------
Investigator's signature Date

.....

CONSENT

I, (full name)....., student number....., the undersigned give consent for my work for Pharmacology (401 module) to be used in the study. This will relate to ward rounds, SOAP notes, power point slide presentations, notes from the presentation session and marks for this component of the module to be used in the study. I am aware that my name will be removed to protect my identity.

---------- ----------

Signature of Participant Date

1

Appendix 10: Letter from SAPC to UKZN (July 2010)

South African Pharmacy Council

REGISTERED MAIL

Dr Fatima Suleman
Head: School of Pharmacy and Pharmacology
Faculty of Health Sciences
University of KwaZulu - Natal Westville campus
Private Bag X54001
Durban
4000

Your reference	Our reference	Date
	27.10/ H Masiza	12 July 2010

Dear Dr Suleman

IMPLEMENTATION OF THE REVISED B PHARM QUALIFICATION IN 2013

In terms of section 3 of the Pharmacy Act 53 of 1974, one of the objects of the South African Pharmacy Council (Council) is to establish, develop, maintain and control universally acceptable standards of pharmaceutical education.

The B Pharm qualification was revised and approved by Council in July 2009. Input was then gathered from the heads of pharmacy schools regarding the introduction of the qualification. Council at its meeting in May 2010 resolved that the revised qualification be implemented at the beginning of 2013, with the last year of enrolment on the old qualification being 2012.

This letter serves to inform the university that the revised B Pharm qualification should be implemented at the beginning of the 2013 academic year.

Your co-operation in this matter is highly appreciated.

Yours faithfully

Registered Office
SAPC Building
591 Belvedere Street
Arcadia, Pretoria, 0083

Postal Address
Private Bag X40040
Arcadia, 0007

Telephone number
Switchboard
27 (12) 319 8500
Registrar
27 (12) 319 8501/8502

Fax

Appendix 11: Curriculum change workshop

Curriculum Development Workshops within the School of Pharmacy and Pharmacology

Staff was first notified about the curriculum revision (via e-mail from the Head of School of Pharmacy and Pharmacology at the time) and compulsory curriculum development workshops were scheduled. There were a series of workshops, commencing on the 2third of Sept 2010 and ending on the 23 May 2011. Detailed course packs were prepared for each member attending and the content covered the following broad areas:

- Exit Level Outcomes
- SAPC information – SAQA documents
- Current B.Pharm programme structure (levels, modules, credits)
- Module content within each module
- Template for approval of new modules
- Articles on curricular
- Presentation by Quality Promotion and Assurance UKN – slides included in course pack
- Feedback from small group discussions

Objectives of the Workshops

	Workshop 1	Workshop 2	Workshop 3
	23 September 2010	27 January 2011	23 May 2011
1.	To engage the members of the discipline in an (ongoing) conversation about the curriculum in an open and considered way.	To engage the members of the discipline in an (ongoing) conversation about the curriculum in an open and considered way.	Teaching Styles presentation by Head of School
2.	To discuss possible changes needed to the curriculum	To review overall programme outcomes and modules (sequence, gaps, duplication, relevance, integration)	
3.	To agree on the process, time frames and people responsible for taking the curriculum review process forward.	To identify possible changes needed to the curriculum	
4.		To agree on the process, time frames and people responsible for taking the curriculum review process forward.	

23 Sep 2010

Time	Session	
9:00-9:15	1	Overview of the programme and workshop objectives Discussion of ways of interacting
9:15-9:45	2	Presentation- the bigger picture Questions and discussion
9:45-10:15	3	A rationale for curriculum review – why make changes?
10:15-10:30	4	Tea
10:30-12:00	5	Perspectives on the curriculum: current students, interns, staff member and a practicing pharmacist Discussion
12:00-1:00		Lunch
1:00-2:00	6	Curriculum review – small group discussion What are the key changes needed?
2:00-3:00	7	Curriculum review- report back and discussion
3:00-3:15		Tea
3:15-4:00	8	Discussion and agreement on taking the curriculum process further. How, by whom, by when?

27 Jan 2011

Time	Session	
9:00-9:15	1	Overview of the programme and workshop objectives Discussion of ways of interacting
9:15-9:45	2	Review of programme outcomes
9:45-10:15	3	Discussion of first year What are students learning in the service modules? What do we need them to learn?
10:15-10:30	4	Tea
10:30-12:00	5	Discussion of second year
12:00-1:00		Lunch
1:00-2:00	6	Discussion of third year
2:00-3:00	7	Discussion of fourth year
3:00-3:15		Tea
3:15-4:00	8	Discussion and agreement on taking the curriculum process further. How, by whom, by when?

Appendix 12: E-mail Correspondence from Head of School

Arising from discussions during the curriculum workshops the following issues were raised/discussed via e-mail correspondence:

- What type of graduate staff would like to see produced?
  Staff guided to reflect on the knowledge, attitudes, skills and values that graduates should possess (e-mail dated: 01/07/2011, 3:45 pm).
- After last curriculum review meeting, staff decided to proceed with a hybrid PBL method of teaching within blocks.
- Identification of key themes around which to structure teaching. Staff to list these (e-mail dated: 01/07/2011, 3:51 pm)
- What are the golden threads to appear throughout each theme? (01/07/2011, 3:59 pm)

Staff were required to e-mail their comments to the Head of School, who later compiled responses and sent out correspondence regarding the matter.

Appendix 13: Pharmacology 401 lecture timetable

CASE-BASED LEARNING (CBL)

PHRM401W1 (Pharmacology IV) - Term 2: 26 March-18 May 2012

LECTURE SCHEDULE

Week	Monday lecture	Friday lecture
Dates	**Lecture/Case Study**	**Lecture/Case Study**
26 March-1 Apr	Introduction; Respiratory system	Respiratory system
2-8 Apr	**EASTER BREAK**	
9-15 Apr[57]	**PUBLIC HOLIDAY**	Respiratory system **CS1:** Asthma
16-22 Apr	Adrenocorticosteroids	Adrenocorticosteroids **CS2:** Rheumatoid arthritis
23-29 Apr	Hypothalamic and pituitary hormones	**PUBLIC HOLIDAY**
30 Apr-6 May	**NO LECTURES**	Gonadal hormones and inhibitors
7-13 May	Gonadal hormones and inhibitors **CS3:** Oral contraception	**CLASS TEST**
14-20 May	Erectile dysfunction	Osteoporosis and mineral homeostasis The thyroid gland

[57] Thursday, 12 April 2012 follows a Monday timetable.

Appendix 14: Pharmacology 401 lecture content page

1. DRUGS AND THE RESPIRATORY SYSTEM	**6**
1.1 Bronchial asthma	7
1.2 Chronic obstructive pulmonary disease (COPD)	12
1.3 Pneumonia	14
1.4 Diphtheria	15
1.5 Cough	16
1.6 Rhinitis and congestion	18
2. ADRENOCORTICOSTEROIDS	**24**
2.1 Glucocorticoids	26
2.2 Mineralocorticoids	30
2.3 Inhibitors of adrenocorticoid synthesis	31
3. DRUGS AND THE ENDOCRINE SYSTEM	**34**
3.1 Hypothalamic and pituitary hormones	35
3.1.1 Hypothalamic hormones	35
3.1.2 Anterior pituitary hormones	36
3.1.3 Posterior pituitary hormones	37
3.2 Gonadal hormones and inhibitors	39
3.2.1 Oestrogens	40
3.2.2 Progestins	41
3.2.3 SERMs	42
3.2.4 Oestrogen/progesterone agonists, antagonists, synthesis inhibitors	43
3.2.5 Hormonal contraceptives	43
3.2.6 Androgens – testosterone	46
3.2.7 Antiandrogens	48
3.3 Erectile dysfunction	49
3.4 Osteoporosis and drugs that affect bone mineral homeostasis	52
3.5 The thyroid gland	56

Appendix 15: Ward-rounds: Housekeeping rules

Discipline of Pharmaceutical Sciences
Pharmacology
PHRM401W1/PHRM402W2
Housekeeping Rules for Hospital Visits 2012

1. Check on the Pharmacology notice board which group you are in, as well as the dates you will be visiting each hospital. A group leader has been assigned to each group.
2. Make sufficient blank copies of the SOAP note (at least 12) as well as the Pharmacy Visit Report (at least 2). You will need to complete these during the visits.
3. Report to the Transport Department (bus stop behind Anatomy) on the Tuesday morning before 07h00. The group leader must check the presence of the other group members, as well as report any issues to our assistant, Nomfundo, who will meet you at the bus stop. She will have a register with her. Check with the bus driver where and when he will be picking you up at the hospital to return to campus. If you will be using private transport, you do so at your own risk.
4. Arrive at the hospital. If you will be visiting King Edward Hospital Pharmacy, report to the pharmacy manager (Ms Gill Cutting). If you will be visiting King George V Psychiatric Hospital, report to the Outpatient Department first. If you will be visiting any of the other hospitals, report to the main pharmacy.
5. Complete at least one set of SOAP notes under the supervision and guidance of the healthcare professional (pharmacist, nurse, doctor or specialist in charge). Remember to include the ward number as well. You may not identify the patient personally, but can for example refer to him/her as "patient X". Once complete, have it signed. If you are visiting King Edward Hospital Pharmacy, complete the Pharmacy Visit Report and have it signed by the Pharmacist. Please note that King George V Psychiatric Hospital does not reveal all the contents of the patient's file, and you would rather be given specific information directly by the psychiatrist.
6. The bus driver will be arriving around 12h30 to pick you up and return to campus.
7. Make a copy of the filled in SOAP note or Pharmacy Visit Report and keep it in your file. **Submit the original in the drop box outside Pharmacology no later than 12h00 on the Friday afternoon. No late submissions will be accepted.**
8. On the Friday afternoon, between 8-9 SOAP notes will be chosen for presentation at the following Tuesday afternoon. The names of the presenters as well as the hospital and date of visit will be posted on the notice board and e-mailed via UKZN SMS e-mail.
9. Prepare a PowerPoint presentation on the clinical case. Use the same headings as in the SOAP note. You should do additional research and list any references. The presentation may not be longer than 15 minutes. Time will be strictly kept.
10. All presentations must be pre-loaded on one USB memory stick and uploaded onto the departmental laptop computer no later than 13h30 on the Tuesday.
11. A DP requirement is 100% attendance of all ward-round and pharmacy visits, as well as ward-round presentations by the whole class. DPs will be refused for non-attendance, even if a valid medical certificate has been submitted. DP refusals can be appealed by submitting reasons and evidence by the indicated deadline.

Appendix 16: SOAPE Report

UNIVERSITY OF KWAZULU-NATAL

Discipline of Pharmaceutical Sciences
Pharmacology
PHRM401W1/PHRM402W2
SOAP Notes 2012

Name of student: _____

Registration Number: _____

Date: _____

Hospital: _____

Patient Folder Number: _____

Signature (Doctor/Pharmacist/Sister-in-charge): _____

Presentation (Subjective Data):

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

1

Assessment (Objective Data):

Diagnosis:

Management (Treatment):

Assessment of Management:

Discharge Summary (Education):

Appendix 17: Ward-rounds presentation assessment

UNIVERSITY OF KWAZULU-NATAL

Discipline of Pharmaceutical Sciences
Pharmacology
PHRM401W1/PHRM402W2
Ward Round Presentation Assessment 2012

Assessor: _____ **Date:** _____

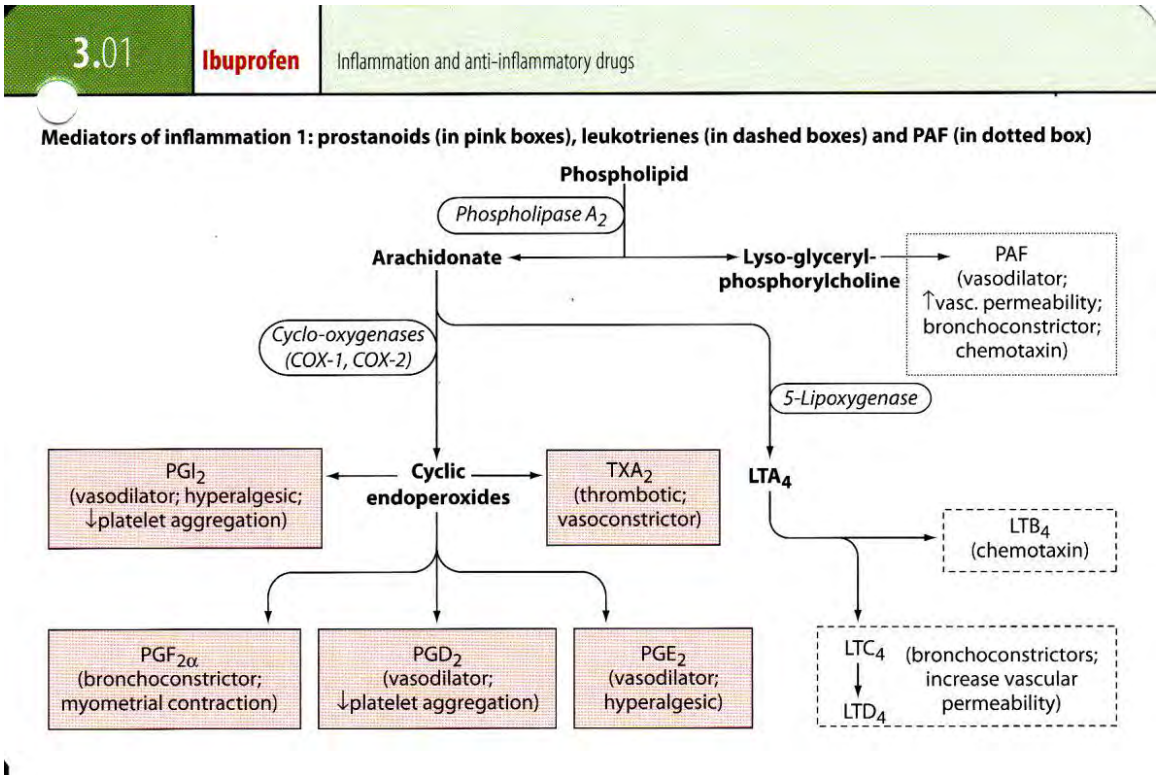
Institution:			
Name of Student:			
Reg. No.:			
Notes:	**[5]**		
Diagnosis Assessment:	**[10]**		
Treatment Assessment:	**[15]**		
Education:	**[10]**		
Questions:	**[10]**		
General Comments:	**TOTAL [50]**		

Institution:			
Name of Student:			
Reg. No.:			
Notes:	**[5]**		
Diagnosis Assessment:	**[10]**		
Treatment Assessment:	**[15]**		
Education:	**[10]**		
Questions:	**[10]**		
General Comments:	**TOTAL [50]**		

Appendix 18: **Pharmacology 301 outline, topics and subtopics**

WEEK	MONDAY LECTURE	MONDAY TUTORIAL	TUESDAY LECTURE	QUIZ
Dates	**Lecture/Case Study (CS)** **Students to identify/formulate objectives of CS**	**Students to research the CS problems/questions**	**Students to provide feedback on CS**	**Students to complete MCQs on Moodle**
6-12 Feb	Introduction; **Revision lecture:** Neurotransmitters; **CS1:** Sedative-hypnotics	**CS1:** Sedative-hypnotics	**CS1:** Sedative-hypnotics	-
13-19 Feb	**CS2:** Anti-seizure drugs	**CS2:** Anti-seizure drugs	**CS2:** Anti-seizure drugs	-
20-26 Feb	**CS3:** Skeletal muscle relaxants; **CS4:** Movement disorders	**CS3:** Skeletal muscle relaxants; **CS4:** Movement disorders	**CS3:** Skeletal muscle relaxants; **CS4:** Movement disorders	**QUIZ 1:** Neurotransmitters; sedative-hypnotics; anti-seizure drugs; skeletal muscle relaxants; movement disorders
27 Feb-4 March	**CS5:** Antipsychotic drugs, bipolar disorder	**CS5:** Antipsychotic drugs, bipolar disorder	**CS5:** Antipsychotic drugs, bipolar disorder	-
5 March-11 March	**CS6:** Antidepressants	**CS6:** Antidepressants	**CS6:** Antidepressants	**QUIZ 2:** Antipsychotic drugs; bipolar disorder; antidepressants
12 March-18 March	**Lecture:** Alzheimer's disease; **Lecture:** ADHD, narcolepsy	-	**CLASS TEST**	-
19 March-25 March	**Lecture:** Migraine headache; **Lecture:** Drugs of abuse	-	**REVISION**	**QUIZ 3:** All topics

Appendix 19: Pharmacology 301 Moodle Flashcards



A non-steroidal anti-inflammatory drug (NSAID) **Ibuprofen**

Actions Reduces inflammation, is analgesic for inflammatory pain, is antipyretic (i.e. reduces raised temperature).

MOA Reversible inhibition of COX-1, weak inhibition of COX-2.

Abs/Distrb/Elim Given orally, half-life 2h.

Clinical use Inflammatory conditions (e.g. rheumatoid disease, osteoarthritis, musculo-skeletal disorders); dysmenorrhoea.

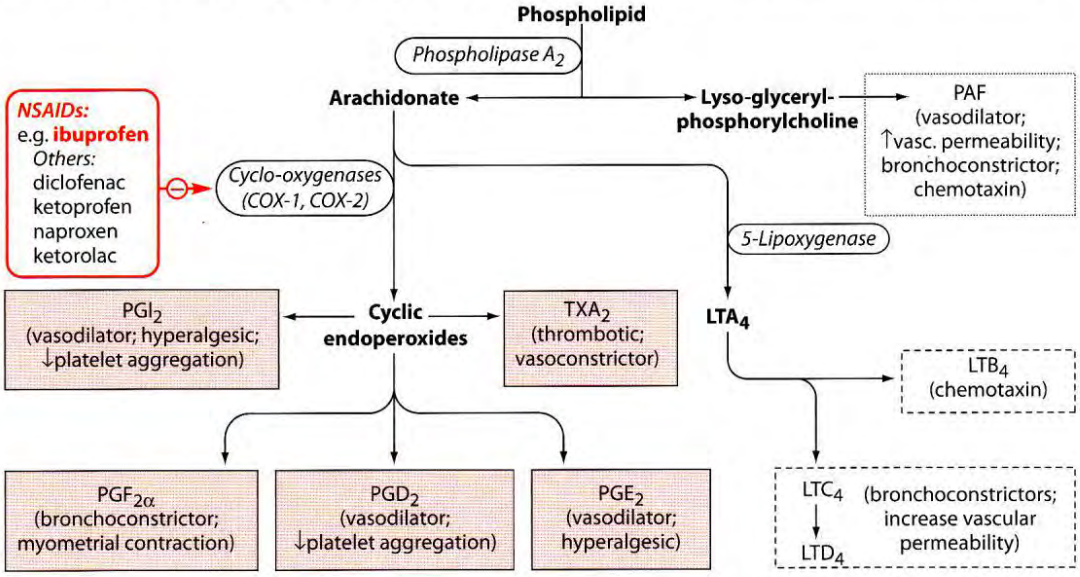
Adverse effects Gastrointestinal disturbances including gastric bleeding; headache, dizziness less commonly, allergic reactions occasionally; renal toxicity rarely.

Special points Increased adverse effects if combined with other NSAIDs. Used to close patent ductus arteriosus.

Similar drugs Diclofenac: (moderate potency, half-life 1–2h). Ketoprofen (half-life ~2h;) Naproxen (more potent, half-life 10–14h); ketorolac (half-life 4–10h, COX-1 selective); piroxicam (half-life 57h, GIT toxicity common, COX non-selective).

R&D 6e pp 226-230; D&H 2e pp. 42-43

Mediators of inflammation 1: prostanoids (in pink boxes), leukotrienes (in dashed boxes) and PAF (in dotted box)



A non-steroidal anti-inflammatory drug (NSAID) **Aspirin**

Actions Reduces inflammation, is analgesic for inflammatory pain, is antipyretic (i.e. reduces raised temperature). Inhibits platelet aggregation (see card 10.01).

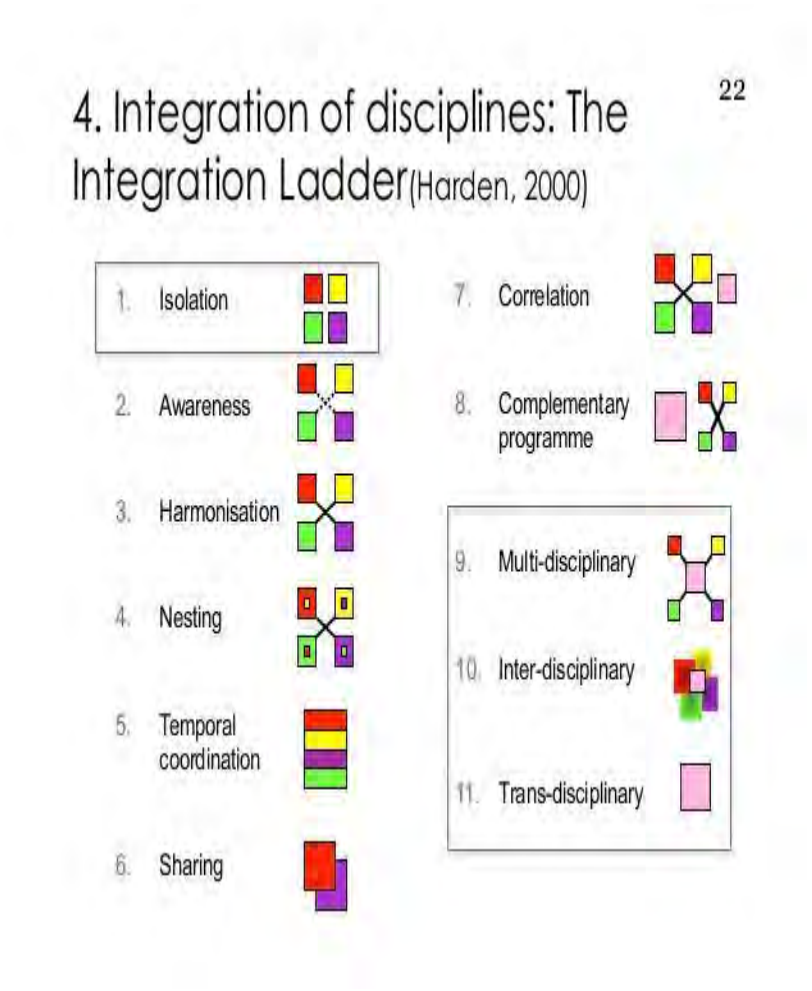
MOA Irreversible acetylation of cyclo-oxygenases; weakly COX-1 selective.

Abs/Distrb/Elim Given orally. Half-life only 30min – rapid hydrolysis to salicylate but effects last longer because the COX has been inactivated and new enzyme must be produced.

Clinical use ***Main use: as antithrombotic in myocardial infarction*** (see card set 7). Other NSAIDs are preferred for anti-inflammatory action and analgesia in musculo-skeletal conditions.

Adverse effects Gastrointestinal disturbances, especially gastric bleeding. In high dosage can cause 'salicylism' (tinnitus, vertigo, reduced hearing); allergic reactions occasionally; renal toxicity rarely. *Can cause the potentially fatal Reye's syndrome (encephalopathy & liver disorder) in children after a viral infection.*

Special points Should not be used in children. Can cause increased effect of warfarin resulting in bleeding. Should not be used for gout because it reduces urate excretion & interferes with the action of uricosuric agents.

R&D 6e pp 226-230; D&H 2e pp. 42-43

Appendix 20: Harden's (2000) integration ladder. Adapted from http://www.slideshare.net/Jibarraj2/candidacy-defense-v13-semifinal [accessed on 13/04/2015].