ROLE AND STATUS OF THE BASIC PHARMACEUTICAL SCIENCES IN PHARMACY EDUCATION: A CASE STUDY OF THE UBC BSC(PHARM) PROGRAM.

by

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY in THE FACULTY OF GRADUATE AND POSTDOCTORAL STUDIES (Curriculum Studies)

THE UNIVERSITY OF BRITISH COLUMBIA (Vancouver)

April 2014

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ABSTRACT

The basic pharmaceutical sciences have played an integral role in the scientific foundations of pharmacy education in Canada for 70 years although their role has shifted as programs have become more clinically-focused. Less reliance on the basic pharmaceutical sciences has prompted concerns regarding the scientific foundations of contemporary curricula and to what extent they are adequate for preparing today’s pharmacists. Addressing these concerns, this study inquired into the role and status of the basic pharmaceutical sciences in UBC’s current BSc(Pharm) program. Employing qualitative case study methodology and learning-centered approaches to post-secondary education, a combination of document, interview, and classroom observation analyses were used to establish: 1) the history of the basic pharmaceutical sciences in UBC pharmacy programs; 2) faculty perspectives on their role and status in the current program, and; 3) the curriculum and pedagogical practices of basic pharmaceutical scientists. Results from document analyses examining the history of pharmacy education in British Columbia since Confederation show that the basic pharmaceutical sciences have played a dominant role in UBC pharmacy programs for four decades; emphasis has decreased from 40% in the heavily science-based curricula of the 1980s to 25% of today’s clinically-focused program. Regarding the role and status of the basic pharmaceutical sciences in the current program, interview analyses suggest perspectives of scientists and practitioners are deeply polarized. While there is agreement that the basic pharmaceutical sciences have a role in preparing students for practice, science and practice solitudes confound curriculum decisions regarding optimal levels, importance, and status. Interview and classroom observation analyses suggest the curriculum and pedagogical practices of basic pharmaceutical scientists are predominantly teaching-centered. Although committed educators, discipline-based practices and a legacy of
privilege may be exacerbating the science and practice solitudes, the lack of agreement amongst scientists and practitioners about role and status, and existing tensions regarding curriculum optimization. To address confounding factors, scholarly approaches and interdisciplinary curriculum development teams are suggested for on-going curriculum reforms. In addition, faculty development programs connecting basic pharmaceutical scientists with practice and developing learning-centered teaching approaches are proposed. The role of Faculty leadership and policies in curriculum reform efforts is also described.
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LIST OF ABBREVIATIONS

AFPC – Association of Faculties of Pharmacy of Canada
ADPC – Association of Deans of Pharmacy of Canada
BC – British Columbia
BCMA – British Columbia Medical Association
BCPhA – British Columbia Pharmaceutical Association
BSc – Baccalaureate of Science
BSc(Pharm) – Baccalaureate of Science in Pharmacy
BSP – Bachelor of Science in Pharmacy
CAHP – Canadian Academy of the History of Pharmacy
CAPS – Cases in Pharmaceutical Sciences
CCAPP – Canadian Council for the Accreditation of Pharmacy Programs
CCPF – Canadian Conference of Pharmaceutical Faculties
CPhA – Canadian Pharmacists Association
E2P – Entry to Practice
FPS – Faculty of Pharmaceutical Sciences
HBC – Hudson’s Bay Company
MSc – Master of Science
MSP – Master of Science in Pharmacy
NAPRA – National Association of Pharmacy Regulatory Authorities
OSCE – Objective Structured Clinical Exam
PEBC – Pharmacy Examining Board of Canada
PharmD – Doctor of Pharmacy
PhD – Doctor of Philosophy
SPEP – Structured Practice Education Program
US – United States
UBC – University of British Columbia
GLOSSARY

**Community pharmacy:** refers to the provision of care through neighbourhood drug stores licensed to store, dispense and sell drugs or medical devices to the public. Common community pharmacies include Canadian chain drug stores such as London Drugs®, Shopper’s Drug Mart® and Pharmasave®; sometimes referred to as corporate pharmacy.

**Conceptual orientation:** refers to a coherent array of overlapping and interacting dimensions, issues, and factors that help frame the complexity of curriculum. Curriculum dimensions for this study: purpose, what is taught (content knowledge), how it is taught (teaching methods), overall design and structure (with attention to coherence), and how learning is demonstrated and judged (through assessment and evaluation).

**Curriculum:** refers to the organized delivery of a selection of content and learning experiences that is appropriate for the learning context, integrated and of increasing difficulty throughout a course or program of study, and designed to create a flexible, respectful and supportive learning environment. Helping students to meet the objectives/outcomes for their courses and our pharmacy program and recognize their potential as individuals and professionals is central.

**Depth:** refers to the degree to which the fundamental principles of the basic pharmaceutical sciences should be explored in pharmacy curricula and understood by students to support contemporary shifts in pharmacy practice.

**Empirical science:** refers to knowledge derived from systematic observation and personal experience of the world rather than on intuition, faith, reasoning, or appeals to authority. Empirical evidence, as it is used here, is often qualitative or descriptive.

**Faculty:** the word “Faculty” is used to denote the UBC Faculty of Pharmaceutical Sciences. The words “faculty members” or “faculty” refers to those contributing to the current BSc(Pharm) program. As appropriate, they are referred to throughout the study by various signifiers including scholars and educators, basic pharmaceutical scientists, clinical and practice faculty, scientists, practitioners, and disciplinary experts.

**Galenical pharmacy:** refers to methods of preparing and delivering medicines of animal, vegetable and mineral origin; galenical pharmacy has ancient roots in the history of the profession and was a common subject in pharmacy programs of the early 20th century.
Ideal professions: refer to a subset of professional occupations that are recognized for their long histories and dominance in organized societies. Architecture, law, medicine and the clergy are typically cited in the sociology literature as ideal professions.

Institutional pharmacy: refers to the provision of care through organized health care settings including hospitals, nursing homes, extended care facilities, and neighborhood health centers.

Materia medica: means medical material and refers to the medicines of animal, botanical and mineral origin used for the treatment of disease. Materia medica has ancient roots in the history of the profession and was a common subject in pharmacy programs of the early 20th century. Materia medica monographs, found in early textbooks, typically included information on the origin, composition, appearance, use and dose of the medicine as well as the methods and standards of preparations and storage.

Pharmacognosy: is the scientific study of medicines derived from naturally occurring botanical sources and a subject often found in pharmacy programs in the first half of the 20th century. In Canadian pharmacy programs pharmacognosy, as a curriculum subject, reached its height of importance in the late 1950s and early 1960s.

Practical Pharmacy: refers to the practical laboratory exercises included in pharmacy curricula to develop the technical laboratory skills needed to prepare products made and sold in pharmacies. Practical pharmacy courses were found in pharmacy programs of the early to mid-20th century.

Profession: is a subset of occupations that can be characterized by the following framework of distinctive dimensions: offering a socially necessary function, specialized knowledge, securing exclusive legal jurisdiction over their knowledge and services, intensive accredited preparation usually in universities, and norms of professional conduct including a commitment to social responsibly usually in the form of a Code of Ethics.

Professionalization: refers to the process by which occupations achieve and maintain professional status articulated as a sequence of events.

Professionalism: refers to the conduct, aims or qualities that characterize or mark a profession or a professional person. Professionalism is often related to the quality and standards of education and practice.

Profession of Pharmacy: conceived broadly, the signifier “profession of pharmacy” encompasses many constituencies including institutional and community pharmacy practice,
pharmacy education, academic pharmacy, the pharmaceutical industry as well as advocacy, regulatory, corporate and government bodies. The uses of the signifiers “profession,” “pharmacy profession” or the “profession of pharmacy” in this thesis denote a narrower grouping of constituencies that include primarily pharmacy practice, pharmacy education and academia. Broader uses of the signifiers will be indicated in the text when necessary.

**Role:** refers to the characteristic or expected function of a person or thing in a particular setting or environment. The word role, as it is used in this thesis, refers to the expected function of the basic pharmaceutical sciences in the UBC BSc(Pharm) program.

**Scope:** refers to the breadth or range of relevant topics that should be covered in pharmacy curricula for understanding the basic pharmaceutical sciences and understood by students to support contemporary shifts in pharmacy practice.

**Status:** refers to the condition or position of a thing with regard to its importance. The word status, as it is used in this thesis, refers to the importance of the basic pharmaceutical sciences in the UBC BSc(Pharm) program.
ACKNOWLEDGEMENTS
Completing this degree program has been a very, very long haul. There have been many times I wondered whether I would make it or if I had the gas to cross the finish line. But I persevered and I could not be more proud. What an incredible ride and despite the head scratching, sweat, and cursing required, I have enjoyed every minute of it. I have loved the opportunity to engage so intensely in the courses, with the professors, in the readings and writings, and with the incredible cohort of fellow students; many have long-since graduated. Fabulous people, fabulous experiences! I feel very privileged to have had this opportunity and I can honestly say that going back to school has been one of the best decisions I have made in my life.

There are many people to thank for helping me reach this stage. First of all to my supervisors, Harry, Tony and Wayne, I thank you for your direction, encouragement and patience. I would not have made it to this point without your tremendous help and support. It has been an absolute pleasure working with you. I would like to thank my Faculty and in particular, former Dean, Dr. Robert Sindelar and Associate Dean Academic, Dr. David Fielding for encouraging me to pursue this degree and for their tremendous support throughout. To Marion, thank you for all your time, energy, and brilliance. I look forward to doing great things in the Faculty and our pharmacy program with you in the future. To my kids, Danielle and Georgina, my parents and my sisters I say thank you and “guess what? I’m done!!” Eden, my love, you have lived and breathed every step I have taken and every word I have written. I thank you for never once doubting. To finish, thank you all for helping me become a better teacher, scholar, colleague and person. Your support and encouragement has allowed me to contribute to my Faculty and this profession in ways that would not have been possible without this journey.
DEDICATION

This thesis is dedicated to all those middle-aged individuals that think they are too old to
go back to school or to learn something new. I started this degree at age 50 and I am now 56. So
if you have been mulling over the idea of going back to school for awhile, perhaps even years,
then I say to you, find a way to do it! Buckle up for an incredible journey and as I always say to
my students, “Give it everything you’ve got!”
CHAPTER ONE: INTRODUCTION

1.1 The Curriculum Challenge

This research study explores the role and status of the basic pharmaceutical sciences in the University of British Columbia’s (UBC) contemporary Baccalaureate of Science in Pharmacy [BSc(Pharm)] degree program. Recognized nationally as the first entry-to-practice degree in seven of ten professional schools of pharmacy, Canadian BSc(Pharm) programs, including UBC’s, have undergone profound change in response to Canada’s increasingly complex and over-burdened public health care system (Canadian Pharmacists Association [CPhA], 2013; Faculty of Pharmaceutical Sciences [FPS], 2012). Aligning pharmacy curricula with models of professional practice that emphasize clinical education and patient-centered care has been the primary focus of BSc(Pharm) curriculum revisions (Hepler & Strand, 1990; Hubball & Burt, 2004; Jungnickel, Kelly, Hammer, Haines, & Marlowe, 2009; Perrier, Winslade, Pugsley, Lavack, & Strand, 1995). Through nationally coordinated efforts (Association of Faculties of Pharmacy of Canada [AFPC], 2010), BSc(Pharm) curricula have been revised to reflect nationally accepted educational outcomes, increased emphasis on clinical and experiential learning and less reliance on scientific fundamentals (Cutler et al., 2009; Skau, 2007; Speedie et al., 2012). Although these curricular revisions are anticipated to help strengthen and align the profession with the health care needs of Canadians (CPhA, 2013), recently concerns have been raised regarding: 1) the diminishment of the foundational basic pharmaceutical sciences in revised curricula, and; 2) to what extent these contemporary curricula are adequate for preparing pharmacists to meet Canada’s present and future health care challenges (Campbell, 2006; Cutler et al., 2009; Skau, 2007; Woster, 2003). With little scholarly research literature investigating these issues and their impact on BSc(Pharm) programs in Canada (Austin & Gregory, 2007) and
none in British Columbia (BC), this study attempts to address this gap by exploring, analyzing and documenting the role and status of the basic pharmaceutical sciences in UBC’s BSc(Pharm) program. Critical insights from this study are anticipated to help inform current pharmacy curriculum reform efforts at UBC (FPS, 2012). This research is also anticipated to provide perspectives on the balance between the basic pharmaceutical sciences and clinical and experiential learning needed in the education of contemporary pharmacists in BC.

1.2 Clarifying Intentions, Study Purpose and the Research Questions

As it has many times in its long esteemed history, today the profession of pharmacy in Canada is facing critical challenges to its core identity, function and role (CPhA, 2013). Attempting to shake off the legacy of decades of technical product-orientation and dispensing focus in practice, the national “Blueprint for Pharmacy” initiative, sets out a bold vision for strengthening, realigning and reasserting the profession’s role, status and key services within the Canadian healthcare system. Coordinated by the Canadian Pharmacists Association beginning in 2007 and now endorsed by all sectors of pharmacy in Canada, the Blueprint’s long-term plan emphasizing “optimal drug therapy outcomes for Canadians through patient-centred care” (CPhA, 2013, p.6) has challenged academic pharmacy to establish the knowledge, skills and values required of Blueprint practitioners; putting patients, drug therapy and patient-centered care ahead of products and dispensing is the primary focus. Targeting 2020 as the implementation timeline, the next decade promises on-going curriculum reform within Canadian BSc(Pharm) programs to meet the Blueprint’s vision; recent commitments by the Deans of Pharmacy of Canada to implement the six-year Doctor of Pharmacy (PharmD) degree in all Canadian pharmacy schools by 2020 (Association of Deans of Pharmacy of Canada [ADPC], 2010) sets the stage for change. While nationally-accredited educational outcomes are well-
established for Canadian BSc(Pharm) programs (AFPC, 2010) and learning-centered curriculum and pedagogical practices have significant traction in pharmacy education (Abate, Stamatakis, & Haggett, 2003; Bradberry et al., 2007; Hubball & Burt, 2004; Hymel & Foss, 1990), the content knowledge of the Blueprint pharmacist has emerged as a focus of much curriculum deliberation and reform effort (Speedie et al., 2012). Vying for attention within the knowledge domains of the Blueprint pharmacist and curricula are, among others: professionalism and social responsibility (Duncan-Hewitt, 2005); intra- and interprofessional education and cultural competency (AFPC, 2010; CPhA, 2013; Jungnickel et al., 2009); technology and informatics (Blouin et al., 2009), and; the scientific knowledge base required for contemporary pharmacy practice and education (Albon, 2010; Campbell, 2006; CPhA, 2013; Cutler et al., 2009; Skau, 2007; Woster, 2003). This study focuses on this last issue with particular attention on the basic pharmaceutical sciences, a foundational knowledge domain in BSc(Pharm) programs for 70 years. As mentioned previously, there is very little scholarly research investigating the scientific foundations of Canadian BSc(Pharm) programs to help inform or guide curriculum reform efforts in the Blueprint era (Austin & Gregory, 2007). This study addresses this issue directly by exploring the state of the basic pharmaceutical sciences in contemporary pharmacy education in BC. Focusing primarily on understanding the present situation, the purpose of this study is to establish the role and status of the basic pharmaceutical sciences in the current UBC BSc(Pharm) program. To what extent the basic pharmaceutical sciences have a place in the knowledge base of the contemporary pharmacist and Blueprint curricula as well as providing critical insights into what goes on in the classrooms of basic pharmaceutical scientists, represent the two main lines of inquiry. A third situates UBC’s BSc(Pharm) program historically within the broader history of pharmacy practice and education in Canada and BC. Together, these lines of inquiry provide
context for bringing understanding to the challenges facing the pharmacy profession, professional education and curriculum reform today. To address the study’s purpose this research is guided by the following questions:

1) What has been and what currently is the scope and depth of the basic pharmaceutical sciences in the current UBC BSc(Pharm) program?

2) What are the current perspectives, as articulated by pharmacy scholars and educators, on the role and status of the basic pharmaceutical sciences in the UBC BSc(Pharm) program?

3) What has been and what currently are the curriculum and pedagogical practices used to teach the basic pharmaceutical sciences in the UBC BSc(Pharm) program?

### 1.3 About Pharmacy Programs in Canada

Currently there are ten university-based professional schools of pharmacy in Canada that have exclusive authority and responsibility for educating pharmacists. Evenly distributed across the country, seven out of the ten schools offer a 1+ 4 program (that is, one prerequisite year of introductory basic sciences followed by the four-year pharmacy program) leading to the BSc(Pharm) degree (Canadian Council for Accreditation of Pharmacy Programs [CCAPP], 2013). Although pharmacy education and programs have changed profoundly since the passing of the first Canadian Pharmacy Act in 1870 (Austin & Duncan-Hewitt, 2005; Hepler, 1987), the 1+ 4 BSc(Pharm) degree program has provided the standard entry-to-practice qualifications for pharmacists in Canada for more than 50 years (Riedel & Stieb, 2001). As mentioned briefly in Section 1.2 above, there is a move nationally towards the PharmD degree as the first entry-to-practice degree by 2020 which requires an additional year of experiential training beyond the BSc(Pharm) qualifications (ADPC, 2010). Currently, pharmacy schools in Quebec (Universities of Laval and Montreal) and the University of Toronto offer the PharmD degree with 2-3 other
Canadian schools, including UBC, moving towards PharmD implementation (CCAPP, 2013; FPS, 2012; Koleba, Marin, & Jewesson, 2006). The entry-level PharmD degree has been mandatory in US pharmacy schools since 2000 (Jungnickel et al., 2009). Following successful completion of national board exams including both written multiple choice and performance-based assessments, pharmacy graduates can practice anywhere in Canada (AFPC, 2010). The vast majority of pharmacy graduates work either as pharmacists in local community pharmacies (e.g., Shopper’s Drug Mart®, Pharmasave®) or in institutional settings such as hospitals, nursing homes, extended care facilities, neighborhood health centers or research environments (Jones, MacKinnon, & Tsuyuki, 2005).

A key strength of the pharmacist as a member of the Canadian health care team is the scope and depth of their knowledge about drugs; that is, their unique understanding of how organic molecules known as drugs, do what they do in the treatment of disease, the management of health outcomes, and quality of life for patients (Pandit, 2007). Historically, Canadian BSc(Pharm) programs, including UBC’s, have been predominantly science-based comprising five disciplines (Skau, 2007). Medicinal chemistry (the chemical, physical and structural basis of drug properties and action), pharmaceutics (the science of drug delivery) and pharmacology (the science of drug action and toxicity) make up the basic pharmaceutical sciences, while clinical pharmacy (drug therapy, disease treatment and patient-care) and pharmacy practice (drug distribution, pharmacy management and patient care) represent the practice-oriented and experiential learning disciplines. While pharmacists today share similar general and scientific knowledge foundations with other health professions such as medicine, nursing and dentistry (AFPC, 2010; DePaola & Slavkin, 2004; Mowforth, Harrison, & Morris, 2005; Weatherall, 2006; Wolf et al., 1993), emphases on understanding how the basic pharmaceutical sciences
underpin therapeutic decision-making distinguish pharmacy programs amongst health professions and provide the unique scientific foundations for professional practice and education (Skau, 2007); no other entry-level health care professional has the specialized drug knowledge of the pharmacist or can make this unique claim (Speedie et al., 2012). Completion of prerequisite courses in biology, chemistry, mathematics and physics prior to admission into pharmacy programs also emphasizes the centrality of science in the education and knowledge base of pharmacists (Austin & Gregory, 2007).

In terms of program structure, generally, the early years of BSc(Pharm) curricula build basic pharmaceutical sciences knowledge while the latter years apply this knowledge in the practice-oriented disciplines of clinical pharmacy and pharmacy practice. Experiential learning in off-campus institutional and community practice settings becomes increasingly predominant towards the end of BSc(Pharm) programs. Austin and Gregory (2007) have aptly described this building blocks approach to BSc(Pharm) curriculum design as follows: “as it is necessary to learn to walk before one can run, it is equally necessary to understand science before one can apply it in a clinical context” (p. 615). While there has been significant learning-centered curriculum reform (Hubball & Burt, 2004), the discipline-based, building blocks structure of Canadian BSc(Pharm) programs remains a common characteristic of pharmacy education and curricula today (Duncan-Hewitt & Austin, 2005). The heritage of this structure dates back to the pharmacy programs of the late 19th and early 20th century in Canada and to the mid-1940s in UBC pharmacy programs (Raison, 1967; Reidel & Steib, 2001).

1.4 The Study

The purpose of this study is to investigate the scientific foundations of UBC’s current BSc(Pharm) degree program with particular attention to the basic pharmaceutical sciences.
Underpinned by Hubball and Burt’s (2004) theoretical framework for learning-centered curricula and framed by three research questions, this study seeks to open up complicated conversations (Pinar, 2004) about curriculum, curriculum content and the challenging work of establishing the role the basic pharmaceutical sciences did, should, and might continue to play in the knowledge base of UBC’s pharmacy graduates. Equally important is understanding the status of the basic pharmaceutical sciences and how current perspectives on their value and importance might provide insight and guidance regarding curriculum decision-making and reform efforts.

Employing research methodology focused on in-depth exploration of the research questions, the study design converges historical context with contemporary views of pharmacy scholars and educators and first-hand knowledge of the teaching practices of basic pharmaceutical scientists to address its purpose. Not only does this study provide a unique opportunity for critical examination of the basic pharmaceutical sciences in UBC’s BSc(Pharm) program, it offers a window into what actually happens in the classrooms of basic pharmaceutical scientists, something that is currently missing in the research literature. The knowledge gained is anticipated to help: 1) inform current strategic planning and curriculum deliberations about UBC’s BSc(Pharm) program; 2) provide insights and perspectives on the role and status of the basic pharmaceutical sciences as well as the science-practice balance in the program, and; 3) bring understanding to internal Faculty and curriculum dynamics that affect curriculum change.

More generally, this study is an attempt to address the Blueprint for Pharmacy’s challenge to academic pharmacy regarding curriculum revision. At its heart, it is about advocating scholarly, contextualized and evidence-based approaches to curriculum decision-making that align closely with contemporary thinking and research-based approaches to post secondary curriculum reform (Blouin et al., 2009; Hubball & Gold, 2007; Weiman, 2007).
Pragmatically, a theoretical empirical inquiry using Stake’s (2010) qualitative intrinsic case study approach was designed and conducted to address the purpose of the study and answer the research questions. The study’s case is the current UBC BSc(Pharm) program. The study took place between March 15, 2011 and March 15, 2012 in the George T. Cunningham Building, home of the UBC Faculty of Pharmaceutical Sciences since 1960, and the lecture halls in UBC’s biomedical library where much of the large-class teaching (for 150 plus students) in the program takes place. Twenty three faculty members participated in the study (approximately 40% of the current faculty roster) including thirteen basic pharmaceutical scientists. Representing all academic ranks, academic disciplines and appointment types (full-time, part-time and emeritus), the study sample drew from over 60 years of experience and Faculty history1. Data collected about the case included semi-structured interviews, classroom observations of basic pharmaceutical scientists, and document analyses. Constant comparative analysis was used to examine connections between the historical context, perspectives and opinions of study participants and the classroom practices of the basic pharmaceutical scientists. The use of multiple data sources helped establish trustworthiness of the research findings through triangulation. Finally, throughout the study the researcher kept a detailed journal of field notes and reflections on issues raised and opinions expressed.

1.5 Significance of the Study

Demands on the Canadian health care system today are the basis of current national efforts to realign pharmacy’s professional role and review BSc(Pharm) curricula (CPhA, 2013; Dolovich, 2012). Examining the scientific foundations of contemporary pharmacy education and

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1 For the purposes of this study “faculty members” or “faculty” are considered all the contributors to the current BSc(Pharm) program. As appropriate, they are referred to throughout the study by various signifiers including scholars and educators, basic pharmaceutical scientists, clinical and practice faculty, scientists, practitioners, and disciplinary experts. The word “Faculty” is used to denote the UBC Faculty of Pharmaceutical Sciences. These definitions have been included in the Glossary.
the science-practice balance in BSc(Pharm) curricula is emerging as a key issue that has shaped and will continue to shape pharmacy education and professional practice (FPS, 2012; Skau, 2007; Speedie, 2012). This study will not only attempt to add to the scant pharmacy education literature exploring, analyzing and documenting the role and status of the basic pharmaceutical sciences in pharmacy education but appears timely in terms of the important issues facing the profession and professional education nationally. Focused on UBC’s BSc(Pharm) program, this case study represents the first of its kind on this program and the teaching practices of the Faculty’s basic pharmaceutical scientists. It is anticipated that critical insights from this study will situate the UBC BSc(Pharm) program in the broader context of pharmacy educational change in Canada, and inform scholarship, curriculum reform efforts and pedagogical practices regarding the basic pharmaceutical sciences in pharmacy education at UBC. This study will also attempt to provide perspectives on the present and future role and status of the basic pharmaceutical sciences in contemporary pharmacy education and professional practice in BC and Canada.

1.6 Researcher Background

As of August 2013, I had been teaching in the UBC BSc(Pharm) program for 26 years; I have recently been inducted into UBC’s Quarter Century Club, the ceremony taking place on November 13, 2012. My academic background, completed at UBC, is in the natural sciences, including a Baccalaureate of Science (BSc) in general and a Master of Science (MSc) in organic and analytical chemistry. I think of myself as a medicinal chemist and science educator. My primary role has been teaching medicinal and analytical chemistry in Years 1 and 3 of the BSc(Pharm) program. I am not a pharmacist and wonder regularly how my understanding and approach to education and teaching would change if I were. I joined the Faculty as a Lecturer in
1986 and was tenured as a Senior Instructor in 1994. Since I joined the Faculty I have immersed myself in all things teaching and learning. I have a diverse array of curriculum development, course design, and teaching experiences as well as a keen interest in the scholarship of teaching and learning. I have published my work, presented extensively at local, national and international meetings, and received substantial grant funding to support my scholarly activities. I am also an award winning teacher receiving Faculty, university, and national teaching awards. At the national level, I spent nine years as a member of the Association of Faculties of Pharmacy of Canada, the professional organization representing academic pharmacy in Canada, including its president in 2007-2008. I am currently the Acting Associate Director of our Faculty’s Office of Educational Support and Development. Although my career has had many ups and downs I feel great privilege and satisfaction to be able to do the work I do in the Faculty and feel supported and respected. I have grown up in this Faculty and care deeply about the pharmacy program, our students, and the profession.

I am also a science lover. I have developed an incredibly deep connection with the science I teach and how weird little organic molecules called drugs do what they do in the ways they do it. I find the basic pharmaceutical sciences fascinating and have come to appreciate just how profoundly scientific pharmacy and drug therapy is. While I personally do not advocate for drug therapy preferring non-drug or live-style change options whenever possible, I do believe, today more than ever, there is a need for health professionals that have expert knowledge of the natural sciences, human biology, how drugs work and how to manage drug therapy. Currently only pharmacy programs offer this in-depth knowledge about drugs and the basic pharmaceutical sciences form much of the scientific foundation of this knowledge. As a long time medicinal chemist I have witnessed the changes in our pharmacy curricula and the continued diminishment
of the scientific foundations of the program. While this trend is concerning, what and how much of the basic pharmaceutical sciences is needed in contemporary curricula is a matter of intense debate (Rosenthal, Austin, & Tsuyuki, 2010; Skau, 2007). In my view, this Faculty needs to think more collectively and critically than it has about the knowledge base of the Blueprint for Pharmacy’s envisioned practitioner (the medication therapy expert) and what role the basic pharmaceutical sciences might play in that knowledge base, if any (CPhA, 2013). While I am well-placed to engage in this work I am under no delusion that the basic pharmaceutical sciences will or should remain part of the specialized knowledge base of the pharmacist or in pharmacy curricula; the basic pharmaceutical sciences may have to go the way of compounding and the apothecary. What I would like to know however, is that if curriculum changes are needed, they have been made from a scholarly research-based perspective. I feel that opening up this conversation is embodied in this research study and represents the start of the next phase of my pharmacy career. I am excited about the possibilities. As I have engaged in this research project I have been particularly mindful and reflexive of how my experiences, opinions, insights and biases could impact this study. To address this possibility I have used extensive data triangulation in my analyses, engaged study participants in member checking activities, and verified my findings through independent analysis and data auditing.

1.7 Organization of Thesis

This thesis is organized into 8 chapters. Chapter 1 has provided an overview of the study in light of the challenges facing contemporary pharmacy practice and education today. Its purpose, research questions, and significance along with the site of the study, the UBC BSc(Pharm) program, the study outline and my background as researcher have been described. Chapter 2 begins the literature review by exploring professions with a specific focus on
pharmacy. Through an examination of what a profession is and how sociological theories have helped characterize them, a brief history of the professionalization of pharmacy in Canada will be presented. Key to this historical account is the critical internal and external pressures that have shaped the profession historically and continue to generate urgency today. Chapter 2 also situates this study in the complex pharmacy practice landscape and foregrounds the corresponding examination of pharmacy education in Chapter 3. Building on Chapter 2, Chapter 3 examines how the professionalization of pharmacy in Canada has impacted pharmacy education and curricula. More specifically, Chapter 3 introduces the specialized knowledge that distinguishes pharmacists and pharmacy education amongst health professions and then follows with a broader examination of the complexities of curriculum that underpin this study. Perspectives on what curriculum is and the approach to developing the subsequent history of pharmacy education in Canada are explored. Key to this historical account, which focuses on the role that science and the basic pharmaceutical sciences have played, is the notion of a conceptual orientation towards curriculum; a construct that attempts to capture curriculum complexity in a framework of dimensions for analyzing and interpreting how curriculum is conceived and enacted. Chapter 3 finishes by clarifying the intentions of this research study and bridging both Chapters 2 and 3 with the study methodology and methods developed in Chapter 4. Designed as a theoretical empirical case study of UBC’s current BSc(Pharm) program, Chapter 4 begins with an exploration of the field of educational research in an attempt to locate theoretical empirical inquiry within it and construct an argument as to why Stake’s (2010) qualitative intrinsic case study approach employing multiple data collection methods was an appropriate methodological choice. The chapter then continues by describing the study pragmatics. The conceptual structure of the study and the theoretical framework used to guide data collection will be presented.

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2 The definition of “professionalization” adopted for this study can be found in the Glossary.
Descriptions of the study setting, its participants and the methods used to collect, manage and analyze the data collected are included. The chapter concludes with comments on issues of trustworthiness, ethical considerations and limitations of the study. Chapters 5, 6 and 7 present the results of the study. Chapter 5 attempts to answer research question one by examining what has been and what currently is the scope and depth of the basic pharmaceutical sciences in the current UBC BSc(Pharm) program. Curriculum development timelines resulting from the historical document analyses of pharmacy education in BC and at UBC since Confederation, are used to situate the current BSc(Pharm) program historically. Through meta-analysis of the curriculum development timelines, pharmacy curricula representative of distinctive conceptual orientations towards pharmacy education provide the basis for: 1) examining the development of pharmacy education at UBC; 2) whether or not these changes aligned with the broader historical changes in pharmacy education in Canada, and; 3) how the emphases on science and the basic pharmaceutical sciences in pharmacy education at UBC have been impacted. Roster analysis and program enrollment information are included as additional indicators of changing perspectives and emphases. Chapter 6 answers research question two by providing the results of interview analyses with a broad sample of faculty regarding the role and status of the basic pharmaceutical sciences in UBC’s current BSc(Pharm) program. The chapter begins by introducing the study participants including their views on what the basic pharmaceutical sciences are, practice experience and its impact on teaching, and the future of the profession. The chapter finishes with the study participant’s perspectives on the role and status of the basic pharmaceutical sciences in the current program. As key working parts of the case their voices as scientists, practitioners, scholars and educators explore the importance of science and the basic pharmaceutical sciences in the program, the extent to which these sciences have a place in the knowledge base of the
contemporary pharmacist and the inherent tensions associated with curriculum deliberation, reform and optimization. Chapter 7 focuses specifically on the basic pharmaceutical scientists. It attempts to answer research question three by exploring the curriculum and pedagogical practices of those responsible for teaching the basic pharmaceutical sciences in the BSc(Pharm) program. Presented in two parts, the chapter begins with a broader examination of the curriculum and pedagogical practices of the basic pharmaceutical scientists developed through interview and course document analyses. Focused on the study’s theoretical framework of curriculum dimensions, approaches to course design and teaching practice are presented and discussed. The chapter finishes by describing “Three Classes in a Week,” a closer look at how the basic pharmaceutical sciences are taught through first-hand accounts of classroom experiences. The intent of Chapter 7 is to provide a sense of the curriculum and pedagogical practices used to design and teach the basic pharmaceutical sciences courses in the program, the scientific content currently taught and the basic pharmaceutical scientists responsible for their designing and teaching. The chapter finishes with a brief summary. Chapter 8 completes this thesis by revisiting results Chapters 5, 6 and 7 to examine what has been learned about the case. The chapter’s focus is discussing the major claims that have emerged from this study, their implications for practice, policy and future research, and the conclusions that have been drawn.
CHAPTER 2: PHARMACY PRACTICE

The intent of this chapter is to explore the key issues that have shaped and continue to shape pharmacy practice in Canada, situate this study in the complex landscape of pharmacy practice historically and foreground the corresponding examination of pharmacy education in Chapter 3. Through an examination of what a profession is and how sociological theories have helped characterize and explain the development of professions in society, a brief history of the professionalization of pharmacy in Canada will be presented. Key to this historical account, which presents three broadly overlapping eras of pharmacy practice since Confederation, is the explication of critical internal and external pressures and stresses that have shaped the profession historically as well as those generating a sense of urgency within the profession today. The current pan-Canadian project, “The Blueprint for Pharmacy,” a national initiative to strengthen and realign the profession’s social responsibility and scope of practice with the health care needs of Canadians, other health professions and the health care system, will be introduced as indicative of continuing professionalization efforts. It is hoped that once readers have finished this chapter they will have a sense of the historical development of pharmacy in Canada, the issues that have driven and continue to drive the professionalization process today, the timeliness and significance of this study, and what is to come in Chapter 3.

2.1 Society and the Professions

In Canada, as elsewhere, professions and professionals are an integral part of a functioning society responsible for running many of society’s major institutions and completing much of society’s business (Abbott, 1988; Almarsdóttir, Kaae, & Traulsen, 2014; Bissell & Traulsen, 2005; Schön, 1983). In the words of Donald Schön (1983), “we look to professionals for the definition and solution to our problems, and it is through them that we strive for social
progress” (p. 3). The prevalence and importance of the professions and the particular kinds of work professionals perform is captured succinctly by Andrew Abbott (1988): “[t]he professions dominate the world. They heal our bodies, measure our profits, save our souls” (p.1). In return, society grants professional occupations and professionals “extraordinary rights and privileges” (Schön, 1983, p. 4). Along with prestige, social status, high remuneration and autonomy, professions and professionals are given authority for social control, deciding who can enter the profession, self-regulation, and establishing programs and standards of education, training and professional practice (Abbott, 1988; Bissell & Traulsen, 2005; Larson, 1997; Macdonald, 1995; Schön, 1983; Wilensky, 1964). Few occupations are given the rights and freedoms of professionals and although many occupations have sought professional status few have succeeded (Abbott, 1988; Bissell & Traulsen, 2005; Larson, 1997; Wilensky, 1964). The profession of pharmacy, as one of many well-established and long-standing health professions, plays an important and critical role in the safe and effective distribution and use of the drugs and medications required to meet the health care needs of Canadians. Like most occupations seeking professional status, the process of professionalizing pharmacy is characterized by a long and tumultuous history that continues today (Almarsdóttir, Kaae, & Traulsen, 2014; Beales & Austin, 2006; CPhA, 2013). As developed next, the literature on the sociology of professions provides particularly useful perspectives and frameworks for examining the sustained and almost herculean campaign required by practitioners, activists and political advocates to establish and maintain professional status in society.

2.2 What is a Profession?

Although the notion of a profession has a long esteemed history with medieval and in some cases ancient origins (Abbott, 1988; Kremers & Urdang, 1976), the professions, as the
occupations we recognize today, have emerged much more recently. For example, the “learned”
occupations of divinity, law, and medicine, referred to in the sociology literature as the ideal
professions due to their long histories and dominance in organized societies (Abbott, 1988;
Gidney & Millar, 1994; Larson, 1997), have only acquired professional legal status in both
Europe and North America since the 1800s. Like medicine, pharmacy is another important
although less studied health care occupation. It has a history that parallels the development of
western philosophy and roots that extend back over 6500 years to early healing practices and
writings of the Babylonians, Assyrians and Egyptians (Ceresia & Brusch, 1955; Dove, 2011;
Fullerton & Enves, 1951; Kremmers & Urdang, 1976; Thompson, 1929). Pharmacy received
professional legal status in Britain in 1868\(^3\) and Canada in 1870\(^4\) with the passing of their first
Pharmacy Acts. Yet despite longevity and importance of professions in western societies
defining what constitutes a profession and what distinguishes them from other occupations has
been problematic; many of the definitions remain nuanced and contested (Abbott, 1988; Bissell
& Traulsen, 2005; Larson, 1997, Macdonald, 1995; Schön, 1983). Sociologists of the often-
studied ideal professions have defined them sparsely as “organized bodies of experts who apply
esoteric knowledge to particular cases” (Abbott, 1988, p. 4) or occupations based on “formally
rational abstract utilitarian knowledge” (Macdonald, 1995, p. 1). Larson (1997), with her primary
focus on medicine and law, provides a broader definition suggesting that “professions are

\(^3\) The Pharmaceutical Society of Great Britain was established in 1841. It was granted a Royal Charter in 1843 and
became the Royal Pharmaceutical Society of Great Britain later, in 1988. Soon after the original formation of the
Society, there were calls to restrict the right to practice pharmacy to those who were specially licensed to promote
professional standards of training and to establish controls on the sale of drugs. These calls led to the passing of the
Pharmacy Act 1868 which introduced a list of drugs, including opium, which could be sold only by ‘pharmaceutical
chemists’. Apart from the restrictions imposed by the 1868 Act, there was no legislative control of opiate drugs in
the United Kingdom until 1916 (Dove, 2011).

\(^4\) The practice of pharmacy was largely unregulated in Canada until after Confederation in 1867; Ontario, Quebec,
New Brunswick and Nova Scotia were the first confederated provinces. Pharmacy Acts were passed in Quebec
(1870), Ontario (1871), Nova Scotia (1876) and New Brunswick (1884) establishing legally recognized Associations
or Colleges authorized to regulate pharmacists and the practice of pharmacy in each province. Association and
College duties typically included registering practitioners, setting standards of practice and education, establishing a
Board of Examiners and administering licensure examinations (Raison, 1967).
occupations with power and prestige...[and that] society grants these rewards because professions have special competence in esoteric bodies of knowledge linked to central needs and values of the social system, and...to service of the public, above and beyond material incentives” (p. x). The literature from teacher education on professionalism and professionalization share many of these definitional characteristics with the ideal professions (Clarke, 2001; Clarke & Ericson, 2003; Hargreaves, 2000). Donald Schön (1983), through his studies of practicing architects, psychotherapists, engineers, planners and managers, broadens these definitions further by recasting the professions not as occupations based on esoteric knowledge but ones based on tacit knowledge and professional action comprising distinctive, reflective and practical judgment. While a unifying definition remains elusive and the debates continue (Bissell & Traulsen, 2005), several key dimensions of these definitions appear common and serve to distinguish the professions from other occupations: offering a socially necessary function, specialized knowledge, securing exclusive legal jurisdiction over their knowledge and services, intensive accredited preparation usually in universities, and norms of professional conduct including a commitment to social responsibly usually in the form of a Code of Ethics. Of these distinctive dimensions, two seem particularly important: specialized knowledge and social responsibility. For the former, the more abstract and intellectually out of reach the profession’s knowledge base is from the public, the more likely the profession will be able to secure long term jurisdictional claim against competing professions, maintain control over professional preparation, and solidify its role and legal status in society (Abbott, 1988). Regarding the latter, adopting norms of professional conduct in which the needs of the citizenry supersede personal gain appear crucial for persuading society (the general public, governments

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5 The definition of “professionalism” adopted for this study can be found in the Glossary (American College of Clinical Pharmacy, 2009).
and professional governing and advocacy bodies) of the continuing need for their professional services (Macdonald, 1995). Although the literature on the sociology of pharmacy is scant compared with the ideal professions or teacher education (Bissell & Traulsen, 2005; Hepler, 1987; McCormack, 1956; Savage, 1994; Thorner, 1942; Wilensky, 1964), this framework of distinguishing dimensions has been used to establish pharmacy’s role and status as a profession historically including in Canada (Beales & Austin, 2006). It also forms the basis of the definition of a profession used in this study and the sociological analyses of pharmacy that follow. Before continuing it is important to note that conceived broadly, the “profession of pharmacy” encompasses many consistencies including institutional and community pharmacy practice\(^6\), pharmacy education, academic pharmacy, the pharmaceutical industry as well as advocacy, regulatory, corporate and government bodies (ADPC, 2010; Wolf et al., 1993). The uses of the signifiers “profession,” “pharmacy profession” or the “profession of pharmacy” in the sociology literature, the contemporary pharmacy education literature, and in the analogies developed below denote a narrower grouping of constituencies that include primarily pharmacy practice, pharmacy education and academia (ADPC, 2010). Broader uses of the signifiers will be indicated in the text where necessary.

2.3 Sociology and Pharmacy

Sociologists have long been interested in the professions although their systematic study did not begin until the 1930s (Abbott, 1988; Bissell & Traulsen, 2005; Larson, 1997; McDonald, 1995). Reaching prominence in the Industrial Revolution era (particularly post-1830s), antecedents to contemporary professions emerged as loosely, yet hierarchically, organized groups of learned individuals (mostly university educated men conversant in Latin, Greek and

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\(^6\) The definitions of “institutional” and “community” pharmacy adopted for this study can be found in the Glossary.
contemporary literature) and freelance practitioners (educated through apprenticeship) that were well-connected with the social elites (Abbott, 1988; Larson, 1997). Within the new and rapidly growing commercial and industrial market place of the time, these gentlemanly professions were distinctly out of step with the principles of scientific management that permeated societal transformation and the capitalist industrial workplace (Taylor, 1911). For social theorists interested in developing explanatory theories for the organization and cohesion of industrialized societies and the impact of industrialization on citizens, the professions were an anomaly in need of study (Abbott, 1988). Much of our understanding of contemporary professions has been derived from sociological theories of professionalization; that is, the many perspectives on how these gentlemanly occupations established and maintained their professional role and status within competitive marketplace economies (Abbott, 1988; Bissell & Traulsen, 2005; Gidney & Millar, 1994; Larson, 1997; Macdonald, 1995). Appreciating the challenges and value of sociological research and theorizing requires a sense of just how complex the landscape is in which professions like pharmacy emerge, exist and continue to operate (Almarsdóttir, Kaae, & Traulsen, 2014). One version of this complex landscape is provided next.

Many professionalization theories have been developed, each based on a distinct vision of society and the contextual factors influencing occupations that aspire to professional status. Different, competing and hotly contested worldviews and theoretical paradigms of thought about how society assembles, operates and coheres, and how physical and perceived social structures influence and pattern human agency or vice versa underpin these theories (Abbott, 1988; Bissell & Traulsen, 2005; Larson, 1997; Macdonald, 1995). While much sociological theorizing about the professions has been based on the ideal professions, primarily through case study research completed in Europe and the influential Chicago School of Sociology (Becker, 1999; Hamel, 2011).
Dufour, & Fortin, 1993; Hughes, 1945, 1963), pharmacy, by comparison, has received only limited sociological attention (Denzin & Mettlin, 1968; Hepler, 1987; McCormack, 1956; Savage, 1994; Thorner, 1942; Wilensky, 1964). Bissell and Traulsen (2005) in their recent book *Sociology and Pharmacy Practice* openly acknowledge this and suggest that “pharmacy has always had an important…social role within the healthcare division of labour, and, as such,…[could benefit greatly from] the sociological imagination” (p.3). For these authors, health and illness are important social phenomena that influence the nature of social structure, the relationship between individuals and society, and society’s historical development. In western societies, like Canada, the perceptions and management of health and illness along with health care practices are embedded in a complex web of physical and ethereal structures and relationships that shape and influence the way societies organize, self-identify and citizens live. Canada’s publicly funded healthcare system, warts and all, is woven into the fabric of Canadian society, the individual life experiences of Canadians and distinguishes Canada in the world (CPhA, 2013). In the context of pharmacy practice, taking medication, responding to the pharmacist’s advice and the pharmacist-patient relationship all impact the patient’s and pharmacist’s identity, sense of self and state of health (Kassam, Volume-Smith, & Albon, 2008). In addition, pharmacists work within local intra- and interprofessional healthcare teams requiring maintenance and negotiation of relationships with a range of healthcare professionals and institutional organizations, structures and policies. Broadening this view further, the conflicts between private and public healthcare services, societal trends, and the ideologies and fiscal constraints of local, national and international governments complicate this picture. As Bissell and Traulsen (2005) attest “the practices of pharmacists, the use of medicines by patients, interactions between pharmacists, patients [and other healthcare professionals], and the [local,
national and international organizational and institutional structure of pharmacy services are all areas ripe for sociological analysis” (p. 4). It is in attempting to examine and bring understanding to the nature of this complex landscape that sociological theorizing has value. Sociological theories of professionalization, in particular, have helped shed light on the issues that have shaped and continue to shape the profession of pharmacy (Almarsdóttir, Kaae, & Traulsen, 2014). The literature on the sociology of professions is vast. What follows is an analysis of the sociological literature on pharmacy.

Sociology, a term coined in the 1830s by Auguste Comte (often referred to as the father of positivism), has been referred to as the science of society which studies the contexts in which individuals live and work, the social forces that act upon them within those contexts and how they, as individuals, contribute to and modify those contexts (Bissell & Traulsen, 2005). As exampled above, a cursory application of the sociological imagination to the practice of pharmacy situates the pharmacist in the complex web of interactions, relationships and structures that embody the maintenance of health and management of illness in society. The sociological study of professions like pharmacy owes much of its theoretical roots to the philosophies of Emile Durkheim, Max Weber and Karl Marx (often referred to as the fathers of sociology) and to the broad social theories of functionalism and social action including symbolic interactionism8. Contemporary professions literature (influenced by the fathers of sociology to different extents) also includes feminist, race and ethnicity, Foucaultian, and risk theory perspectives (Bissell & Traulsen, 2005; Macdonald, 1995). Each of these perspectives brings a different worldview to

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8 Sociological theories based on social action focus on the meaning of action and interaction among individuals to attempt to explain how society develops, coheres and functions. Symbolic interactionism, a highly developed example of the social action perspective, sees society as a product of continuous face-to-face interaction among individuals in different settings. The *symbol* is something that meaningfully represents something else (i.e., a written or spoken word, a gesture, or a sign). The *interaction* refers to the ways two or more people respond to one another. Developed in the 1930s, symbolic interactionism focuses on the processes by which people interpret and respond to the words and actions of others and studies the way social structures, as patterns of behaviour, arise out of these processes (Bissell & Traulsen, 2005).
the study of society that reflects to varying degrees, the importance of structural systems and human agency in their vision of the nature of society. Each theoretical perspective or lens provides different epistemological understandings and knowledge about the society or context under study. For the purposes of the sociological examination of pharmacy, only functionalist theories will be explored. While this approach is potentially deterministic and may limit trustworthiness of the arguments developed (Mathison, 1988), much of the present understanding of issues that have shaped and continue to shape pharmacy can be traced to functionalist research and a systems view of society. Some of the only systematic studies of pharmacy were in this tradition (Bissell & Traulsen, 2005; Hepler, 1987; McCormack, 1956; Savage, 1994; Thorner, 1942; Wilensky, 1964) and much of the theoretical basis of the pharmaceutical care movement in the 1990s, a time of radical change in both pharmacy practice and education in North America, appears to be grounded in functionalist sociology (Hepler, 1987; Hepler & Strand, 1990). Social action theories, with their Weberian focus on human agency, human protagonists and power theories in the shaping of society, has a valuable contribution to make to an understanding of the professionalization of pharmacy but has only been developed for the ideal professions, specifically medicine (Larson, 1997). Based on Raison’s (1967) centennial project celebrating Canada’s 100th anniversary in 1967 which documents both the history of pharmacy across the country and the role and persistent actions required of pharmacy leaders of the time to establish and maintain the profession provincially and nationally, it is hard to argue against the importance of human agency in the history of Canadian pharmacy. Presented next is an examination of functionalist perspectives on the professionalization of pharmacy.

Functionalism, which dominated sociological thinking about the role of professions in society from the 1930s to the 1960s, can be traced to the positivist orientations and social
theories of Comte and Durkheim (in France) but was systematically developed by Harvard sociologist Talcott Parsons through the study of medicine (Abbott, 1988; Bissell & Traulsen, 2005; Gauthier & Boisseau, 2009; Macdonald, 1995). Parsons’ functionalist perspective viewed society as a system of interrelated parts (or structures) with each part contributing to the cohesion and vitality of the system; a metaphor aligned with the natural sciences view of a biological organism. Like Durkheim, Parsons’ felt the professions fulfilled a critical function in society (hence the name functionalism) embodying the eufunctional characteristics and social forces by which a stable and progressive social system is maintained. Up to the end of the 1960s much of the mainstream functionalist research and writings on the professions was concerned with identifying essential traits of an ideal profession. Based on the traits exhibited by medicine in particular, functional traits analysis was used to classify other occupations on a scale of professionalism. The Guttman scale of professionalism was an attempt to operationalize functional traits analysis of occupations (Abbott, 1988; Bissell & Traulsen, 2005; Macdonald, 1995). Some of the early sociological studies on pharmacy were of this nature leading to a classification of pharmacy as a marginal profession (McCormack, 1956; Thorner, 1942), a fate suffered equally by chiropractics (Wardwell, 1952). The marginal status for pharmacy was due primarily to the highly technical nature of pharmacy services as well as the inherent conflict between business practices of the independent pharmacy owner and social responsibility of the pharmacist to the paying public. The key distinguishing dimensions of professions presented earlier in Section 2.2 (i.e., offering a socially necessary function, specialized knowledge, securing exclusive legal jurisdiction over their knowledge and services, intensive accredited preparation usually in universities, and norms of professional conduct including a commitment to social responsibly usually in the form of a Code of Ethics) appear founded in this early
sociological work on the professions and specifically for pharmacy. Interestingly, the characterization of pharmacy as a marginal profession has been an ongoing insecurity as well as an important developmental dynamic in the history of the pharmacy profession (Buerki, 1999; Jungnickel et al., 2009). Pharmacy’s ongoing claim to professional status, seriously challenged in 1915 by Abraham Flexner, the individual largely responsible for transforming medicine into the most influential and respected profession in 21st century North America (Campbell, 2006), and then again through the sociological studies of the 1940s (Thorner, 1942), 1950s (McCormack, 1956) and 1960s (Denzin & Mettlin, 1968), continues to be haunted by the stubborn stigma as a marginalized profession amongst the professional work of pharmacy visionaries today (Jungnickel et al., 2009; Svensson et al., 2012). In the British Columbian context, Dove (2011) describes two such challenges to the professional role and status of pharmacy. The first, in 1929, which focused on the technical nature of pharmacy services, saw the BC legislature attempt to “[re]classify pharmacy as a trade and place it under the minimum wages law” (Raisin, 1967, p. 35). The second, in the 1960’s, emerged from growing concerns from governments and the public that saw “pharmacists as ‘counters and pourers’ …rais[ing] the question: Are pharmacists professionals or merely technicians?” (Dove, 2011, p. 84). While both were resolved in favour of the profession each had, and continues to have, significant impact on the history, future and self-perception of the profession in the province (Austin, 2013; Rosenthal, Austin, & Tsuyuki, 2010). Fifty years on, the “Blueprint for Pharmacy,” the current pan-Canadian initiative to solidify pharmacy’s core role and services in the provision of health care to Canadians (CPhA, 2013), could be viewed as the latest measure to advance the professional status of pharmacy within the Canadian health care system. This issue will be explored further in Section 2.5 below.
Also studied extensively during this time was how various occupations became legally recognized professions, a process called professionalization (Wilensky, 1964). Although there were many theories of professionalization proposed (Abbott, 1988; Gauthier & Boisseau, 2009; Larson, 1997; Macdonald, 1995), most articulated this process as a sequence of events. Wilensky’s (1964) classic study, “the professionalization of everyone” (p. 137), organized the dates of first events in the histories of 18 American professions, including pharmacy, finding that professionalization could be described as a series of five stages through which an occupation had to pass to achieve professional legal status. Although not always followed sequentially, the stages of professionalization (which closely resemble the distinguishing dimensions of a profession) included: engaging in the occupation as full time employment, establishing a training school often within a university setting, forming a professional association, agitating politically for legal status and jurisdictional claim, and establishing a code of professional ethics (Abbott, 1988; Wilensky, 1964). Importantly, Wilensky’s model also acknowledged the constant struggle for jurisdictional claim by professions against closely related professions and occupations following professionalization; a point emphasized across the professions literature and exampled by the external challenges to the pharmacy profession mentioned earlier (by Flexner, the functionalist studies on pharmacy and in BC). What Debra Savage (1994) has called “border skirmishes” (p.141) between the professions, Andrew Abbott (1988) claims is the central phenomena of professionalization and professional life: the competition between professions and occupations for jurisdictional claim to a profession’s specialized knowledge and services. According to Abbott’s (1988) model, which Macdonald (1995) suggests has functionalist roots, each profession is bound to a set of tasks by ties of jurisdiction, the strengths and weaknesses of these ties being established in the processes of actual professional work. Since none of these links is absolute or permanent, the professions make up an interacting system, an ecology. Professions compete within this system, and a
profession’s success reflects as much the situations of its competitors and the system structure as it does the profession’s own efforts. From time to time, tasks are created, abolished, or reshaped by external forces, with consequent jostling and readjustment within the system of professions (p.33).

The issue of jurisdictional claim is particularly relevant to pharmacy profession in Canada today and will be discussed again later in this chapter (Section 2.5).

While functionalist theories were harshly criticized for their systems view of society, the privileged position of professions as well as for neglecting human agency in the shaping of professions and society, functionalist traits and professionalization theories do provide valuable frameworks for distinguishing professions amongst occupations. They also help us understand the internal (i.e., factors influencing the distinguishing dimensions of a profession and the professionalization process) and external (i.e., addressing the needs of society and jurisdictional competition) issues to which occupations must respond to achieve and maintain professional status (Abbott, 1988; Beales & Austin, 2006; Gauthier & Boisseau, 2009; Larson, 1997). Rather surprisingly, although many of the studies and arguments cited above are decades-old many of the issues raised, particularly regarding pharmacy’s self-perception and the persistent stigma as a marginal profession, are still applicable to the profession today (Austin, 2013; Dove, 2011; Jungnickel et al., 2009; Rosenthal, Austin, & Tsuyuki, 2010; Speedie et al., 2012; Svensson et al., 2012). In the next section the professionalization of pharmacy in Canada will be briefly reviewed with particular attention to the functionalist framework just described. The reader should be aware that although additional footnotes have been added to the history for more in-depth exploration, the section can be read with or without them.
2.4 A Brief History of the Professionalization of Pharmacy in Canada

The history of pharmacy in Canada⁹ has been documented back to the 16th and early 17th centuries, particularly in Eastern Canada, to the arrival of colonial explorers from Britain and France (Martin, 1954; Raison, 1967). While the two countries competed vigorously for control of the territory and commodities, particularly the lucrative fur trade, of the central, eastern and maritime regions of the country¹⁰, the exploration and settlement of western Canada and the subsequent spread of pharmacy across the country has been attributed largely to the economic expansion of the Hudson’s Bay Company¹¹ (HBC) (Cameron, 1993; Martin, 1954). Based initially out of York Factory (in 1670) and then Fort Churchill (in 1717) on the south west shores of Hudson Bay, by the early 1800s the HBC had established trading posts and supply routes along the country’s major river systems to the foot of the Rocky Mountains in the south and Great Slave Lake and Mackenzie River basin in the north¹². By the early 1820s the HBC had also established trading posts on the Pacific Coast on the Columbia and Fraser River systems as

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⁹ Pharmacy is recognized as one of the world’s oldest professions as evidenced by, amongst other artifacts, 4000 year old written records on Assyrian clay tablets and Egyptian papyrus of hundreds of drugs of vegetable and mineral origin as well as formulas for the preparation of specific medications. The ancient Greeks are thought to have introduced the modern day terms pharmacy and pharmacist. Associated with purification and the purging of evil, medications were known as pharmakons while those that prepared them pharmakoepoee. Borrowing primarily from British “free enterprise” traditions, early Canadian pharmacy practitioners were physicians, apothecaries, druggists and chemists. Although it is unclear when the designation of “pharmacist” was adopted nationally for all those practicing pharmacy in Canada, one of the first provincially legislated uses of the signifier was in the first Pharmacy Act in Ontario, passed on February 15, 1871 (Dove, 2011; Raison, 1967).

¹⁰ Although First Nations peoples had inhabited the region for thousands of year, French explorer Jacques Cartier is often credited with discovering Canada (1535). By the early 1700s France claimed control of territories known as New France that extended from Quebec, the St. Lawrence River region and the Maritime Provinces down to Louisiana and the Gulf of Mexico. By the 1670s, the British had claimed control of Rupert’s Land as part of British North America which included all the land and water ways that drained into Hudson Bay, a region over one-third the area of Canada today. Engaging in many conflicts for control of the land and commodities in New France and British North America the French ceded control of the region to the British with the signing of the Treaty of Paris in 1763 (Canadian Encyclopedia, 2012).

¹¹ The Hudson’s Bay Company (HBC) was founded in 1670 and was given control of Rupert’s Land and the fur trade in the region. The North West Company, one of the HBC’s major competitors, was also involved in opening up western Canada. In 1821 the North West Company merged with the HBC creating a near monopoly of the fur trade in the country (Canadian Encyclopedia, 2012).

¹² By 1810 HBC had established trading posts on Lake Athabasca (in northern Alberta) and on Great Slave Lake and the Mackenzie and Liard Rivers systems (in the North West Territories) in the north. In the south HBC trading posts had been established in central Alberta on the Clearwater, Sturgeon and North Saskatchewan River systems (Canadian Encyclopedia, 2012).
well as on southern Vancouver Island. Until the completion of the Canadian Pacific Railway in 1885 connecting the country from the St. Lawrence River to the Pacific Ocean, access to the trading posts on the Pacific coast was predominately by ship around the southern tip of South America (after 1855 use of the Panama Railway shortened the trip). Due to the Rocky Mountains overland trading routes were deemed impractical. While the practice of pharmacy was largely unregulated in Canada until after Confederation in 1867, the pharmacy practices that were available were typically provided by physicians practicing both medicine and pharmacy and appointed by the colonial powers to work in the trading posts of the HBC. Following the decline of the fur trade in the 1870s, regulation of the profession by 1911, and the subsequent economic diversification, industrialization and rapid population growth across the country, the early decades of the 20th century saw the increasing demand for pharmaceuticals and pharmacy services addressed by a mix of practitioners. In addition to physicians, druggists and chemists, pharmacists, and pharmacy apprentices and clerks provided the majority of the pharmacy

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13 The first HBC trading post on the Pacific Coast, which controlled the fur trade west of the Rocky Mountains, was Fort Vancouver built on the Columbia River in 1821 (now the city of Vancouver, Washington). With the signing of the Oregon Boundary Treaty in 1846, establishing the border between Canada and the United States, Fort Victoria, initiated in 1843, became the new base of operations for the HBC. Fort Langley, constructed near the mouth of the Fraser River in the late 1820s became a major HBC trading post on the Pacific Coast (Canadian Encyclopedia, 2012).

14 Although Ontario, Quebec, New Brunswick and Nova Scotia had joined Canada in 1867 it was not until 1905 that all western provinces were confederated (Manitoba, 1870; British Columbia, 1871; Alberta and Saskatchewan, 1905). Regulation of pharmacy, through legislated Associations or Colleges in each province, was established by 1884 in the first four confederated provinces and by 1910 in the western regions of the country but remained unregulated in the western regions of the country until 1911. Following confederation pharmacy Associations were established in Manitoba (1878), British Columbia (1891), Alberta (1905) and Saskatchewan (1911). Prince Edward Island joined confederation in 1873 and established an Association to regulate pharmacy in 1905; Newfoundland and Labrador joined in 1949 but had established a pharmacy Association in 1905 (Raison, 1967).

15 Canada’s First Nations were the first dispensers of medications, crude preparations of plants and herbs. Early Metis and HBC fur traders brought British and European medicines. As HBC became established physicians followed bringing formalized treatments and therapies; they dispensed medicines and/or made their own. The clergy were also involved in treating illness, administering and compounding medications and in particular, controlling distribution of poisons. One of the first systematized approaches to pharmacy was introduced by the North West Mounted Police in Saskatchewan who established hospitals and medical supply depots. Hospitals often had responsibility for managing depot supplies and for filling and compounding prescriptions; hospital attendants and nurses compounded medicines under medical supervision. More generally, the lack of regulation/legislation permitted anyone to establish a professional practice regardless of qualifications. Anyone could open a store, sell drugs and medications, and dispense prescriptions (Cameron, 1993; Raison, 1967).
services required to meet the growing societal demand. Trained predominantly in British
traditions, the professional roots of these early pharmacy practitioners and the professionalization
of pharmacy in Canada to the present day can be traced back to the practices of the apothecary
(Beales & Austin, 2006; Dove, 2011; Kremers & Urdang, 1976).

Originating from 13th century British and European guild economies and employed full
time in the preparation and trade of crude medicinal herbs and medicines as well as a range of
common commodities, apothecaries emerged as a niche occupation in response to acute demands
for specialized disease treatments and health-related services that were difficult to buy or sell
through established trade markets (Beales & Austin, 2006; Kremers & Urdang, 1976). Of
particular importance and suggestive of key distinguishing dimensions of a profession, these
specific products and services addressed acute client vulnerabilities requiring knowledge, skills
and tacit understandings deemed beyond the ordinary person, offered a service ideal in which the
client’s needs superseded the personal interests and profit of the seller, and could only be
acquired through long prescribed apprenticeship training from within the community of
apothecaries (Buerki, 1999). Coveted and fiercely protected empirical knowledge of
pharmacognosy (naturally occurring botanical medicines), galentical pharmacy (methods of
preparing and delivering medicines) and materia medica (specific medicinal recipes for the
treatment of disease) along with guarded secrecy and an heir of mystique, reinforced the
specialized knowledge and unique position of apothecaries in guild societies (Kremers &
Urdang, 1976; Thompson, 1929). The abstract and spiritual nature of the apothecary’s
jurisdictional claim is suggested in C.J.S. Thompson’s book (1929), The Art and Mystery of the
Apothecary, in which he states,

[the art of the apothecary has always been associated with the mysterious, and its
practitioners, owing to their peculiar knowledge of drugs of unknown powder,
some of which were capable of producing delirium and sleep, were believed to have connection with the world of spirits and so act as intermediaries between the seen and the unseen (p. 3).

The Antidotaria, the books of early apothecaries containing extensive collections of recipes and list of drugs employed in healing (Thompson, 1929), are the ancient precursors to today’s United States Pharmacopeia\(^\text{16}\) (United States Pharmacopeial Convention [USP], 2000). Claiming widespread social need, theoretical mastery, exclusive jurisdiction and adherence to norms of ethical behavior and practice, apothecaries were able to establish themselves as uniquely qualified drug specialists as well as differentiate their products and services from the competing occupations of spicers, pepperers and grocers in the guild marketplace (Beales & Austin, 2006; Kremers & Urdang, 1976; Thompson, 1929).

It is important to note that despite having many of the unique characteristics of professions (i.e., offering a socially necessary function, specialized knowledge, securing exclusive jurisdiction, intensive preparation and norms of professional conduct), apothecaries did not maintain professional status due in part, to a failure to achieve Wilensky’s (1964) five stages of professionalization (i.e., engaging in the occupation as full time employment, establishing a training school often within a university setting, forming a professional association, agitating politically for legal status and jurisdictional claim and establishing a code of professional ethics). While apothecaries of 17th century Europe had secured their employment, created the Society of Apothecaries, established intensive training programs including long apprenticeships, fluency in Latin, and a code of ethics, the apothecaries could not establish long term jurisdictional claim to their specialized knowledge and services (procurement of drugs and medicines, compounding and dispensing). Druggist and chemists, who could sell medicines but not compound them and

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\(^{16}\) The United States Pharmacopeia contains 1200 pages of recipes and analytical procedures for close to 4000 drugs and drug products and represents a component of the specialized knowledge of contemporary pharmacists.
physicians, who could do both in addition to controlling prescriptions of controlled drugs (opiates), competed fiercely in this market place (Beales & Austin, 2006; Kremers & Urdang, 1976; Thompson, 1929). In a chapter that Thompson (1929) has titled, “The Battle of the Dispensary - The End of the Struggle” (p. 272) he describes 150 years of intense disputes between apothecaries, druggists and chemists and physicians for control of prescribing, procurement, compounding, and dispensing of medicines ending unsuccessfully for apothecaries. Eventually apothecaries were absorbed into the practice of medicine, remained as subordinate freelance practitioners or disappeared (Bissell & Traulsen, 2005; Thompson, 1929). By the close of the eighteenth century, the apothecary was “the physician of the poor at all times, and to the rich whenever the distress or danger [was] not great” (Thompson, 1929, p. 281). With the passing of the British Pharmacy Act in 1868, druggists and chemists, had successfully navigated the five stages of professionalization, replaced apothecaries, and established their practitioners as the legally recognized drug specialists in much of Britain and Europe (Beales & Austin, 2006; Kremers & Urdang, 1976). Heavily influenced by British colonialist and American traditions, and having negotiated the difficult path of professionalization over a 200 year period (Beales & Austin, 2006; Hepler, 1987; Hepler & Strand, 1990), pharmacy in Canada achieved legal professional status in 1870 with the passing of the first Pharmacy Act in the province of Quebec. By securing this legislation, which involved intensive jurisdictional disputes between apothecaries, druggists and chemists, and physicians reminiscent of earlier British and European struggles as well as lobbying of social elites and government representatives, the stage was set for pharmacists to secure the professional authority as the drug specialists responsible for the procurement, preparation and safe use of drugs and medicinal agents across Canada (Beales & Austin, 2006). First dates in the process of professionalization of Canadian pharmacy are
summarized here (Raison, 1967; Riedel & Stieb, 2001): 1) the first pharmacist of colonial origin practicing fulltime was Louis Hérbert in Nova Scotia [ca. 1604]; the practice of pharmacy, spread across the country by the Hudson’s Bay Company over a 200 year period, was established in British Columbia in the early 1800s; 2) the first pharmacy school within a university setting in Canada was in Ontario (in 1892); British Columbia’s first university-based pharmacy program opened at the University of British Columbia in 1946; the last university-based program to be established was at the Memorial University of Newfoundland in 1967. The Canadian BSc(Pharm) program was approved as a minimum requirement in all Canadian pharmacy programs by 1960; 3) the first professional pharmacy association, the Canadian Pharmaceutical Association (later the Canadian Pharmacists Association) was founded in 1867; the first association representing academic pharmacy, the Canadian Conference of Pharmaceutical Faculties (CCPF) established in 1944, was reorganized in 1969 as the Association of Faculties of Pharmacy of Canada (AFPC); 4) first official legal status for pharmacists occurred with the passing of the Quebec Pharmacy Act in 1870; by 1910 all provinces and territories had passed similar legislation. Provincial legislation establishing scopes of practice for pharmacists continue to be revised (CPhA, 2013), and; 5) the first code of ethics for pharmacy in Canada was established by the Alberta Pharmaceutical Association in 1937.

2.5 Canadian Pharmacy Today, the Blueprint for Tomorrow and this Study

Since the passage of the first Pharmacy Act of 1870, the professionalization of pharmacy has continued vigorously (Beales & Austin, 2006; Buerki, 1999; CPhA, 2013; Hepler, 1987). Characteristic of the ongoing challenges professions face (Abbott, 1988; Wilensky, 1964), Canadian pharmacy has undergone profound change in its knowledge base and practice models in order to demonstrate to the public, payers, legislators and other health care providers its value
to individuals, the health care system and society as a whole. In the approximately 140 years since the passing of the first Pharmacy Act, pharmacists have seen their specialized knowledge and practice roles shift from empiricist-apothecary to drug dispensing pharmacist-scientists to drug use advisors and consultants, pharmaceutical care practitioners and medication therapy experts (Austin, 2013; CPhA, 2013; Hepler, 1987; Hepler & Strand, 1990). Today, while pharmaceutical care continues to provide the philosophical basis for the profession, most recently the pharmaceutical care process (the practice model of the pharmaceutical care practitioner) has been replaced with a refined set of tasks under the title of medication therapy management and an approach to practice focused on patient-centered care (Dolovich, 2012; Van Mil & Fernandez-Llimos, 2013). While these changes may seem subtle and even unimportant they represent the shifting theoretical and practical goalposts of the profession as it seeks to position itself amongst competing health professions and to adjust to the needs of society. At the heart of this shifting ground appears to be, in part, a search for a new specialized knowledge base on which to assert its professional jurisdictional claim as well as a reconnection with its social responsibility (Austin, 2013; Duncan-Hewitt, 2005). Some say that this process is about “searching for the soul of pharmacy” (Zellmer, 1996, p. 1) while others, describing a profession in crisis, see the current challenges facing the profession as the legacy of major external forces in society, in particular, the impacts of industrialization (Buerki, 1999; Hepler, 1987; Hepler & Strand, 1990). One particularly critical example of the impacts of industrialization on the pharmacist’s specialized knowledge and practice role has been documented by Savage (1994). Analyzing the impact of the pharmaceutical industry on compounding practices in pharmacies in North America (a foundational aspect of the pharmacist’s specialized knowledge), she found that in the 1930s 75% of all prescriptions were compounded in pharmacies. By the 1950s this number
had dropped to 25% and by the early 1960s to 4%. By the early 1970s pharmacy had effectively lost three of its four mainstays of jurisdiction to the pharmaceutical industry (drug procurement, storage and compounding) leaving dispensing and drug distribution as the focus of practice (Savage, 1994). Pharmacies became the channel of distribution for the pharmaceutical industry and the pharmacist’s role was reduced to that of a technician and drug dispenser with the concomitant loss of social and professional worth (Hepler, 1987). Arguments have been made that since that time the profession has been on a long, slow, painful path of self-reflection and reinvention, searching for opportunities to use existing knowledge more fully or develop a new knowledge base upon which to reassert its jurisdictional claim and professional status within the health care system (CPhA, 2013; Hepler, 1987; Hepler & Strand, 1990; Manasse, 1989). The introduction of pharmaceutical care in the 1990s, embraced as a “truly …revolutionary concept in the practice of pharmacy” (Buerki, 1999, p. 159), reestablished pharmacy’s purpose and specialized knowledge based on the detrimental health issues and costs associated with drug misuse, underuse and overuse in society referred to in the pharmaceutical care literature as drug morbidity and mortality (Hepler, 1987; Hepler & Strand, 1990; Manasse, 1989). Pharmaceutical care, a term intended to invoke analogies with the ideals of medical care and nursing care, was defined by Hepler and Strand (1990) as,

the responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient’s quality of life…Pharmaceutical care involves the process through which a pharmacist cooperates with a patient and other health professionals in designing, implementing, and monitoring a therapeutic plan that will produce specific therapeutic outcomes for the patient (p. 539).

Unfortunately pharmaceutical care was not widely known outside of the pharmacy profession and did not radically transform practice in the ensuing decades as many had hoped, particularly in community pharmacy settings (Kassam & Kwong, 2009). Today, the legacy of the
industrialization of pharmacy, drug dispensing and distribution, remains an almost unmovable focus in contemporary pharmacy practice particularly in the community setting (CPhA, 2013; Strand, 2008). As evidenced by the recent battles between Shoppers Drug Mart®, Canada’s leading chain drugstore, and the government of Ontario over “professional allowances” that generic drug manufacturers pay to pharmacists to stock and sell their products, the role of the pharmacist as drug dispenser continues to be fiercely defended by chain drug store pharmacies (Taylor, 2010).

Looking forward there does seem to be consensus within the profession that the concept of pharmaceutical care will continue to articulate the core responsibility and purpose of the profession (ADPC, 2010; AFPC, 2010; CPhA, 2013; Jungnickel et al., 2009). There also seems to be agreement that pharmacy practice will center around three functional roles that include a significant focus on wellness and disease prevention as opposed to just disease treatment: patient-centered care, population-based care, and systems management. In addition, pharmacists will have the authority and autonomy to manage drug therapy, will be held accountable for the health outcomes achieved and will be paid for their specialized knowledge and services as medication therapy experts (Dolovich, 2012; Marra, Lynd, Grindrod, Joshi, & Isakovic; 2012).

Other more contentious internal professionalization issues revolve around the preprofessional curriculum (Boyce & Lawson, 2009), generalist vs. specialists education and the need for residency training following completion of the first professional degree (Murphy et al., 2006; Schwinghammer, 2004), professionalism and social responsibility (Duncan-Hewitt, 2005), interprofessional team work and cultural competency (Jungnickel et al., 2009), faculty recruitment (Kerher, Kradjan, Beardsley, & Zavod, 2009), technology (Blouin et al., 2009) and establishing the scientific knowledge base of contemporary pharmacy practice and education.
Externally, in addition to the myriad of pressures related to Canada’s increasingly complex and over-burdened public health care system, the emergence of nurse practitioners, physician’s assistants and naturopathic doctors that are encroaching on pharmacy’s jurisdictional territory (Campbell, 2006), pharmacy technicians assuming responsibility for the drug dispensing and distribution functions within pharmacies (at a lower wage) (Zebroski, 1998), looming joblessness for pharmacists (Brown, 2013) and the need for new remuneration models that accommodate pharmacy’s expanding scopes of practice (Marra et al., 2012), the options for the future of the pharmacy profession are becoming increasingly clear: “[adapt] or risk irrelevance and extinction” (Austin & Duncan-Hewitt, 2005, p. 381).

The “Blueprint for Pharmacy,” a national initiative of the Canadian Pharmacists Association started in 2007 and now endorsed by all sectors of pharmacy in Canada (CPhA, 2013), can be interpreted as the newest chapter in the story of the professionalization of pharmacy in Canada. In direct response to the internal and external pressures experienced by the profession today and as an example of the high stakes nature of maintaining professional status and autonomy amongst professional health care occupations, the Blueprint’s vision sets out a long-term plan intended to strengthen and realign the profession’s jurisdictional claim as medication therapy experts within the Canadian healthcare system and society. Based on the philosophy of pharmaceutical care and goals emphasizing “optimal drug therapy outcomes for Canadians through patient-centred care…[and that the ] status quo is not an option” (CPhA, 2013, p. 6), the Blueprint’s implementation plan has identified five strategic areas for action (i.e., education and continuing professional development, pharmacy human resources, financial liability and sustainability, legislation, regulation and liability, and information and
communication technology). As one of the major players in this process, academic pharmacy has been identified as a lead organization for implementing educational change in the Blueprint era. Ensuring that core pharmacy curricula address the knowledge, skills and values required for future pharmacy practice and that new graduates are prepared to develop and practice in emerging roles is the focus of current curriculum reform efforts in Canadian pharmacy programs. As an emerging internal stress within the profession, addressing and establishing the scientific knowledge base for the contemporary medication therapy expert will be challenging considering the competing interests amongst various knowledge constituencies within academic pharmacy (Austin & Duncan-Hewitt, 2005; Holmes & Desselle, 2004). Striking a balance between the knowledge disciplines of the basic pharmaceutical sciences, clinical sciences and pharmacy practice or as has been suggested, developing new paradigms of knowledge through integration of these existing knowledge paradigms, will be an important task for the future of the profession (Austin, 2013; Speedie et al., 2012). To this end, the proposed research project appears timely and is anticipated to explore this issue in detail for UBC’s BSc(Pharm) program.

While the professionalization of Canadian pharmacy promises to be anything but static, there is ample evidence to suggest that the reshaping of the pharmacist’s role over the past 140 years may have had an impact on pharmacy education. This issue will be the focus of Chapter 3.
CHAPTER 3: PHARMACY EDUCATION

The aim of this chapter is to build on Chapter 2 with the dual purpose of examining how the professionalization of pharmacy in Canada has impacted pharmacy education and curricula historically and clarifying the intentions of this study. Chapter 3 begins by revisiting the specialized scientific knowledge that distinguishes pharmacists amongst health professionals and then continues with a broader examination of the complexities of curriculum that frame the history presented and underpin this study. Perspectives on what curriculum is, the curriculum definition adopted for this study and the approach developed for examining the history of pharmacy education and curricula in Canada since Confederation will be presented. The role that science and the basic pharmaceutical sciences have played in pharmacy education will be key to this historical account. Chapter 3 finishes by situating and clarifying the intentions of this study and bridging Chapters 2 and 3 with the Methodology and Methods developed in Chapter 4.

On completing this chapter it is hoped readers have a sense of the interplay between societal change, professional practice and pharmacy education, the role of science and the basic pharmaceutical sciences in pharmacy education in Canada historically, how this study is situated within this historical landscape and what is to come in Chapter 4.

3.1 Professionalization, Specialized Knowledge and Pharmacy Education

As developed in Chapter 2, the professions represent an important subset of occupations that have become an integral part of a functioning society. Sharing long histories and imbued with elite social status, high remuneration and autonomy, professions and professionals are given legal authority for, among other things, establishing programs and standards of education and practice (Austin, 2013). What distinguishes professions from other occupations and why society grants professional occupations special rights and privileges appears to be due, in part, to their
specialized knowledge. The unique knowledge of pharmacists ensures the safe and effective distribution and use of the drugs and medications for Canadians (CPhA, 2013). University-educated, predominantly through nationally accredited 1+4 year, outcomes-based BSc(Pharm) degree programs (AFPC, 2010), Canadian pharmacists today share similar general and scientific knowledge foundations with other health professions that includes the natural (basic and organic chemistry, physics, math), biological (biology and microbiology) and biomedical (anatomy, physiology, pathophysiology, and immunology) sciences (AFPC, 2010; DePaola & Slavkin, 2004; Mowforth, Harrison & Morris, 2005; Weatherall, 2006; Wolf et al., 1993). As discussed previously in Section 1.3, what distinguishes pharmacy as a profession and differentiates it from other health professions is, in part, a specialized knowledge of drugs grounded in the basic pharmaceutical sciences: medicinal chemistry, pharmaceutics and pharmacology (Lemke, Williams, Roche, & Zito, 2008; Pandit, 2007). Therefore, in addition to an understanding of how the body functions in wellness and disease, offering scientifically-based knowledge and skills regarding how drugs work, act and interact as well as how they can be delivered and used safely in the management of drug therapy and patient-centered care provides the basis for pharmacy’s unique contribution to the Canadian health care system and team. While pharmacy today is recognized as a science-based profession (Crabtree, 2012: Skau, 2007), the foundational scientific knowledge and skills of pharmacists have undergone profound change as the profession has adapted to dramatic changes in society, the health care needs of Canadians, and medical advancement (Chew & Sharrock, 2007; Hepler, 1987; Riedel & Stieb, 2001). Mapping the professionalization of pharmacy in Canada over the past 140 years, pharmacists have seen their knowledge base and practice roles shift from empiricist-apothecary to drug dispensing, pharmacist-scientists to drug use advisors and consultants, pharmaceutical care practitioners and
medication therapy experts (Beales & Austin, 2006; Hepler & Strand, 1990). Having legal authority and responsibility for establishing programs and standards of education and practice, the tremendous efforts of professionalization have necessitated equally intensive efforts and dramatic shifts in pharmacy education and curricula (Buerki, 1999; Hepler, 1987; Newton, 1991; Riedel & Stieb, 2001). Exploring these shifts underscores not only the complex interplay between societal change, pharmacy practice and pharmacy education but the ways pharmacy curricula have adapted historically to reflect changing perspectives on the role and importance of science and the basic pharmaceutical sciences in the knowledge base and education of the practicing pharmacist. The history of pharmacy education in Canada to be presented later in this chapter begins by exploring the complexities of curriculum.

3.2 What is Curriculum?

For this author, curriculum can be many things, take many forms and mean different things to different people. A cursory Google search for “curriculum definitions,” for example, provides over ten million hits on the topic. Analysis of the scholarly literature on curriculum studies, like the Google search above, underscores just how broad and diverse the thinking and opinion is regarding what constitutes curriculum as well as the vigour and intensity with which various ideas, approaches and stances have been and continue to be legitimized and defended (Lather, 2006; Moss et al., 2010; Palys & Atchison, 2008). Since curriculum studies emerged as a legitimate field of academic study in the early 20th century (Pagano, 1999), curriculum scholars have fought intellectual and verbal wars over curriculum (Flyvbjerg, 2001). Theory versus practice debates (Dewey, 1977; Hubball & Gold, 2007; Schwab, 1973) as well as how curriculum often unconsciously replicates the social and economic norms and structures in society (Apple, 2004) also figure strongly in this scholarly discourse and continue to impact
views of what curriculum is and can be (Egan, 1978; Marsh & Willis, 1999; Robinson, 2002). Ask ten educational scholars and practitioners how they would define curriculum and you will likely receive ten different answers (Table 1). Ask a larger group and although definitional agreement is unlikely, broad themes and patterns begin to emerge that reflect the complex and multifaceted nature of curriculum and why a common definition does, likely will, and probably should, remain elusive. Figure 1 attempts to illustrate some of this complexity.

As society’s dominant means of educating its citizenry, curriculum (and the educational institutions through which they are provided) is embedded in societal and world complexity and constantly buffeted by historic, political, economic, technological, demographic and cultural social forces and change. In addition, curriculum, which often mirrors societal complexity, is a potent form of socialization inculcating citizens, as learners, into accepted norms of behavior, habits of thought and ways of being, acting and contributing to society. Although rarely made explicit, curriculum embodies an underlying theory with deep seated ontological (metaphysical reasons for being; broadly based on deductive versus inductive reasoning) and epistomological beliefs (that is, ways of knowing that often privilege specific types of knowledge) that guide the thinking, acting, doing and language of curriculum work (Cohen, Manion, & Morrison, 2000). With roots in history, philosophy, psychology, theology and sociology, curriculum theorists, for example, have focused their energies on interpreting and understanding world and societal complexity and how it impacts schools, curriculum, teachers and students. This scholarship has resulted in a multitude of curriculum theories that address important societal issues in terms of their positive and negative effects in society and on schools, curriculum, teachers and students. Curriculum theories addressing modernism (Bobbitt, 2004; Tyler, 1949), postmodernism (Slattery, 2006), criticality (Apple, 2004), queerness (Sumara & Davis, 1999), gender (Grumet &
### Table 1: Some curriculum definitions from educational scholars and practitioners

1. “[Curriculum is] that series of things which children and youth must do and experience by way of developing abilities to do the things well that make up the affairs of adult life; and to be in all respects what adults should be.” (Bobbitt, 2004, p. 11)

2. “[Curriculum is] an instructional program as a functioning instrument of education.” (Tyler, 1949, p. 1)

3. “Curriculum, it seems to me, is the study of what should constitute a world for learning and how to go about making this world. As such it implies, in microcosm, the very questions that seem to me to be of foremost concern to all of humanity. Such questions as “what is the good society, what is the good life, and what is a good person,” are implicit in the curriculum question.” (B. J. Macdonald, 1995, p. 137)

4. “I employ the concept of currere – the Latin infinitive of curriculum – to denote the running (or lived experience) of the course.” (Pinar, 2004, p. xiii)

5. “The curriculum in schools responds to and represents ideological and cultural resources that come from somewhere. Not all groups' visions are represented and not all groups' meanings are responded to. How, then, do schools act to distribute this cultural capital? Whose reality "stalks" in the corridors and classrooms of American schools?” (Apple & King, 1977, p. 343)

6. "we refer to curriculum in higher education as a coherent program of study (e.g., 4-year BSc) which is responsive to the needs and circumstances of the pedagogical context and is carefully designed to develop student's knowledge, abilities and skills through multiple integrated and progressively challenging course learning experiences." (Hubball & Gold, 2007, p. 7)

7. "we take curriculum to mean that which is imagined, proposed, and enacted by teachers as they engage with learners around topics building on, but not limited by, curriculum guidelines as presented by Ministries of Education or similar governing bodies. In other words, curriculum is that which the teacher teaches. Such a curriculum addresses the public desire for a common or core set of experiences…, student needs and interests, and it relies on the teacher's talents, and strengths. This is an integrated view of curriculum and consistent with our argument that classrooms are dynamic systems.” (Dr. Tony Clarke, personal email communication, September 24, 2007)

8. “Curriculum refers to the organized delivery of education through instructional design, with the goal of achieving specific objectives/outcomes.” (Dr. Zubin Austin, personal email communication, September 27, 2007)

9. “the curriculum is an outline of a program of study (e.g., for a certificate, degree, etc.). That is, it transcends the course level. At its most basic, the curriculum could just be a list of courses, but it could also prescribe some sort of order to the courses and might include some indication of the knowledge, skills and attitudes expected of learners.” (Marion Pearson, personal communication, September 26, 2007)

10. “Curriculum - content of instruction in a particular subject area (pharmacy) that has been so chosen and organized based upon rationale (knowledge, skills, processes and strategies required) related to the discipline being taught. I.e., our curriculum is designed to prepare pharmacy practitioners (essentially) and the units are structured and ordered in such a way so as to best accomplish that outcome. Curriculum is also a formal plan of subjects, goals, objectives agreed upon.” (Dr. David Fielding, personal communication, October 23, 2007)
Societal Complexity

School & Curriculum Complexity

Curriculum embodies a world view (societal and world complexity) and a sense of purpose; what is taught, how it is taught, an approach to organization, and an anticipated impact also appear important. Through interaction with curriculum, students and teachers are influenced by societal complexity and the socialization process.

Curriculum theorists interpret societal complexity (context) in light of its impacts on schools, curricula, teachers and students. Curriculum theories represent the different lenses theorists use to "see and explain" the complexity and its impact on education, the curriculum, teachers and students.

Complexity driven by many contextual factors including historic, political, economic, technological, demographic and cultural factors and world events; factors are temporal and subject to constant change. Curriculum embeds societal/school complexity and a process of socialization. Student/teacher interaction is complex and impacted by curriculum.

Student/teacher Complexity

Figure 1: A view of curriculum

17 Clipart used in Figure 1 retrieved from the Open Clip Art Library available at http://openclipart.org/.
Stone, 2000), sexuality (Britzman, 1996), multiculturalism (Slattery, 2006), ecology (Sumara, Davis & Laidlaw, 2001), complexity science (Davis & Sumara, 2005) and aboriginality (Cole, 2002; Mazzei & Jackson, 2009) are examples of the important ways that views on curriculum have been exposed to scholarly examination and how conceptions of what curriculum is, does and can be have been broadened. Whether explicitly or implicitly understood, this orientation or lens with which curriculum is viewed (a world view) along with its complex contextual nature have important implications for curriculum work, specifically its development, implementation, evaluation and reform (Hubball & Gold, 2007). Influenced by world view and context, establishing the purpose of curriculum, the approach to curriculum planning, its design and structure, what knowledge is privileged, how it should be taught, the roles of teacher and learner, and the perceptions of how people learn, what learning entails and how it is demonstrated and judged are among some of the important challenges of creating a coherent and purposeful education. Amongst the community of curriculum scholars and practitioners, curriculum is recognized as complex, contextual, temporal, and guided by deep seated, although often unconscious, beliefs. In addition, curriculum embodies a sense of purpose and how people learn along with what is taught, how it is taught, an approach to organization, and an anticipated impact on learning (Bransford, Brown, & Cocking, 2000; Egan, 1978; Hubball & Gold, 2007; Sork, 2010). Given these themes, expectations of a common definition for what constitutes curriculum are likely unrealistic. More realistic might be the observed multiplicity of definitions that acknowledge the broad range of human experience and address the educational needs of teachers, learners and society within specific learning contexts. The professional education of the Canadian pharmacist represents one such context. Below is this author’s definition of curriculum adopted for this study:
Curriculum refers to the organized delivery of a selection of content and learning experiences that is appropriate for the learning context, integrated and of increasing difficulty throughout a course or program of study. Designed to create a flexible, respectful and supportive learning environment, help students meet the objectives/outcomes for their courses/program and facilitate their growth as individuals and professionals is central.

How curriculum might be conceptualized historically is developed next.

3.3 Conceptualizing Curriculum and Educational History

As mentioned at the outset of this chapter, the dual purpose of Chapter 3 is to build on Chapter 2 by exploring pharmacy education and curriculum change resulting from professionalization and focusing the intentions of the study. Examining the ways Canadian pharmacy curricula have changed historically to reflect curriculum complexity, shifting perspectives on professional practice, and the role and importance of science and the basic pharmaceutical sciences proved challenging. While the enormous energies directed at curriculum reform in Canada was abundantly evident (Louis & Twaites, 1996; MacCara, 2012; Raison, 1967; Riedel & Stieb, 2001), the Canadian historical literature on pharmacy education is largely fragmented and presented chronologically with limited detail on the specifics of curriculum reform or insight as to how curriculum was viewed holistically. While historical perspectives are discussed primarily in terms of structural alternatives (i.e., total number of years), hours of instruction required, and content generalities, a coherent view of curriculum (as conceptualized and enacted) and how these views have changed historically is less evident. This situation stands in contrast to that in the US (Anderson-Harper, Robinson, & Kochan, 1996; Buerki, 1999) and the historical literature from other professions such as teacher education. Showing striking similarities to the historic developments in pharmacy practice and education, the scholarly professionalization literature on teachers and the history of teacher education provided early
guidance for conceptualizing curriculum in ways that addressed curriculum complexity as discussed in Section 3.2 and the dual purpose of this chapter (Feiman-Nemser, 1990; Hargreaves, 2000).

Interested in the quality of teacher’s and teacher education programs in the k-12 system, Hargreaves (2000) and Feiman-Nemser (1990) analyzed teacher preparation historically for coherent perspectives on teaching, learning, and learning to teach that have been and continue to be used to situate, inform, and reform the practice of educating teachers. Hargreaves (2000) for example, examined the quality and standards of teaching practice (which he refers to as professionalism) throughout the 19th and 20th centuries. Adopting the concept of “grammar of schooling” (Tyack & Tobin, 1994, p. 453) to denote broad institutionalized perspectives on how to educate (that are highly stable and slow to change), he describes the history of teacher professionalism in terms of four ages, each with a set of practices that define the essence of curriculum and teaching. Although Hargreaves’ approach acknowledges the complexity of curriculum and provides a means for historical analysis, his framework was limited mainly to the impact of social and contextual changes on teaching practice. Of potential importance to the arguments developed in this chapter however, was the suggestion that his four ages overlapped significantly and that each new age exhibited “significant residues and traces from the past” (Hargreaves, 2000, p. 152). In a more comprehensive historical analysis of teacher preparation, Fieman-Nemser (1990) used the term conceptual orientation, defining it as “a set of ideas about the goals of teacher preparation and the means of achieving them” (p. 220). Also aligned with this chapter’s purpose, she suggested that an understanding of the traditions of thought and practice that have characterized her field might help teacher educators locate their own curriculum development and reform efforts amongst alternatives. Based on broad historic
traditions of teacher preparation during the 19th and 20th centuries (i.e., the normal-school, liberal arts and university traditions) and using vignettes of specific teacher preparation programs, the practical expression of 5 different conceptual orientations towards teacher preparation were described (i.e., the academic, practical, technological, personal, and critical/social curricula). Although world view was not explicitly developed for these conceptual orientations, the framework of dimensions used to capture the complexity of curriculum in her analysis included context and the importance of social forces, a central purpose, appropriate content and teaching methods, and design and structure. Particularly important was how her analysis clearly linked conceptual orientations with the enactment of curriculum. In light of the different practice roles pharmacists have assumed in the past 140 years, Fieman-Nemser’s (1990) approach seemed particularly promising for examining pharmacy education historically. Her notion of conceptual orientation and its use of a framework of curriculum dimensions was subsequently adopted for the purposes here. Building on the perspectives of Hargreaves (2000) and Feiman-Nemser (1990) as well as the previous discussions of curriculum complexity in Section 3.2, the meaning of conceptual orientation as intended for use in this study was further developed with insights gained from contemporary scholarship on curriculum reform in higher education (Wolf & Christensen Hughes, 2007).

Typified by Wolf’s (2007) faculty-driven, data-informed and educational-developer supported model, Hill’s (2007) learning fractal model and Hubball and Burt’s (2004) framework for learning-centered curricula, contemporary approaches to curriculum reform have openly embraced the complexity of curriculum and developed robust and comprehensive dimensional frameworks that capture their vision of curriculum. Aligning well with the dimensions of curriculum complexity discussed previously, these models and frameworks for curriculum
reform pay close attention to the complex contextual nature of curriculum, its purpose, the “what” and “how” aspects, coherence of design and structure, and quality, accountability and impact. Also critical are processes of reform that fully respect the challenges inherent in curriculum reform efforts (for faculty, students, institutions and academic units) which acknowledge and advocate for congruence between conceptions of curriculum and its enactment. Instead of prescriptive solutions that tinker with complex curriculum reform issues (Austin & Duncan-Hewitt, 2005; Parekh, 2006; Schnieder & Schoenburg, 1999), these contemporary approaches to curriculum reform seek purposeful, enduring and sustainable contextually-bound solutions that meet the unique needs and characteristics of programs and curricula. They also emphasize rigorous integration and alignment of curriculum dimensions at all levels of development, implementation and evaluation (Hill, 2007; Hubball & Burt, 2004; Wolf, 2007). Stressing incremental and continuous as opposed to episodic and ad hoc reforms, and using iterative and cyclic faculty-driven collaborative strategies, these approaches to curriculum reform intentionally link the conception and enactment of curriculum. Further, they incorporate principles and practices informed by contemporary thinking and research on learning, and curriculum and pedagogical practices are integral aspects of these processes. Paradigm shifts from teaching to learning (Barr & Tagg, 1995), outcomes-based education (Ascough, 2011; Harden, 2007; Hubball, Gold, Mighty, & Britnell, 2007), continuous assessment and evaluation (Abate, Stamatakis, & Haggett, 2003; Council of Ministers of Education, Canada, 2007; Hill, 2007), curriculum integration (Hubball & Burt, 2004; Pearson & Hubball, 2012; Raman-Wilms, 2001), learning theories (Bransford, Brown, & Cocking, 2000; Fenwick, 2000; Phillips, 1995), learning styles (Austin, 2004; Pashler, McDaniel, Rohrer, & Bjork, 2008), and student engagement (Kuh, 2001; Kuh, Kinzie, Schuh, & Whitt, 2005) are among some of the important
trends in higher education that have been recognized as important for improving learning, the student experience and teaching practice; many of these are included in contemporary curriculum reforms (Bain, 2004). Importantly, reform leaders advocate strongly for context-specific research-based curriculum reform solutions that build on and emerge from within academic units; an acknowledgement of the critical importance and on-going need for continuous improvement of teaching and learning in higher education based on a culture of scholarship and scholarly activity directed at curriculum teaching and learning optimization (Hill, 2007; Hubball & Gold, 2007; Wolf, 2007). While these models and frameworks have been applied successfully in multiple higher education contexts (Albon & Hubball, 2004; Devine, Daly, Lero, & MacMartin, 2007; Hubball & Pearson, 2010) there appears to be need for critical analysis of their overall impact on the quality of higher education (Knight, 2001; Regehr, 2010).

Based on the preceding discussions, curriculum has been presented as complex, contextual, temporal, and guided by deep seated beliefs. The notion of conceptual orientation, referring to a coherent array of overlapping and interacting dimensions, issues, and factors that help frame the complexity of curriculum, has also been developed. Table 2 compares key dimensions of curriculum from the above discussions. Drawn from the literature explored, perspectives on the dimensions of curriculum from curriculum theorists, the teacher preparation and contemporary higher education literature, and those of this author are included in the table. The particular dimensions used to frame the notion of conceptual orientation for this study and guide the development of the history of pharmacy education presented next are provided in the last column. Importantly, this array of overlapping and interacting curriculum dimensions aligns closely with Hubball and Burt’s (2004) framework for learning-centered curricula adopted as the theoretical framework for this study (to be described in greater detail in Chapter 4, Section 4.2).
Table 2: Comparison of key dimensions of curriculum

<table>
<thead>
<tr>
<th>Curriculum Dimensions</th>
<th>Curriculum Theorists</th>
<th>Teacher Preparation Literature</th>
<th>Contemporary Higher Education Literature</th>
<th>Author’s Perspective</th>
<th>Conceptual Orientation (for this study)</th>
</tr>
</thead>
<tbody>
<tr>
<td>World view</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Context</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Purpose</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Approach to planning</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design and structure</td>
<td>*</td>
<td>*</td>
<td>* (with attention to coherence)</td>
<td>*</td>
<td>* (with attention to coherence)</td>
</tr>
<tr>
<td>What is taught (content knowledge; which is privileged)</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>How it is taught (teaching methods and practices)</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Teacher and learner roles</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>How people learn (theories of learning)</td>
<td>*</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>How is learning demonstrated and judged (assessment and evaluation practices)</td>
<td>*</td>
<td></td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>
3.4 A Brief History of Pharmacy Education and Curricula in Canada

Analysis of the historical literature on pharmacy education in Canada, while fragmented, provides interesting insights into the complex interplay between societal change, pharmacy practice and pharmacy education. Riedel & Stieb (2001) have linked the changes in pharmacy practice and education in Canada with three major contextual transformations in society since Confederation. Their analysis aligns well with corresponding developments in the US (Hepler, 1987). These perspectives, among others, provide an opportunity to examine the conceptual orientations towards pharmacy education that have emerged in the past 140 years along with corresponding perceptions of the importance of science and the basic pharmaceutical sciences in each. Interestingly, and not surprising, the changes in pharmacy education described below parallel the changes in practice roles described previously in Section 2.4. Table 3 provides a summary of the conceptual orientations towards pharmacy education and curricula in Canada since Confederation.

The agrarian era, existing in Canada until the 1940s was typified by apprenticeship training for pharmacists in the role of preparer and seller of medicinal drugs (Louis & Twaites, 1996; MacCara, 2012). Ensuring quality, purity, safety and safe storage of drugs and medicinal agents was also a critical aspect of apprenticeship training. Apprentices, often as young as 14 years of age, signed indenture agreements or apprenticeship contracts calling for 4-7 years of service in exchange for learning under the tutelage of an established practitioner (commonly a physician or pharmacist) (Raison, 1967). Although variable and unstandardized during much of

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18 Canada and the US have a long history of synergy and cooperation regarding the development of pharmacy practice and education. While there continues to be differences regarding extent of public funding for universities, entry-to-practice degree programs and perspectives on pharmacy practice, especially with respect to scopes of practice and reimbursement models, today both countries share a common philosophy of practice, pharmaceutical care, and grapple with similar issues and challenges regarding optimization of pharmacy programs to meet the health needs of their citizens (Kehrer, Schindel, & Mann, 2010).

19 The dates included are meant to be suggestive only and acknowledge significant overlap between eras.
Table 3: Conceptual orientations towards pharmacy education and curricula in Canada since Confederation

<table>
<thead>
<tr>
<th>Context</th>
<th>Program Purpose</th>
<th>Design and Structure</th>
<th>What was Taught</th>
<th>How it was Taught</th>
<th>How is learning judged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agrarian Society (up to 1940)</td>
<td>Apprenticeship training</td>
<td>Apprenticeship, 4-7 years, unstandardized following finishing school models; contractual obligations</td>
<td>Qualitative and empirical sciences; tacit practical knowledge</td>
<td>Coaching, shadowing, one-on-one tutelage</td>
<td>Written and oral board exams</td>
</tr>
<tr>
<td>Industrialization Society (1940-1970)</td>
<td>Developing pharmaceutical scientists</td>
<td>University-based Bachelor programs; 1-4 year courses, variable apprenticeships required (to 1960); 1 + 4 year BSc(Pharm) programs (1960-1970); building blocks approach with practice deferred to the end; apprenticeship largely eliminated by 1970</td>
<td>Natural/basic pharmaceutical sciences dominant; practice focus minimal</td>
<td>Lectures, laboratories, teacher-centered</td>
<td>Written exams, science laboratory reports and practicals</td>
</tr>
<tr>
<td>Information/Knowledge-Based Society (1970-present; change slow up to 1990, rapid change following)</td>
<td>Developing clinical pharmacists</td>
<td>University-based 1 + 4 year BSc(Pharm) programs; building blocks approach; experiential learning built in; 2 + 4 year PharmD programs begin to emerge emphasizing patients, clinical and experiential learning</td>
<td>Biological, biomedical and clinical sciences (therapeutics) increasingly important; basic pharmaceutical sciences decreased; experiential and practice learning emphasized</td>
<td>Lectures; active learning; science labs minimized, practice labs emphasized; learning-centered approaches dominant; learning technologies emerge</td>
<td>Multiple assessment strategies used; national board exams increasingly important</td>
</tr>
</tbody>
</table>
In this era, formalized apprenticeship training programs for pharmacists, where they existed, provided a combination of practical experience and course work. Often attained through private schools, correspondence courses, or evening lecture series offered by experienced pharmacists or physicians\textsuperscript{20}, formal study was voluntary, focused on foundational textbooks, required much memorization, and was largely ungraded (Canadian Academy of the History of Pharmacy [CAHP], 1969; British Columbia Pharmaceutical Association [BCPhA], 1940)\textsuperscript{21}. Referred to in the pharmaceutical education literature as the finishing school model, the purpose of formal pharmacy education was to “finish” or “round out” apprentices, making them fully competent as employee pharmacists. The path to licensure was frequently tiered requiring successful completion of minor and major board exams for promotion from Certified Apprentice to Certified Clerk to Licentiate of Pharmacy. Licensure exams were administered by the pharmacy Associations or Colleges (licensing bodies) in each province (Buerki, 1999; Raison, 1969; Riedel & Stieb, 2001). Although the understanding of science during this era was primarily empirical, qualitative and descriptive\textsuperscript{22}, the knowledge of pharmacognosy, galentical pharmacy, materia medica, practical pharmacy\textsuperscript{23} and chemistry along with the tacit understandings of medicinal drugs and their preparation accumulated over many centuries, was the basis of the pharmacist’s professional status and fiercely guarded livelihood (Beales & Austin, 2006; Hepler, 1987; Kremers & Urdang, 1976). The suggestion that in the 1930s 75% of all prescriptions were prepared in pharmacies and required the compounding skills of the pharmacist, highlights their

\textsuperscript{20} In an attempt to standardize pharmacy practice and apprenticeship training these types of supplemental educational opportunities were typically organized and run by provincial pharmacy Associations or Colleges (Raison, 1967).

\textsuperscript{21} Borrowing primarily from British models of self-study for apprentices, typical textbooks included the British Pharmacopoeia (1885), Maisch’s “A manual of organic materia medica” (1887), Remington’s “The Practice of Pharmacy” (1886) and Semple’s “Aids to Chemistry” (1881) (BCPhA, 1911).

\textsuperscript{22} The definition of “empirical science” adopted for this study can be found in the Glossary (Empirical, 2013).

\textsuperscript{23} The definition of the knowledge domains of “pharmacognosy”, “galentical pharmacy”, “materia medica,” and “practical pharmacy” adopted for this study can be found in the Glossary (Hurst, 1934).
specialized knowledge and lends support to the importance and central role of empirical science in the pharmacists education and practice (Savage, 1994). In addition, aligning the pharmacist’s role of this era with the notion of an “empiricist-apothecary,” as developed in Section 2.5, appears appropriate. While much the history of pharmacy education in Canada up to 1940 can be viewed as a series of attempts to improve, rather than replace, the apprenticeship system of training pharmacists, the importance of apprenticeship, or the need for practical training of any type, began to wane as modern science-based programs within universities became established (Buerki, 1999; Raison, 1969; Riedel & Stieb, 2001).

With the rise of industrialization in society in the late 19th and early 20th centuries, the pharmacy profession in Canada entered the industrial era (1940 - 1970) (Riedel & Stieb, 2001). The decades immediately following World War II were a particularly intensive time of change and growth in the country and profession (Buerki, 1999; Louis & Twaites, 1996; MacCara, 2012). Characterized by sweeping changes in pharmacy knowledge, education and practice as the profession struggled to align with universities and the ideology of science in society, the importance of the natural and basic pharmaceutical sciences peaked (Buerki, 1999; Hepler, 1987; Riedel & Stieb, 2001; Taylor, 1911). Buoyed by the medical discoveries of the day24, increasing public demand for prescription drugs and patent medicines25, and a strong desire to contribute to

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24 Scientific developments in the late 19th and early 20th centuries revealed the powerful potential of applying biomedical science to therapeutics. European discoveries in 1890 (a biologically derived cure for diphtheria) and 1910 (design of the first chemotherapeutic agent, Salvarsan, to destroy the syphilis pathogen) stimulated the development of the research-based US pharmaceutical industry in the 1920s and 1930s. Discovery of insulin in 1922 (by Canadians Banting and Best), isolation of penicillin in 1929 (by British researcher Fleming) and discovery of sulfa antibacterial agents in 1935 (by French researchers Trefoulèl, Nitti and Bovet) added to the excitement and potential of drug discovery and the basic pharmaceutical sciences in pharmacy programs (Khan, Deimling, & Philip, 2011; Hughes, 1943; Swann, 2001).

25 Patent medicines were proprietary medicines manufactured by physicians and pharmacists. Often referred to as “quack” remedies, patent medicines were marketed directly to the public as special remedies for specific diseases or ailments, often with widely exaggerated claims of success. Some recipes were standard formulations from the British Pharmacopoeia but others contained addictive drugs such as cocaine or heroin as well as high levels of alcohol. Since the recipes were secret neither the public nor the dispensing physician or pharmacist knew if the
medical advancement (Chew & Sharrock, 2007; Hughes, 1943; Swann, 2001), disciplinary scientific knowledge was adopted as the basis of pharmacist’s new specialized knowledge, education and training. Apprenticeships, diplomas and certificates were gradually replaced with standardized four year university-based BSc(Pharm) degree programs and rigorous training in the natural and basic pharmaceutical sciences. The finishing school model of curriculum design typical of the agrarian era was inverted to a building blocks approach in which the scientific foundations of pharmacy education preceded practice-oriented experience and training. In most BSc(Pharm) programs the requirement for apprenticeship, practical or internship training as part of degree completion was severely reduced, took place after graduation, or eliminated (Riedel & Stieb, 2001). In these scientific curricula descriptive pharmacognosy, galentical pharmacy, materia medica and practical pharmacy were converted to botany and plant physiology, bacteriology, natural products, organic and medicinal chemistry, pharmacology, and pharmaceuticals including physical pharmacy and drug analysis (Hepler, 1987). Practical synthesis and analytical laboratories, associated with each scientific discipline, dominated curricula along with disciplinary lectures. Newly trained Doctor of Philosophy (PhD) scientists well grounded in the pharmaceutical sciences were hired to teach and develop research programs generously supported by governments and the pharmaceutical industry. Establishing post-graduate MSc and PhD programs in drug research and development became increasingly important. Within BSc(Pharm) classrooms teacher-centered approaches to education were prominent and assessment methods were typically high-stakes often including practical laboratory testing and

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product was harmful. Naylor’s Pectoral Ointment, Laboror’s Own Remedy and Mrs. Winslow’s Soothing Syrup are examples of patent medicines sold in Canada (Raison, 1967).

26 Establishing university-based 1 + 4 BSc(Pharm) programs as the first entry-to-practice degree in Canada took more than 70 years. The first university-based pharmacy program was offered in Ontario (1892) and the last in Newfoundland and Labrador (1965). In the interim, university-based pharmacy programs took many forms ranging from 1 to 4 years of science-based coursework supplemented with various apprenticeship, practical or internship training requirements. Degree designations of Bachelor of Pharmacy (BP) and Bachelor of Science in Pharmacy (BSP) were common prior to the BSc(Pharm) degree becoming established.
written midterm and final exams (Austin & Gregory, 2007; Barr & Tagg, 1995; Louis & Twaites, 1996). The focus of these programs was on the drug and drug product while their purpose was to prepare pharmacists with scientific knowledge and technical expertise approximating pharmaceutical scientists (Buerki, 1999; Hepler, 1987; Riedel & Stieb, 2001).

The industrial era was a particularly difficult time for pharmacists professionally. Although demand for prescription medicines and profits for pharmacists soared (Buerki, 1999; Dove, 2011), their once specialized knowledge and social role as empiricist-apothecary (preparer and seller of medicinal drugs) was gradually subsumed by the pharmaceutical industry. In addition, while the basic pharmaceutical sciences were legitimized within pharmacy programs, practice was marginalized. Described cynically as the “lick, stick, count and pour” model of pharmacy practice (Skau, 2007, p. 1), pharmacists practiced in the shadow of physicians, having limited involvement with patient therapy, and deferring responsibility for health outcomes back to the physician. Pharmacies became the channel of distribution for the pharmaceutical industry and the pharmacist’s role changed, as suggested in Section 2.5, from empiricist-apothecary to pharmacist-scientist and dispenser of prepackaged drug products (Hepler, 1987). Many pharmacists felt they could not practice to their potential and that their education was increasingly irrelevant to practice (Riedel & Stieb, 2001). That less than one percent of all prescriptions required compounding skills by 1973, underscores the loss of professionalism felt by pharmacists (Dove, 2011; Savage, 1994). Hepler (1987) describes the impact of the industrial era on pharmacy education and practice in this way,

[During the industrial era] pharmaceutical education had accommodated itself to the Industrial Revolution, had legitimized itself academically and in the process had been reformed…for all its progress, [pharmacy] education seemed to have lost its purpose of producing professionals. It had compartmentalized its curricula along disciplinary lines and seemed to have replaced the objective of educating professionals with the typical
objectives of...sciences faculties: discipline-oriented teaching, peer relationships, publications and external funding. (p. 371)

Reclaiming the professional status and role of pharmacy within the health care system was the embodiment of the information era of pharmacy education and practice which Riedel & Stieb (2001) have aligned with the development of a knowledge-based society in Canada (1970-present). Corresponding to the clinical movement in pharmacy practice (Dove, 2011; Wood, 2001), the information era signified the beginning of a long 40 year period of recovery from the “de-professionalization that resulted from industrialization” (Hepler, 1987, p. 379). Based on cost, demand and public safety issues related to the prevention of drug misuse, underuse and overuse (Wu, Bell, & Wodchis, 2012; Zed et al., 2008), pharmacists began to reassert exclusive claim within the health care system as society’s drug specialist involved in drug use control, medication management and patient-centered care (CPhA, 2013; Hepler & Strand, 1990). The concurrent emergence of the pharmaceutical care model of practice in 1990, “intended to invoke analogies with the ideals of medical care and nursing care” (Hepler, 1987, p. 376), redefined and operationalized the pharmacist’s renewed professional role to that "entail[ing] the direct interaction of the pharmacist with the patient for the purpose of caring for the patient's drug-related needs" (Strand, Cipolle, & Morley, 1992, p. 6). The intent of the pharmaceutical care movement was “self-actualization - the full achievement of [the pharmacist’s] … professional potential” (Hepler & Strand, 1990, p. 534). Although the philosophy and practices of pharmaceutical care were slow to penetrate professional practice frustrating many pharmacy leaders and practitioners (Jungnickel et al., 2009; Rosenthal, Austin, & Tsuyuki, 2010), pharmacy schools embraced the movement and the need for overhauling curricula of the industrial era. The purpose of program revisions was the development of clinical education for pharmacists that emphasized the patient instead of drugs, drug products, dispensing and technical
expertise. The dominance of the basic pharmaceutical sciences was reduced with the inclusion of clinical or applied pharmaceutical sciences such as therapeutics and pharmacokinetics, in the hope of converging of the sciences with practice. The biomedical sciences of anatomy, physiology and pathophysiology played an increasingly important role along with a refocusing of curricula from plants to the human body. While the building blocks design of the industrial era remained, experiential training opportunities for students in community, hospital and other health care settings were reintroduced and grew steadily in importance within curricula (Stieb, 2001). Despite great resistance from traditional pharmaceutical scientists, new clinical scientists and clinicians were incorporated into Faculties, Schools and Colleges of Pharmacy and a welcome addition in the practice setting for their enhanced professional knowledge. In the profession, while some pharmacists adopted their new role wholeheartedly others were reluctant to assume the patient care responsibilities commensurate with their education, particularly in the community pharmacy setting27. Nationally, coordinated efforts were undertaken to develop outcomes-based pharmacy curricula (AFPC, 2010), national accreditation standards (CCAPP, 2013) and national board exams that replaced provincial exams (Pharmacy Examining Board of Canada [PEBC], 2010). Following decades of often wrenching curriculum restructuring efforts, curricula typical of the information era, which emphasized outcomes-based, clinically-oriented pharmacy programs with less reliance on the basic pharmaceutical sciences were accepted as a minimum accreditation requirement for all Canadian BSc(Pharm) programs (AFPC, 2010; CCAPP, 2013; Hubball & Burt, 2004; PEBC, 2010). Teaching-centered approaches to pharmacy education were replaced with learning-centered approaches and traditional science-based laboratories replaced with pharmacy practice skills labs and small group case-based therapeutics.

27 The opposite situation was also true. Many pharmacists felt that the practice environment did not allow them to practice at their full potential or use their clinical education (Dove, 2011; Kassam & Kwong, 2009; Munger, Gordon, Hartman, Vincent, & Feehan, 2013).
tutorials. While lectures continued to be prominent, active learning increased in importance as did the variety of assessment methods (Abate, Stamatakis, & Haggett, 2003; Barr & Tagg, 1995). As articulated by Hepler and Strand (1990) twenty years ago, “pharmaceutical care practice restored what had been missing for years: a clear emphasis on the patient’s welfare, [and] a patient advocacy role with a clear ethical mandate to protect the patient …” (p. 534). In terms of the progress made during the information era of pharmacy education Hepler (1987) puts it succinctly, “After half a century of loitering at the cross roads, pharmacy watched education approach from one direction and practice from another. Their joining has made it possible for both practice and education to move forward” (p. 373).

3.5 Pharmacy Education Today, the Blueprint for Tomorrow and this Study

Today, the clinically-oriented pharmacy programs and curricula of the information era have fully embraced the clinical movement, pharmaceutical care, and the role of the pharmacist as clinician and medication therapy expert (AFPC, 2010; Dolovich, 2012). Four decades in the making, the education of pharmacists’ has shifted slowly but profoundly since the industrial era as have assertions about the importance of pharmacists in the health care of Canadians (CPhA, 2013). Addressing the new specialized knowledge envisioned for contemporary practice roles, the principles and practices of learning-centered education in pharmacy education and curricula have been building momentum since the early 1970s (Hymel & Foss, 1990); these have been adopted widely since the early 1990s and continue to be optimized (Abate, Stamatakis, & Haggett, 2003; Bradberry et al., 2007; Wolf et al., 1993). Nationally accredited outcomes based programs (AFPC, 2010) that “inform students about what they can expect to achieve from a program of study” (Hubball & Gold, 2007, p. 9) emphasize increased experiential learning, curriculum integration, active learning, small group and collaborative learning, technology use,
and continuous assessment and evaluation at all program levels. In addition, curriculum optimization efforts are attempting to address the multitude of internal and external pressures facing the profession as discussed earlier in Section 2.5 (Bradberry et al., 2007; Blouin et al., 2009; Hubball & Burt, 2007; Purkerson Hammer & Paulsen, 2001; Perrier, Winslade, Pugsley, Lavack, & Strand, 1995). While these changes have appeared to enhance student learning, the learning experience, practice abilities (Boyce & Lawson, 2007), and practice change, particularly in community settings, continues to lag prompting some to suggest that contemporary curriculum reform efforts require radical rethinking (Austin & Duncan-Hewitt, 2005; Crabtree, 2012; Duncan-Hewitt and Austin, 2005; Jungnickel et al., 2009; Kassam & Kwong, 2009; Rosenthal, Austin, & Tsuyuki, 2010; Speedie et al., 2012).

The national Blueprint for Pharmacy initiative, as mentioned previously, has articulated a bold vision for the future of pharmacy in Canada. With goals emphasizing “optimal drug therapy outcomes for Canadians through patient-centred care” (CPhA, 2013, p.6) by 2020, academic pharmacy has been challenged with ensuring curriculum optimization and revision efforts prepare new graduates for emerging roles and the future of pharmacy practice. One of the many issues vying for attention in the discourse on curriculum reform concerns the role and status of the basic pharmaceutical sciences in revised pharmacy programs (Skau, 2007). Specifically called into question has been the perceived dilution of the basic pharmaceutical sciences in contemporary pharmacy education as well as the balance between the basic pharmaceutical sciences and practice-oriented and experiential learning opportunities in contemporary pharmacy education (Cutler et al., 2009; Skau, 2007; Woster, 2003). Woster (2003), for example, has suggested that revised pharmacy programs are creating “chemophobes” (p. 1) while Albon (2010) has questioned whether contemporary programs are creating generations of pharmacists
that are afraid of the basic pharmaceutical sciences and chemistry in particular. Austin and Gregory (2007), concur suggesting that it may not be the basic pharmaceutical sciences but “science- in all its dimensions- [that] is becoming devalued by students, practitioners, and curriculum planners” (p. 615). With very little research available exploring this issue in the Canadian context (Austin & Gregory, 2007), this study intends to investigate the current role and status of the basic pharmaceutical sciences in UBC’s contemporary BSc(Pharm) program in an attempt to fill this existing knowledge gap. How this study was conducted will be the focus of Chapter 4 to be developed next.
CHAPTER 4: METHODOLOGY AND METHODS

This study inquired into the scientific foundations of UBC’s BSc(Pharm) program with particular attention to the role and status of the basic pharmaceutical sciences. As introduced briefly in Section 1.4, the study was designed as a theoretical empirical inquiry using Stake’s (2010) notion of qualitative intrinsic case study. Semi-structured interviews, classroom observations, and documents analyses were employed as data collection methods to provide multiple sources of information for detailed, in-depth exploration of the case, UBC’s BSc(Pharm) program. Chapter 4 begins with an exploration of the field of educational research in an attempt to locate theoretical empirical inquiry within it and construct an argument as to why Stake’s (1995, 2005) qualitative intrinsic case study approach employing multiple data collection methods was an appropriate methodological choice. The chapter continues by describing the study pragmatics. The conceptual structure of the study and the theoretical framework used to guide data collection will be presented along with descriptions of the study setting, its participants and the methods used to collect, manage and analyze the data collected. The chapter concludes with comments on issues of trustworthiness, ethical considerations and limitations of the study. It is hoped that once readers have finished this chapter they have a clear sense of the study design, the route taken to answer the research questions and why the methodological choices were made.

4.1 Why Case Study?

Today the field of educational research is characterized by an enormous and ever expanding body of research literature. What becomes immediately clear upon entering this field is the inherent respect for the complexity of human behavior, experience, and action in educational settings, and the research enterprise created to study it. Much like the sociological
imagination and the challenges of curriculum described in Chapters 2 and 3 respectively, educational research is a multifaceted endeavor comprising a complex array of views, perspectives and schools of thought about what is important, what can be learned, and the ways to investigate it (Denzin & Lincoln, 2008). While disagreements amongst the various schools continue, intense disputes of the past have given way to a continuum of belief systems that reflect more realistically how thinking in the world has become more holistic and complex (Kimpston, Williams, & Stockton, 1992; Lather, 2006; Moss et al, 2009). While acknowledging that different belief systems and world views address different priorities, privilege different research strategies, and create different types of knowledge (Mazzei & Jackson, 2009), there is agreement and adamancy that the research questions drive the research design and methodological choices (Stake, 2010). Creswell (2007) acknowledges the “baffling number of…approaches” (p. 6) available to the educational researcher and the difficulties of making informed methodological choices. Research suggests that methodological choice for a given research study should be grounded in an explicit understanding of its implicit ontological and epistemological commitments (Bassey, 1992, 1999; Cousin, 2009; Shulman, 1997). What is examined next is why a theoretical empirical inquiry using Stake’s (2010) intrinsic case study approach and a qualitative methods perspective is particularly well-suited for this research.

Research in education can be represented by three broadly overlapping categories underpinned by deep assumptions (worldview), an ethos of systematic, critical and ethical inquiry, and social responsibility (Bassey, 1992, 1999; Cousin, 2009; Creswell, 2007; Shulman, 1997)28. The categories have been characterized as empirical, reflective-integrative and creative research. Empirical research, representing the largest proportion of research in the field, is

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28 In terms of social responsibility, Shulman (1997) suggests that educational researchers have a responsibility for communicating and disseminating the outcomes of their research to the educational context, the community of educational scholars and to the general public.
characterized by systematic data collection; careful attention is paid to research questions, methodological choice, research design, rigorous data analysis and interpretation, and conclusions drawn. For empirical research the central focus is on data collection necessary to answer research questions posed. Austin and Gregory’s (2007) study for example, one of the only Canadian empirical research studies to investigate the scientific foundations of contemporary BSc(Pharm) programs, used student interviews and focus groups as data sources to examine student perceptions of the value, role and impact of the basic pharmaceutical sciences on their education. Reflective-integrative research utilizes and builds on existing empirical research for meta-analysis in an attempt to develop models, frameworks and theories for helping bring understanding to educational issues. A large and vital part of educational research is of this sort. Many of the works cited in Chapters 2 and 3 of this thesis (Feiman-Nemser, 1990; Hubball & Gold, 2007; Riedel & Stieb, 2001) as well as the chapters themselves are examples of reflective-integrative research. Creative research is educational research focused on novel solutions to problems, new ideas, and creation of unique educational artifacts and tools. The development of the influential pharmaceutical care concept (Hepler & Strand, 1990), and the Blueprint for Pharmacy visioning documents (CPhA, 2013) could be characterized as examples of creative research. Recognizing that categorization in education is slippery business, these research categories have vague boundaries, size, and much overlap. Creative research for example, builds on empirical and reflective-integrative research to extend current understandings in novel directions while empirical research requires a reflective-integrative literature review. Reflective-integrative researchers must read the empirical research for meta-analysis. Based on this interpretation of the field of educational research, this study was designed as an empirical research study using a range of data collection methods to provide multiple sources of
information to address the study’s purpose and answer the research questions posed. Three other important issues impact the study’s design.

The first issue is rooted in the fundamental purpose of the research and whether a particular research study (and the researcher) seeks understanding, change or some variation (Bassey, 1992, 1999). Empirical research (the only category discussed here), for example, can be divided into three subcategories each with a different underlying purpose. Like the broad categories of educational research described above, the subcategories of empirical research presented next have vague boundaries and much overlap.

_Theoretical empirical research_, the first subcategory, seeks understanding; the purpose is to investigate an educational topic or issue in its natural setting with minimal disruption or disturbance. The aim of theoretical empirical research is to provide an in-depth account or description that enhances understanding and provides useful perspectives and insights about the educational topic or issue of interest (Bassey, 1992, 1999). While analysis and interpretation of empirical data requires judgment, the findings of theoretical empirical research develop with minimal expectation of change or actions in mind. _Evaluative empirical research_, the second subcategory of empirical research, seeks understanding and judgments about change and potential actions; the purpose of this type of research is not only to explicate understanding but to make explicit value judgments about the suitability, appropriateness or impact of an educational topic, issue or intervention. While not advocating change directly, evaluative empirical research embodies explicit actions and an implicit expectation that others may act on them (Bassey, 1992, 1999). _Action research_, the final subcategory, seeks understanding, judgment and change; the purpose is on improvement of the practical situation often at the local level. Action researchers work closely with study participants in an on-going iterative process of understanding, judgment
and change regarding an educational topic or issue (Bassey, 1992, 1999). Valuable for locating the research literature within this typology, the Austin and Gregory (2007) study cited earlier could be classified as theoretical empirical research while previous classroom and curriculum reform research on the UBC BSc(Pharm) program (Albon & Hubball, 2004; Hubball & Burt, 2004) represent examples of action research. In terms of refining the purpose, methodological choices and design of this study, conceptualizing empirical research in this way was particularly helpful. Although this study was anticipated to help inform curriculum reform efforts currently underway in the Faculty (FPS, 2012), it was deemed premature to think about developing specific action plans or enacting curriculum change before an in-depth understanding of the current program was established. While the implications of this research were anticipated to provide guidance on curriculum change related to the role and status of basic pharmaceutical sciences in the UBC BSc(Pharm) program, the primary focus of this study was about understanding; how the findings of this research might be used by the Faculty or others to enact curriculum reform now and over the next decade of the Blueprint era was of secondary importance. Guided by this perspective, the study was designed as theoretical empirical research with the primary purpose of understanding the current situation regarding the basic pharmaceutical sciences in the UBC BSc(Pharm) program.

The second issue impacting the broad categories of educational research is the generalizability of research findings. Referred to as “the degree to which findings from one context or under one set of conditions may be assumed to apply in other settings or under other conditions” (Shulman, 1997, p. 13), generalization receives a lot of attention in the educational research literature. There are different forms of generalization possible depending on study design. Studies involving samples of people thought to be representative of larger populations
can produce statistical generalizations that support inferences about the population. Although effective sampling of large populations is often difficult, expensive and unrealistic in educational settings, survey research about educational topics and issues can lead to statistical generalization (Bassey, 1999; Cousin, 2009; Creswell, 2007; Stake, 2010). More commonly for empirical research in educational settings is the study of singularities (Erickson, 1986; Palys & Atchison, 2008). Focusing on particular situations, events or bounded systems that include people, the study of singularities can produce predictive or interpretive assertions without any measure of statistical probability. As Bassey (1999) describes them, these assertions are “qualified generalizations carrying the idea of possibility but no certainty…[or] fuzzy generalizations” (p. 46). While this terminology is awkward, the concept of fuzzy generalization does capture the dilemma faced by empirical educational researchers studying singularities. Generalizing beyond the particular situation, event, or sample investigated becomes uncertain and must be made with caution (Regehr, 2010). Based on this analogy, the design of this study was further honed as a theoretical empirical study of a singularity, the UBC BSc(Pharm) program. Generalization beyond this program to other Canadian BSc(Pharm) programs, for example, would require careful thought. The issue of generalizability of this study will be discussed further in Section 4.3.

The last issue of importance to empirical educational research is the deeply held beliefs or world views that underpin and drive the research. Educational researchers, like the social scientists and curriculum theorists discussed previously, try to make sense of the world from different theoretical perspectives about the nature of reality. Referred to as ontological belief systems, the influence of world view on educational complexity, research design, and what can be known (i.e., epistemological assumptions) is debated widely in the educational research
literature (Cousin, 2009; Creswell, 2007). Briefly summarized, the positivist worldview, which underpins the quantitative paradigm of educational research, has been characterized as regarding reality as single, objective, and fragmented. Educational complexity from this perspective can be understood rationally in terms of factual knowledge describing human experience, actions and events, and laws that govern the relationships between them. Influenced heavily by the natural sciences model of research, the positivist-quantitative research paradigm often concentrates on confirming theory and testing hypotheses; what can be measured, analyzed statistically, and generalized is an important aspect of this research. In terms of what can be known, the epistemological assumption is that research findings represent objective reality, accurately reflect common understandings of complex educational phenomena, and are independent of the researcher and learner. Survey methodology, often associated with positivist worldview and quantitative research design, is often used by empirical researchers to examine and enhance understanding of complex phenomena in educational settings (Bassey, 1999; Creswell, 2007; Guba & Lincoln, 2005; Palys & Atchison, 2008; Shulman, 1997).

In contrast, the interpretive worldview underpins the qualitative paradigm of educational research. Interested in exploring meanings of people’s experiences, and how people make sense of their lives and the world, reality from this perspective, is regarded as socially constructed. To the interpretive educational researcher, educational complexity cannot be fully understood in terms of the quantitative approaches of the positivist. Instead, interpretivists believe that understanding human experience, actions and events in educational settings requires in-depth study of the research participants in their natural educational settings using time intensive methodologies (Table 4) (Lincoln & Guba, 1985). The epistemological assumptions of the interpretivist-qualitative research paradigm are that meaning and understanding is embedded in
lived human experiences and can be best understood in terms of their own experiences of them.

The researcher, who is actively involved in the research process, builds abstractions, concepts, and theories from observations, interviews, and interactions using complex variables that are difficult to measure. Study of individuals, small samples and singularities are preferred and generalization must be approached cautiously\(^\text{30}\).

### Table 4: Common qualitative research approaches and key interpretive questions\(^\text{29}\)

<table>
<thead>
<tr>
<th>Approach</th>
<th>Key Interpretive Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>case study</td>
<td>What are the characteristics of this particular entity, phenomenon, or person? What are the characteristics of this single case or of these comparison cases?</td>
</tr>
<tr>
<td>ethnography</td>
<td>What are the cultural patterns and perspectives of this group in its natural setting? What are the cultural characteristics of this group of people or of this cultural scene?</td>
</tr>
<tr>
<td>grounded theory</td>
<td>How is an inductively derived theory about a phenomenon grounded in the data in a particular setting? What theory or explanation emerges from an analysis of the data collected about this phenomenon?</td>
</tr>
<tr>
<td>phenomenology</td>
<td>What is the experience of an activity or concept from these particular participants’ perspective? What is the meaning, structure, and essence of the lived experience of this phenomena by an individual or by many individuals?</td>
</tr>
<tr>
<td>action research</td>
<td>How can teachers solve or understand an identified teaching problem and improve practice based on data they have collected and analyzed?</td>
</tr>
<tr>
<td>historical research</td>
<td>How does one systematically collect and evaluate data to understand and interpret past events? How do historians know when they know something?</td>
</tr>
</tbody>
</table>

\(^{29}\) Key questions underpinning the qualitative research methodologies in Table 4 were adapted from Creswell (2007), Denzin and Lincoln (2008), Gay, Mills, and Airasian (2009), and Palys and Atchison (2008).

\(^{30}\) Several key issues emerged from this mapping exercise including: 1) ontology, epistemology and methodology are linked, 2) methodologies embody different perspectives on reality, value judgments about the importance of lived experience in educational settings and the varying potential for generalization, 3) methodological choice determines the specific data collection procedures and research design to be used, the kinds of knowledge that can be created from their application, and the depth of understanding generated, 4) methodological choice is not a technical exercise but implies a commitment to the inherent belief system that underpins it; the research questions...
Based on the preceding discussion including Table 4, case study with a qualitative methods perspective was deemed an appropriate methodological choice for this thesis work. Designed as a theoretical empirical study of a complex singularity, the UBC BSc(Pharm) program, the intent was to develop a comprehensive, in-depth understanding about the role and status of the basic pharmaceutical sciences in the program. A qualitative perspective was chosen to facilitate depth of understanding and rich descriptions about the current situation in its naturalistic setting (Lincoln & Guba, 1985). The study’s purpose, its research questions and a commitment to the inherent ontological and epistemological belief system that underpins qualitative case study helped justify this methodological choice. In addition, while several case study typologies have been developed for various investigational purposes, as a research approach, case studies have been described as holistic processes leading to in-depth understanding of bounded systems (Bassey, 1999; Creswell, 2007; Merriam, 1998; Stake, 2010; Yin, 2003). The term “bounded” refers to the ability to separate out, by time and place, the particular event, program, institution or social group of interest for detailed study (Merriam, 1998; Stake, 2010; Yin, 2003). Unit of analysis is used instead of bounded system in some case study literature to emphasize the boundedness of a case (VanWynsberghe & Khan, 2007).

The UBC BSc(Pharm) program, a bounded system comprising a 1+4 year entry-to-practice professional degree program uniquely available at UBC and in BC, represented a good candidate for qualitative case study investigation. Although vigorous debates about defining case study continue despite a long history (Becker, 1999; Hamel, Dufour, & Fortin, 1993; VanWynsberghe & Khan, 2007), for this study, case study was viewed as a methodology as well.
Conceptualizing the case, the UBC BSc(Pharm) program, as a unique, complex, functioning “thing” (Stake, 2010, p. 25) comprising its own intrinsic issues worthy of study seemed particularly appropriate. An intrinsic case study approach also kept the study focused on understanding the current situation regarding the role and status of basic pharmaceutical sciences in the UBC BSc(Pharm) program; other types of case studies within Stake’s typology, such as instrumental or collective case studies, have broader purposes (Stake, 2010; Yin, 2003). Stake’s (2010) intrinsic case study approach also provided the flexibility to involve a range of qualitative methods to investigate the case in its naturalistic setting. Inclusion of interviews, classroom observations and document analyses allowed for extensive interaction with study participants and collection of a comprehensive data set for answering the research questions, addressing the study’s purpose and learning about the case.

4.2 Pragmatics of the Study

Based on the preceding discussion, this case study of the UBC BSc(Pharm) program was designed to optimize understanding of the case rather than to generalize beyond it. The epistemological question driving the case study design was “What can be learned from the single case?” (Stake, 2005, p. 443). The study design will be described next.

Conceptual Structure of the Case Study

Designing this study began with conceptualization. Informed by Stake’s (1995, 2005, 2010) perspectives, identifying the case to be studied provided the initial entry point for the study design. Viewing UBC’s BSc(Pharm) program as a complex functioning system (“thing”) with

31 For this study, “methodology” refers to the process of inquiry used to study a bounded system (a case) and research efforts undertaken to understand its uniqueness. This thesis, a case study about the UBC BSc(Pharm) program, is also the product of the study.
boundaries, integrated working parts and a well-established and critical purpose helped clarify and refine the study’s purpose and research questions, confirm choices about research methodology and methods, and organize the investigational activities. Figure 2 provides the conceptual structure for the case study (Stake, 2005). Developed to gather and focus thinking about the case, Figure 2 situates UBC’s current BSc(Pharm) program (the case) within the complex interplay of pharmacy practice and pharmacy education historically as well as indicates some of the complex internal and external contextual pressures influencing the case today.32 Conceptualizing the case study in this way highlighted the case’s complexity, historical embeddedness, and contextuality. It also helped clarify the study’s focus and what could be learned about the case. Through the process of “progressive refocusing” (Stake, 1995, p. 22), the case study’s purpose and research questions were honed, the working parts of the case to be studied identified, and the investigational activities established and sequenced.33 To complete the study’s conceptual structure a theoretical framework was adopted to help guide decisions about

32 The conceptual structure of the case study was developed based on the histories of pharmacy practice and education in Canada as presented earlier in Chapters 2 and 3, respectively. Internal and external pressures on the current program are indicated in the small rectangles and the inward pointing arrows.

33 The working parts of the case are indicated in Figure 2 as the pie-shaped sub-components of the current BSc(Pharm) program. Included are the basic pharmaceutical sciences courses, faculty members (as disciplinary experts), and Faculty and curriculum review reports. The data collection methods to be used to investigate the working parts are shown in the lower pie-shaped segment and include interviews, classroom observations, and document analysis.
Figure 2: Conceptual structure for the case study

Canadian Pharmacy Education and Programs (1867-2010)
- Apprenticeship (until 1940): apprenticeship, unstandardized, finishing school models, qualitative empirical science, one-on-one tutelage
- Bachelor programs (1940-1970): university-based programs, 1-4 year programs, incremental standardization, building blocks model, disciplinary natural and pharmaceutical sciences, knowledge central, practice marginalized, teacher-centered
- BSc(Pharm) programs (1970-2010): 1-4 year programs, standardized, biomedical sciences and clinical knowledge increased, pharmaceutical sciences diminished, PharmD emerges, increasingly learning-centered

Conceptual Orientations towards Pharmacy Curricula in Canada (1867-2010)
- Apprenticeship training
- Developing pharmacist scientists
- Developing clinical pharmacists

Practice Roles (1867-2010)
- Empiricist apothecary
- Drug dispensing pharmacist scientist
- Drug use consultant, pharmaceutical care practitioner, medication therapy expert

Practice Role (2010-2011)
- Pharmaceutical care practitioner, medication therapy expert
- Legacy of product focus and drug distribution

Pharmacy Practice (2020)
- Medication therapy expert, patient-centered care
- Limited drug distribution activities and dispensing

Curriculum optimization, professionalism, technology, faculty recruitment, scientific knowledge base

The Case: UBC’s Current BSc(Pharm) Program (2010-2011)
- Faculty members, disciplinary experts
- Basic pharmaceutical sciences courses
- Faculty and curriculum review reports
- Interviews, classroom observation, document analysis

UBC’s Envisioned Pharmacy Program (2020)
- Blueprint for Pharmacy program
- Accreditation, professional enhancement, PharmD development, technology, remuneration models

Conceptual Orientations towards Pharmacy Curricula at UBC? (2010-2011)
- Focus of study
- Assume parallel development with Canadian programs
- Assume legacy of pharmacist scientist curricula

Conceptual Orientation towards Pharmacy Curricula at UBC in the Blueprint era? (2020)
- Predicting fully mature clinical education
- Medication therapy expert
- Legacy of pharmacist scientist curricula gone

UBC mission, Faculty strategic plan 2012-2017, new building 2012
what information in particular to collect from the working parts of the case by the data collection methods identified. The theoretical framework will be described next.

**Theoretical Framework**

Hubball and Burt’s (2004) framework for learning-centered curricula was chosen as the theoretical framework for this study. Providing a particularly useful lens for exploring and analyzing curriculum complexity, their robust and comprehensive dimensional framework not only aligned well with the notion of conceptual orientation adopted for this study (Table 2) but helped guide decisions about the particular information needed to address the study’s purpose and answer the research questions. Described briefly, this flexible, heuristic framework views curriculum holistically and integrates the learning context with curriculum planning, teaching and assessment activities (Figure 3). *Learning context* acknowledges the critical importance of context in educational settings, the importance of understanding the internal and external factors affecting it, and how it influences the program purpose, planning, assessment and teaching

**Figure 3:** Theoretical framework adopted for the study (Hubball & Burt, 2004)
aspects of curriculum design and reform. Planning activities take into account learning context factors and refer to the articulation of learning outcomes which in part, drive the process of content selection and program structuring, design, and coherence. Assessment activities take into account learning context factors and refer to the methods used to gather data on student learning as well as the standards to judge achievement. Acknowledging assessment as a powerful force driving the learning process, emphasis is not placed on any one single method of assessment but on a range of methods comprising formative and summative approaches (Hubball & Gold, 2007). Instructional methods or teaching practices take into account learning context factors and refer to the application of various learning strategies, on a continuum from teaching-centered to learning-centered, that promote active learning and provide opportunities for individual work, partner work, small group work and large class activities (Ambrose, Bridges, Lovett, Dipietro, & Norman, 2010). Practical and robust, Hubball and Burt’s (2004) framework for learning-centered curricula has been time-tested and applied successfully across higher education contexts including pharmacy (Albon & Hubball, 2004; Devine, Daly, Lero, & MacMartin, 2007; Hubball & Pearson, 2010).

For the purposes of this study the particular information collected from the working parts of this case study was framed by the following curriculum dimensions: context, purpose, what is taught (content knowledge), how it is taught (teaching methods), overall design and structure (with attention to coherence), and how learning is demonstrated and judged (through assessment and evaluation).

**Study Setting and Case Context**

The primary settings for this case study were the offices, teaching spaces and meeting places of the George T. Cunningham Building, home of UBC’s Faculty of Pharmaceutical
Sciences for more than 50 years. In addition, the tiered, theatre-style lecture halls in UBC’s Health Sciences Instructional Resources Centre (IRC) where much of the large-class teaching in the BSc(Pharm) program has taken place since the early 1970s were used (Louis & Twaites, 1996). Located on the Vancouver campus of one of Canada’s largest research intensive universities, the Faculty offers, in addition to the BSc(Pharm) program, post-graduate master, doctoral and professional degree programs. Continuing pharmacy professional development rounds out the programs offered. Over 5000 pharmacists, pharmaceutical scientists and advanced clinical practitioners have graduated from the Faculty since it opened in 1946. The Faculty represents one of twelve on the UBC Vancouver campus joining medicine,34 dentistry and nursing amongst health sciences Faculties and Schools. The Faculty has established, maintained and continues to cultivate strong relationships with external provincial and national organizations including health authorities, teaching hospitals, pharmacy regulatory and accreditation bodies, and professional associations and societies (FPS, 2012).35 While both the George T. Cunningham Building and the IRC lecture halls have undergone extensive renovation and modernization they retain the distinct architectural flavor of the eras in which they were built.36

Study Participants, Recruitment and Consent

As of March 28, 2011, the study’s ethics approval date, the volunteer pool comprised

34 The UBC Faculty of Medicine includes 19 academic departments, two schools and 19 research institutes and centres (available at www. http://med.ubc.ca/about/departments-schools-centres/).
35 The governance structure for the Faculty, showing faculty roles and responsibilities, can be found at www.pharmacy.ubc.ca/aboutus/factsfigures. The Faculty comprises the portfolios of Research & Graduate Studies, Academic programs, and Practice Innovation each with an Associate Dean that reports to the Dean. Within the Academic portfolio, Directors oversee Student Services, the Entry-to-Practice program [BSc(Pharm)], the postgraduate Doctor of Pharmacy (PharmD), experiential education (OEE) and continuing pharmacy professional development (CPPD). The Director, Entry-to-Practice program, oversees the development, delivery and enhancement of the BSc(Pharm) program with the assistance of Program Coordinators in Years 1 to 4 and individual faculty course coordinators. Sampling for this study was sensitive to the variety of roles faculty play in the Faculty.
36 Pictures of the George T. Cunningham Building and the IRC lecture halls 2 and 6, where classroom observations took place, can be found at http://www.maps.ubc.ca/PROD/index_detail.php?show=y,n,n,n,y&bldg2Search=n&locat1=625 and http://www.students.ubc.ca/classroomservices/buildings-and-classrooms/?code=WOOD, respectively.
all full-time, part-time and emeritus faculty members in the UBC Faculty of Pharmaceutical Sciences; a roster of approximately 60 individuals. At that time the Faculty employed 34 full-time equivalent faculty members within the five disciplines of pharmacy (pharmaceutical chemistry, pharmacology, pharmaceutics, clinical pharmacy and pharmacy practice). The faculty contingent (both full-time and part-time appointments; approximately 45 members in total) included approximately 70% professorial research-track and 30% instructor teaching-track positions. In addition, approximately 35% of these were basic pharmaceutical scientists (16/45) while 65% held clinical and practice appointments (29/45). The Faculty also maintained a close relationship with emeritus faculty (approximately 15), of which approximately five continue to be active in Faculty and University affairs, and the profession locally, provincially, and nationally. Based on these parameters the initial volunteer pool for the study comprised 50 full-time, part-time and emeritus faculty members from which study participants were selected.

Purposive sampling was used to select study participants from the volunteer pool (Gay, Mills, & Airasian, 2009; Palys & Atchison, 2008). Approximately two-thirds of the volunteer pool was invited to participate in the study with an expectation that approximately half would participate. Selecting a study sample representative of the uniqueness, diversity and complexity of the case as well as one that could proffer in-depth understanding was the primary focus of the purposive selection process. Sampling criteria included sensitivity to administrative status, academic ranks, discipline affiliations, and teaching responsibilities and context. Gender, years of service, practice experience, diversity of opinions and level of involvement in pharmacy affairs locally, provincially and nationally were also included in the sampling criteria. Although the extensive insider knowledge of the researcher was helpful for purposive selection, “critical reflexivity” (Bishop, 2005, p. 113) was practiced to attempt to minimize researcher bias during
sample selection and to maintain focus on learning about the case (Stake, 2010). Based on the purposive sampling criteria and proportional representation, a sample of approximately 25 study participants was anticipated to include nine basic pharmaceutical sciences faculty, 13 members from clinical and pharmacy practice, and three emeritus faculty.

Recruitment of study participants from the volunteer pool began with individualized e-mail and hard copy invitations (Gay, Mills, & Airasian, 2009; Palys & Atchison, 2008). Copies of the study email and hard copy invitations can be found in Appendix A. Email addresses were obtained from Faculty email lists compiled and circulated to faculty members on a regular basis by the Dean’s Office. Hard copy letters of invitation in sealed envelopes were delivered through the Faculty mailroom. Volunteers that responded to the initial study invitation were contacted to set-up an initial information meeting about the study and to address any questions or concerns regarding the study and their potential involvement. The study’s purpose and background, participant roles, data collection procedures (the interview protocol and questions, classroom observation process, and course document analysis to be discussed below were provided at the meeting) and informed consent were discussed at this meeting. While most of the initial meetings took place in the George T. Cunningham Building, some had to be scheduled for alternate locations to meet personal needs and circumstances of the volunteers (particularly for some emeritus faculty and those working in teaching hospitals). The information meetings took approximately 20 minutes. No attempt was made to seek consent at these meetings unless freely offered by the study volunteer and each was encouraged to take the time necessary to decide whether or not to participate. The final decision to participate was the volunteer’s. Those volunteers that agreed to participate were asked to provide written consent and were included in the study unless they chose to withdraw. The letter of consent has been included in Appendix A.
Two copies of the letter of consent were provided to study participants at the initial meeting (one to keep and one to return to the researcher). The signed consent forms were collected, placed in a sealed envelope and stored in a locked cabinet in the researcher’s office in the George T. Cunningham Building. Any faculty member that responded to the study invitation but declined to participate further was thanked at the meeting (if applicable) and in a follow-up email message. Although publicly accessible, for the purposes of this study email addresses were considered confidential information, stored on a password protected and encrypted portable memory device designated for use in this study only, and when not in use, stored along with the consent forms.

To refine sample selection, make adjustments to data collection tools and processes where necessary (e.g., interview questions, interviewing techniques and classroom observation processes) and attempt parsimonious data collection (Lingard & Kennedy, 2010; Merriam, 1998) invitations to participate in this study were sent in three rounds dated June 3, 2011, June 22, 2011 and October 3, 2011 to allow for on-going data analysis and decision making during data collection. In total 31 invitations were sent with 24 faculty agreeing to participate; two basic pharmaceutical scientists and five clinical and practice faculty declined the invitation. One emeritus faculty member later withdrew for health reasons. This data set was not included in the study and there were no further withdrawals. Study sample characteristics, comprising 23 participants, are presented in Table 5.

Data Collection Procedures

To address the purpose of the study and answer the research questions the data to be collected comprised of semi-structured interviews, classroom observations, course documents, a range of historical documents, and research journal entries. All study participants (n=23) took part in the interviews while only those basic pharmaceutical scientists currently teaching in the
<table>
<thead>
<tr>
<th>Discipline Affiliation</th>
<th>Study Participants</th>
<th>Academic Ranks</th>
<th>Average Years of Faculty Experience (high/low)</th>
<th>Faculty with Pharmacy Degrees</th>
<th>Average Years of Practice Experience (high/low)</th>
<th>Faculty Currently Practicing</th>
<th>Previous Undergraduate Teaching Experience in Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicinal chemistry, pharmaceutics, pharmacology</td>
<td>13</td>
<td>Assistant, Associate and Full Professors; Emeritus faculty including senior administration</td>
<td>19.8 (45/4)</td>
<td>8</td>
<td>2.9 (0.5/8)</td>
<td>0</td>
<td>Minimal; mostly graduate teaching assistantships, graduate level lecturing; some associated with previous positions or with faculty appointments at other universities</td>
</tr>
<tr>
<td>Pharmacy practice, clinical pharmacy</td>
<td>10</td>
<td>Lecturers, Instructors, and Senior Instructors; Assistant, Associate and Full Professors including senior administration; Emeritus faculty</td>
<td>15.6 (60/1.5)</td>
<td>10</td>
<td>15.6 (43/2)</td>
<td>5</td>
<td>Minimal; mostly precepting, tutoring, and residency training, some lecturing; some associated with previous positions or with faculty appointments at other universities</td>
</tr>
</tbody>
</table>
program (8) participated in the classroom observation and provided course documents. Described below are the procedures used for data collection.

To answer research question one, historical information specific to the UBC BSc(Pharm) program was required (Gay, Mills, & Airasian, 2009; Kaestle, 1992; Palys & Atchison, 2008). The UBC calendar archive containing calendar entries dating back to the inception of the program in 1946, the historical pharmacy literature pertaining to the UBC Faculty of Pharmaceutical Sciences, and as shown in Table 6, major accreditation and Faculty external review documents were used to situate the current BSc(Pharm) program in historical context. While the UBC calendar archive\(^\text{37}\) and the historical pharmacy education literature were public documents or available through UBC’s Special Archives library, the major Faculty accreditation and external review documents developed for UBC’s BSc(Pharm) program were not. A letter of request was sent March 28, 2011 to the Office of the Associate Dean of Academic Programs in the UBC Faculty of Pharmaceutical Sciences to access documents created between 1990 and 2007 for use in this study. Appendix B provides a copy of the letter of request. Through subsequent verbal agreement, the Faculty’s approved 2012 accreditation document was included as an additional data source for the case study. The products of the historical document analysis, the focus of Chapter 5 of this thesis, included: written summaries for each accreditation and Faculty review document (focused on the curriculum dimensions of interest in this study; 10 summaries in total were generated); curriculum development timelines for the UBC pharmacy program since inception; an historical account of the conceptual orientations towards curriculum evident for the UBC BSc(Pharm) program (with specific emphasis on the role of science and the basic pharmaceutical sciences in each), and; a graphical representation of changes in program enrollment and faculty composition (comparing basic pharmaceutical scientists and clinical and

Table 6: Faculty and curriculum review documents for UBC pharmacy programs

<table>
<thead>
<tr>
<th>Date</th>
<th>Title</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 2012</td>
<td>Faculty of Pharmaceutical Sciences BSc(Pharm) Self Assessment Report for Accreditation (Single digital file; 260 pages)</td>
<td>Prepared for CCAPP accreditation of the BSc(Pharm) program (23 standards reviewed); the Faculty’s fourth accreditation review.</td>
</tr>
<tr>
<td>October 2007</td>
<td>The University of British Columbia Review of the Faculty of Pharmaceutical Sciences (Single binder, 600 pages)</td>
<td>Review of academic strengths and balance of the Faculty in teaching, scholarly activity and service; and to advise on future development</td>
</tr>
<tr>
<td>November 2005</td>
<td>Faculty of Pharmaceutical Sciences BSc(Pharm) Self Assessment Report for Accreditation (Three binders, 600 pages)</td>
<td>Prepared for CCAPP accreditation of the BSc(Pharm) program (25 standards reviewed); the Faculty’s third accreditation review.</td>
</tr>
<tr>
<td>April 2001</td>
<td>Faculty of Pharmaceutical Sciences, New BSc(Pharm) Curriculum Report to CCAPP (Single binder, 100 pages)</td>
<td>Addressing deficiencies in the BSc(Pharm) program as identified in the 1999 CCAPP Accreditation Report</td>
</tr>
<tr>
<td>September 1999</td>
<td>Faculty of Pharmaceutical Sciences BSc(Pharm) Self Assessment Report for Accreditation (Single binder, 300 pages)</td>
<td>Prepared for CCAPP accreditation of the BSc(Pharm) program (25 standards reviewed); the Faculty’s second accreditation review.</td>
</tr>
<tr>
<td>March 1995</td>
<td>The University of British Columbia Review of the Faculty of Pharmaceutical Sciences (Single binder, 400 pages)</td>
<td>Review of academic strengths and balance of the Faculty in teaching, scholarly activity and service; to advise on future developments. Documentation for external review similar to 1994 Accreditation Self Assessment report.</td>
</tr>
<tr>
<td>September 1994</td>
<td>Faculty of Pharmaceutical Sciences BSc(Pharm) Self Assessment Report for Accreditation (Single binder, 400 pages)</td>
<td>Prepared for CCAPP accreditation of the BSc(Pharm) program (24 standards reviewed); the Faculty’s first accreditation review.</td>
</tr>
<tr>
<td>February 1990</td>
<td>The University of British Columbia Review of the Faculty of Pharmaceutical Sciences (17 page document)</td>
<td>Review of academic strengths and balance of the Faculty in teaching, scholarly activity and service; to advise on future developments.</td>
</tr>
<tr>
<td>May 1967</td>
<td>Report of the Pharmacy Planning Commission, Pharmaceutical Association of the Province of British Columbia (138 page document)</td>
<td>Prepared following a comprehensive review of the practice of pharmacy in BC. Review of the BSP degree program was one aspect of the Commission’s Terms of Reference.</td>
</tr>
<tr>
<td>Pre-1946</td>
<td>No formal documents available</td>
<td>Perspectives developed using selected historical literature on pharmacy education in BC prior to the establishment of the first UBC BSP program.</td>
</tr>
</tbody>
</table>
practice-oriented faculty appointments). These historical products were included, along with the interview and classroom observation data collected, in the broader analysis and understanding of the study and the case. The curriculum revision and review documents for UBC’s BSc(Pharm) program were treated as confidential information, stored securely in a locked cabinet when not in use, and returned once the historical analysis was complete. Example written summaries for the 1999 Accreditation Self Study of the BSc(Pharm) program and the 2007 External Review of the Faculty of Pharmaceutical Sciences have been included in Appendix B.

To answer research question two and aspects of question three semi-structured interviews were used to gather perspectives from study participants on the role and status of the basic pharmaceutical sciences in the UBC BSc(Pharm) program as well as their curriculum and pedagogical practices (DiCicco-Bloom & Crabtree, 2006). While most interviews took place in the participant’s office in the George T. Cunningham Building, some had to be scheduled off-campus (particularly for faculty working in teaching hospitals and some emeritus faculty). All faculty members that consented to participate were included in this aspect of the study (n=23). The date, time and place of the interviews were negotiated with study participants and the interview protocol and questions were provided beforehand to encourage prior preparation. The interviews took approximately 60 minutes and were conducted by this researcher. The interviews began with a preamble recapping the study plans and intent, the risks and benefits of participation, and issues related to confidentiality (Merriam, 1998). In addition, an overview of the interview format as well as potential follow-up procedures (i.e., follow-up interviews, member checking activities, and sharing of research findings) was provided. The structured component of the interview involved collecting data related to the purposive selection criteria (see Table 5), courses taught and typical approaches to teaching, learning and course design.
Interviewees were also probed on their decision-making regarding the scope, depth and selection of content included in their courses. The ‘unstructured’ component of the interview, the basis of Chapter 6, included open-ended questions seeking perspectives on the role and status of the basic pharmaceutical sciences in the UBC BSc(Pharm) program and how that has changed. The interview preamble and questions have been included in Appendix B. Attempts were made to follow reflexive approaches to interviewing (Fontana & Frey, 2005) and interviewees were thanked for their participation prior to and after the interviews. Interviews were audio-taped in duplicate using digital recorders (two recording devices were used to provide back-up in case of device failure) and journal notes were generated immediately following the interviews to record general impressions, typical or atypical issues that arose, and suggestions for improvements to the interview questions, techniques and format (Merriam, 1998). Within 24 hours the audio recording of each interview was reviewed to become familiar with the data, clarify the need for follow-up, begin analysis, and help make decisions regarding the next round of invitees. Audio-taped interviews were transcribed by a third party (except one) and reviewed by re-listening to the audio recording, reading the transcript and editing for accuracy (DiCicco & Crabtree, 2006). Time stamps were also added to the transcripts at this point to allow quick access to the original audio data (Merriam, 1998). Interview transcripts were then sent to the participant for review and adjustment to attempt to ensure that the final version was representative of the experiences of both the interviewee and interviewer; aural feedback was received on all transcripts with minor adjustments were made to three. Transcripts along with the audio files were organized for easy access and stored safely prior to broader analysis with the other data sources collected for the study. Twenty three semi-structured interviews were conducted between June 20th and
November 1\textsuperscript{st}, 2011 comprising 22.4 hours of interview recordings and 382 pages of transcription.

To gather additional data on the curriculum and pedagogical practices of the basic pharmaceutical scientists teaching in the UBC BSc(Pharm) program (research question three), direct classroom observations were employed (Gay, Mills, & Airasian, 2009; Lincoln & Guba, 1985; Merriam, 1998; Palys & Atchison, 2008). Course documents were also collected for analysis including course syllabi, lecture hand-outs and typical exam questions. Only those faculty members that self-identified as basic pharmaceutical scientists and consented to participate were included in this aspect of the study (n=8). The classroom observations were conducted by the researcher and attempted to minimize disruption to the natural setting or functioning of the classrooms visited; the researcher assumed the role of passive, non-participant observer (Lingard & Kennedy, 2010). The date and time of the classroom observations were negotiated with the faculty member following review and discussion of the course. Preference was given to observation of specific sections of or modules within courses (i.e., a particular disease state or scientific concept) in order to examine how the participant’s conceptualization of the topic was manifest in the classroom and to experience the “rhythm and flow” (Merriam, 1998, p. 98) of classroom practices. On the specified dates and times students were informed that the observations were taking place using a script read by the faculty member. The naturalistic observations were recorded in field notes using an observation form developed for this purpose and comprised purposeful observations about: the classroom context and setting; the students and faculty member; the interactions and activities that took place; the curriculum dimensions of interest in this study, and; the researcher’s reflections. Since each participant was observed between 2 and 4 times, the researcher sat in different positions around the classroom to attempt
to experience different perspectives on classroom practices. No information about individual students was collected. The script used to inform students about the study and classroom observation form have been included in Appendix B. Debriefing sessions of between 15-40 minutes were held with each faculty member following the observations to discuss issues that arose; these sessions did not involve peer review of classroom practices but were meant to gather participant reflections and clarify observer issues (e.g., self-assessment of classroom practices, clarification of approaches to teaching the science and answering specific questions about the scientific content). Within 24 hours of the observation initial hand-written field notes and journal entries from the debriefing sessions were developed into full digital summaries of the in-class sessions. These provided detailed descriptions of the setting, what took place and the post session reflections; the time required to create the summaries was approximately equal to the in-class time. The classroom observation summaries were then sent to the participant for review and adjustment to attempt to ensure that the final summary was representative of the experiences of both the teacher and researcher. The classroom observations took place over two academic terms (i.e., September – December of the 2010-2011 and January - April of the 2011-2012 academic years, respectively) and a total of 22 hours of lectures were observed and 18 observational summaries generated and member checked. Aural feedback was received on all summaries; minor adjustments were made to four. An example of one of the classroom summaries has been included in Appendix B. Field notes, classroom summaries and course documents were used in the broader analyses of curriculum and pedagogical practices of the basic pharmaceutical scientists and for the development of vignettes of first-hand experiences of their classrooms; these data are presented in Chapter 7. The field notes, classroom summaries and course
documents were organized for easy access and stored safely along with the other data sources collected for the study.

**Data Analysis and Interpretation**

To answer the research questions posed for this study and to develop an in-depth understanding about the case, the constant comparative method was used to varying degrees as appropriate for analyzing, interpreting and making sense of the data sets collected; historic documents, interviews and classroom observations (Lincoln & Guba, 1985; Merriam, 1998; Lingard & Kennedy, 2010). Creating the historical curriculum development timelines used in Chapter 5 for identifying and describing conceptual orientations towards pharmacy curricula involved comparison of the UBC calendar archive entries for UBC pharmacy programs, the historic literature available, and the summaries developed for the Faculty accreditation and review documents. Calendar descriptions for each pharmacy program between 1946 and 2011 (approximately 65) were read and compared to identify curriculum changes from year to year. This analysis often required examining the course offerings in each year to attempt to establish the changing focus of course content and the trending taking place within pharmacy curricula. In parallel, the historical literature and the accreditation and review summaries were read and compared to attempt to verify the archival analyses as well as establish important contextual factors impacting curriculum change. The final composition of the curriculum development timelines showed the curriculum changes below the timeline in enough detail to follow the shifting focus of the pharmacy programs; the contextual changes were included above the timeline. Conceptual orientations towards pharmacy curricula at UBC were identified along these timelines as points where curriculum change stabilized, contextual influences were clear, and a coherent view of the program and curriculum was supported by the historical literature and
the accreditation and review summaries. The specific curricula chosen were then described with attention to: the calendar archive information; the historic literature; the accreditation and review summaries, and; the theoretical framework of curriculum dimensions underpinning the study. To help verify the trustworthiness of the analysis a colleague not involved in the study, independently reviewed some of the calendar archive entries and accreditation and review documents to establish that the historical findings and interpretations were supported.

Interview analyses, an important aspect of the results presented in Chapters 6 and 7, followed a four step constant comparative process (Gay, Mills, & Airasian, 2009; Lincoln & Guba, 1985; Palys & Atchison, 2008). A common word processing program was used for organizing and keeping track of the interview data during the manual analysis process used. Initially the audio recording of each interview was listened to 3 times to become familiar with the interview data. The last listening involved reading the digital transcript at the same time, numbering the lines continuously, clarifying time stamps and highlighting in colour where answers to interview questions began and ended. Memoing in journal notes and on hard copies of the transcripts was also used at this early stage to identify particularly rich and insightful interviews; common words, phrases and potential emerging themes were also identified. Starting with the insightful interviews and then moving randomly through the remainder, the interview analysis involved 3 broad iterative phases each including extensive cycling and recycling through the data. The first phase involved reading the responses to each interview question line-by-line, using open coding to identify important issues and ideas raised, and pooling the coded answers to each question into a separate word processing document; these separate documents included the interview questions along with the coded sections of transcript copied and pasted underneath. The reading and open coding process continued until saturation was reached, in this
study once approximately 85% of the interviews had been read and coded (19/23). The second phase involved grouping similarly coded interview answers together (as an additional subsection within the separate word processing documents) for closer review, further analysis and to identify broader categories and themes. As the most time consuming and intense aspect of the interview analysis process, this stage required “progressive refocusing” (Stake, 1995, p. 22) on coded segments of the interviews and revisiting the raw transcripts as necessary, until stable categories, themes and overall schema (connecting the codes, categories and themes) emerged. Throughout this phase data discrepancies, unique responses, direct quotes, examples and historical perspectives were flagged for possible inclusion in the written summaries of the analysis. While fresh, and connection with the data vivid (Lincoln & Guba, 1985), the final phase of the analysis involved writing the summary of the analysis for inclusion in the relevant chapters. The interviews from all study participants were analyzed in two groups, one for the basic pharmaceutical scientists, the other for clinical and practice faculty. Seven separate documents and analyses were completed in total including: prefacing issues, role, and status for both groups, and; curriculum and pedagogical practices for basic pharmaceutical scientists only.\footnote{Prefacing issues included perspectives on what the basic pharmaceutical sciences are, practice experience, and the future of the profession. Curriculum and pedagogical practices for basic pharmaceutical scientists included analysis of interview questions related to the following curriculum dimensions: what was taught (content scope, depth and selection), how it was taught (teaching methods), course design and assessment practices.} To help verify the trustworthiness of the analysis a colleague who was not involved in the study, independently analyzed and coded some of the interviews to establish that the study findings and interpretations were supported. Appendix B contains an example of the interview analysis process for the question asking basic pharmaceutical scientists about the role of the basic pharmaceutical sciences in the current program. Included are the study code identifiers for the participants and the transcript line numbers used in the analysis.
The vignettes of the first-hand accounts of the classroom visits that appear in Chapter 7 as specific examples of what happens in the classrooms of the basic pharmaceutical scientists were developed using original field notes, member checked classroom summaries and course documents. The process here was similar but much less intensive than the constant comparative analysis described above.

Data Management and Procedural Auditing

The data set for this study was extensive requiring careful labeling and organization for easy access, secure storage and auditing throughout the study (Gay, Mills, & Airasian, 2009; Lincoln & Guba, 1985; Palys & Atchison, 2008). The complete data set for the study included hard copy as well as digital files and included: signed consent forms; written summaries of Faculty accreditation and external reviews; roster and program enrollment analyses; interview audio files and transcripts; classroom observation field notes and summaries; course documents, and; the researcher’s journal notes. For digital files, a series of folders were used to categorize and organize the data according to the five pharmaceutical sciences disciplines (i.e., pharmaceutical chemistry, pharmaceutics, pharmacology, clinical pharmacy and pharmacy practice). Individualized sub-folders within the disciplinary folders were used to compile data for each study participant. For hard copy data a series of binders, organized in a similar fashion, were used. All data included dates, times and the location of collection. Participants were not identified by name on any pieces of data or study documents and a number coding system was used to link folders, sub-folders, study participants and data sets. Digital files were stored on a portable memory device (a memory stick) designated for use in this study only; a second memory device was used to create an independent back-up of all digital study data. The data trail was audited independently by a colleague not involved in the study. Only the researcher had
access to the data set (except during the data audit) and when not in use, all hard copy and digital data were stored securely. Data will be stored for a 5 year period after completion of this study and then destroyed.

**Trustworthiness and Issues of Generalizability**

Designed as a theoretical empirical inquiry using Stake’s (2010) notion of qualitative intrinsic case study, the primary focus of this study was to optimize understanding about the case rather than to generalize, in a statistical sense, from it. As qualitative naturalistic research, specific strategies and processes were incorporated into the study design to establish trustworthiness as a measure of the study’s quality and the overall reliability and validity of its findings (Creswell, 2007). Drawing on the perspectives of Stake (1995) and Lincoln and Guba (1985), Merriam (1998) outlines three criteria to enhance trustworthiness in naturalistic qualitative research. They include credibility, consistency and transferability. Credibility establishes that a study is believable to the “critical reader” and approved by those who provided the information (Merriam, 1995). In this study, credibility was established by employing triangulation of multiple data sources obtained through different research methods including interviews, classroom observations and document analyses (Stake, 1995, 2010). Transcribed interviews and classroom observation summaries were shared with study participants as a form of member checking to attempt to rule out the possibility of misinterpreting the meaning of what the study participants said or did. To establish congruency between the emerging findings and the raw data, a colleague who was not involved in the study, independently analyzed many of the historic documents and coded some of the interviews to establish that the study findings and interpretations were supported. The researcher’s positionality and reflexivity were explained and
exercised in undertaking this study to make explicit dispositions, assumptions and biases that may have influenced the study’s findings.

Consistency is a measure of the rigour of the study design and how competently the data collection and analysis techniques are carried out. Driven by the research questions, what was done, how the research was conducted, and how the study findings and conclusions were arrived at received careful and systematic attention throughout the study (Creswell, 2007; Lincoln & Guba, 1985; Merriam, 1998). To ensure the research process was transparent enough to be understood by others, detailed records of the data collection, coding, and analysis procedures were kept. The same colleague that provided independent analysis of some of the raw data acted as an “independent auditor.” She reviewed the study’s “audit trail” of interviews, observations, and document analyses to verify that these study procedures supported the findings and interpretations.

Transferability or generalizability in qualitative research refers to the applicability of a study’s findings to similar contexts or settings (Lincoln & Guba, 1985; Merriam, 1998; Shulman, 1997; Stake, 1995). While the primary purpose of this study was understanding the current situation regarding the basic pharmaceutical sciences in the UBC BSc(Pharm) program, the results may inform other educators or researchers who are interested in the scientific foundations of pharmacy education and the pedagogical practices of the scientists that teach them. This research approach and findings may also assist researchers conducting naturalistic studies of similar pharmacy programs in Canada, the US and beyond. Two strategies recommended by Merriam (1998) were incorporated in the study design to achieve transferability; purposive sampling and thick description. The purposive selection of a study sample representative of the Faculty roster provided a range of perspectives and opinions about the importance of the basic
pharmaceutical sciences in the current program. The results of the interview, classroom observations and document analyses, including evidence in the form of quotes from interviews, field notes and documents, provided a rich and detailed account of the study, the study setting and the research findings. These two strategies provide the reader with the in-depth information required to judge whether the study’s findings may be relevant to other settings (Creswell, 2007; Lincoln & Guba, 1985; Stake, 1995).

**Ethical Considerations**

Following ethical research practice guidelines to ensure that study participants were treated with respect, dignity and care throughout the study was of paramount importance (Palys & Atchison, 2008). Obtaining informed consent, ensuring that harm or risk to participants was minimized, establishing honesty and trust between researcher and participant, and maintaining confidentiality was part of the study design. To ensure this study met appropriate ethical guidelines application, approval was obtained through UBC’s Behavioral Research Ethics Board. Prior to their involvement, study participants were introduced to the study including what their participation would involve, what risk they may run by being involved in the research and a description of the intent and outcomes of the research. Written informed consent was obtained from all study participants. To protect the confidentiality and privacy of the study participants a number coding system and pseudonyms were used, where necessary, and specific references to their courses and areas of expertise were removed.

**Limitations**

Optimizing understanding about the case was the primary focus of this study. Several limitations related to the study design, the data collected from the working parts of the case, and their analysis and interpretation, have the potential to impact the answers to the research
questions, the quality of the findings and what was learned about the case. Limitations that had
the greatest potential impact are presented below.

The first limitation of this study is related to the role of the researcher as insider and
primary instrument in this research (Merriam, 1998; Stake, 1995). Throughout this research
study decisions were made about the study design, what data to collect and when, what data to
analyze and what to privilege, and what lens to bring to bear on the interpretation. The
mountainous data corpus could support other interpretations besides the one presented here.
Personal bias was inevitable during the conduct of this study exacerbated by the insider status of
the researcher. While awareness of these influences was heightened and reflexivity exercised
throughout, the study’s findings are influenced by the beliefs and experiences of the researcher
as a longtime faculty member, colleague of the study participants, educator, and science lover.
Acknowledging this limitation, the understanding of the case presented endeavoured to be as
congruent with the data collected and as unbiased as possible. Member checking, independent
analyses and data auditing were incorporated into the research design to attempt to address
potential researcher bias.

The second limitation of this study is related to the composition of the study sample
purposively selected to participate in the study (Gay, Mills, & Airasian, 2009; Palys & Atchison,
2008). Although the sampling protocol and selection criteria were carefully developed for
maximum variation within the sample, and the final sample was deemed representative, the voice
of community pharmacy was not as strong as originally anticipated. Despite being invited to
participate in the study through three rounds of invitations, many of the faculty currently
practicing in the community declined to participate. Introducing a potential selection bias
towards those that were interested in the study topic, the characteristics of the final study sample
may have been different from the overall volunteer pool. Whether or not additional community practitioners in the study sample would alter the study findings requires further research.

The third limitation of this study is the lack of easily accessible historical literature available on the profession of pharmacy in BC or the UBC pharmacy programs. Although Faculty and curriculum review documents for UBC pharmacy programs were freely available by request, other relevant historical information and literature about the profession and pharmacy programs was fragmented and difficult to find, particularly prior to 1990. While the UBC calendar archive was an invaluable resource, finding other documents such as the BCPhA Pharmacy Planning Commission (MacPhee, Dyck, Dykeman, & Watson, 1967), information on pharmacy education in the early decades of the 20th century (Moir, 1957; Stewart, 1957), and the BCPhA Pharmacy Act Sale of Poisons Book (BCPhA, 1911) required labourious searching through the Faculty’s currently unorganized historical library or boxes of musty old documents currently stored but uncatalogued, in UBC’s Special Archives section of the Ike Barber Learning Centre. While key documents were found, lack of ready access to historic information made it difficult, but not impossible, to establish historic trends in practice and education, and identify conceptual orientations towards curriculum as part of the case study. Although difficult to infer, additional searching through these documents may have established a more nuanced historical context in which to situate the current program. As a future research project, creating a coherent history of pharmacy education in BC using the copious historic materials available would make a valuable contribution to the current gap in the history literature about the profession and pharmacy education in the province.

Two further limitations of this historical analysis are worth noting. The first is the lag time between the UBC calendar archive entries and when the event or change actually took place
in the program. While this discrepancy may have changed the chronology presented slightly (judging by today’s standards this lag time may be up to a year), it should be noted that this lag time exists and that independent analysis of some of the historical data (calendar archive entries and Faculty accreditation and review documents) helped alleviate some of this incongruency.

The second is more general and related to variable perspectives on how historical research is represented. The history developed here is presented in chronological fashion and as such, is open to postmodern criticism and even rejection, as it could be conceived as “grand explanations that seek to explain all of reality from a singular [modernist or positivist] perspective” (Slattery, 2006, p. 40).

The fourth major limitation of this study is related to the credibility of the interview and classroom observation data collected, analyzed and interpreted. While care was taken during the interviews to create a safe and respectful interaction and interview questions were triangulated to probe key aspects of interest from different angles, the responses from study participants was self-reported during one interview only. Although study participants appeared very engaged and interview transcripts were member checked, the interview data collected represented a construction of reality or a recollection of the truth on that day (Palys & Atchison, 2008). In addition, the skills and abilities of this researcher as a newcomer to qualitative research, interviewing and interpreting interview data had the potential to influence the interview data collected and the corresponding analysis and interpretation (Merriam, 1998). Assuming the study participants were responding “truthfully,” every effort was made during the study to monitor and improve qualitative research skills to minimize these limitations on the case report (Palys & Atchison, 2008).
Similar issues emerged regarding the classroom observation data. While there was congruence between the basic pharmaceutical scientist’s pedagogical practices described during the interviews and what took place in their classrooms, only a small number of classes were observed for each. Even though carefully scheduled to attempt to observe the rhythm and flow of the classrooms and study participants acknowledged the observations as typical of their day-to-day teaching practices, the summaries generated represented a snap shot of classroom practices of the basic pharmaceutical scientists. Following their classroom practices over a longer period of time may have improved the accuracy of the observational data and the depth of understanding about the teaching practices of the basic pharmaceutical scientists and the case. Unfortunately, the timelines and exigencies of the study did not allow this. It should also be noted that both the classroom visits and interviews just described may have been further biased by the Hawthorne Effect which suggests that participant’s behaviour might change when they become engaged in a research study and they do what they believe they are expected to do when participating (Diaper, 1990). While the data does not support claims about the Hawthorne Effect actually occurring in this study, future studies will be mindful of such possibilities.

The fifth major limitation of this study is related to the groupings used for analyzing and interpreting the study data collected and results inferred. Despite representing all disciplines in the Faculty study participants were grouped as basic pharmaceutical scientists or as clinical and practice faculty. These broad groupings do not take into account the specific differences for example, between faculty in the various basic pharmaceutical sciences disciplines (medicinal chemistry, pharmaceutics, pharmacology) or between clinical pharmacy and pharmacy practice faculty. Accounting for these differences may not have changed the study findings but may have produced a more nuanced picture of the case. However, for the purposes of this study the broader groupings of disciplinary experts were felt sufficient to capture the most prominent issues and
diversity of perspectives between them. Exploring these differences through further research would help to build a more detailed understanding of the program and additional suggestions for optimization.

The final limitation of this study is related to the study’s purpose and possible lost opportunities. While the study design and research questions focused primarily on the basic pharmaceutical sciences and the scientists that teach them, a broader, more in-depth understanding of the case would incorporate analysis of the pedagogical practices of clinical and practice faculty for comparison. Although interview transcripts of clinical and practice faculty included an examination of their approaches to teaching and learning this data was not used. In addition, scheduling classroom visits with clinical and practice faculty would provide a valuable opportunity to see if and how the claims generated for the basic pharmaceutical scientists might apply to other faculty and whether or not the understanding about the case would be impacted.
CHAPTER 5: SCOPE AND DEPTH OF THE BASIC PHARMACEUTICAL SCIENCES

This chapter provides the results of the historical document analysis of pharmacy education in BC and at UBC since Confederation. The intent is to answer research question one by examining what has been and what currently is the scope and depth of the basic pharmaceutical sciences in the current UBC BSc(Pharm) program. Chapter 5 also provides context for further examination of the basic pharmaceutical sciences in research questions two and three (Chapters 6 and 7, respectively). The approach to the document analysis was comprehensive to facilitate in-depth learning and thorough understanding about the historical aspects of the case (Stake, 2010). Specifically, the analysis attempted to identify distinctive conceptual orientations towards pharmacy curricula representative of the history of pharmacy education in BC, how the science and the basic pharmaceutical sciences content changed in each, and whether or not these conceptual changes aligned with the broader changes in pharmacy education in Canada as developed in Chapters 2 and 3. In addition, the historic analysis included examination of program enrollment and Faculty roster data to determine if and the extent to which either might be reflective of educational changes taking place. Situating the current program historically was a key aspect of the case study. Using the Faculty and curriculum review documents and summaries generated (Table 6; Appendix B), the UBC calendar archive, and the available historical literature on curriculum development in BC and at UBC, curriculum development timelines were created since inception of the program in 1946. Through meta-analysis of the curriculum development timelines, specific curricula representative of conceptual orientations towards pharmacy curricula at UBC emerged for closer examination and description. Hubball and Burt’s (2004) framework was used to orient the meta-analysis and as with all analytical processes, fine tuning and adjustments were made where necessary but always aligned
closely with the original framework. This responsiveness ensured that analysis was critical, appropriate, and focused at all times. Roster analysis and program enrollment information was used as additional indicators of changing perspectives and emphases. It is hoped that once readers have completed this chapter they have a sense of how pharmacy education and the UBC pharmacy program have changed, how the current program is situated historically, and in particular, how the importance of science and the role and status of the basic pharmaceutical sciences in pharmacy education at UBC have changed.

5.1 Historical Document Analysis

Curriculum Development Timelines

Figures 4-9 provide the curriculum development timelines for the UBC pharmacy program since its inception in 1946. Each timeline contains two types of information. The space above the timeline provides some of the important external and internal contextual factors affecting the profession and development of pharmacy education and curricula at UBC. Included are influences from the federal government, national and provincial pharmacy organizations and regulatory bodies as well as UBC administration and Faculty-level change. Below each timeline information on curriculum change has been included, some minor, others major. Figure 4 for example, provides the curriculum development timeline for pharmacy education in BC from 1944 through 1958. As shown above the timeline, the British Columbia Pharmaceutical Association (BCPhA; the legislated governing and regulatory body for pharmacy in BC since the passing of the province’s first Pharmacy Act in 1891) and the Canadian Conference of Pharmaceutical Faculties (CCPF; established in 1944 as the national association representing academic pharmacy in Canada) were instrumental in establishing a pharmacy program at UBC (in 1945-1946) and developing related national program standards. CCPF national standards for
**Figure 4:** UBC pharmacy curriculum development, 1944-1958

- **BCPhA** lobbying over 30 year period helps establish the UBC pharmacy program; **CCPF** established; 3 year curriculum adopted; 18 months practical training suggested.

- **Faculty status granted**
  - UBC Department of Pharmacy established, Faculty of Arts and Science
  - First Dean: Mr. Eliz Woods
  - Program offered in converted army huts

- **CCPF establishes 3 year BSP curriculum as Canadian standard**
  - First BSP program graduates

- **New Dean**
  - Dr. Whitney Matthews, first PhD graduate from a Canadian pharmacy school, University of Alberta, 1941

- **CCPF establishes 4 year BSP curriculum as Canadian standard; minimum hours approved at 3200**

- Universal health care introduced by federal government

- **Curriculum changes**
  - Latin dropped, pharmacy course numbers change, some course replacements, 10 pharmacy electives offered; veterans and applicants with 12-18 month practical training accepted preferentially; enrollment capped at 50

- **Curriculum changes: BCPhA entrance exam discontinued**

- **Curriculum changes: 12 month practical training could be deferred until after completion of 3 year BSP program**

- **Curriculum changes: BCPhA program fully mature; pharmacognosy increasingly important; 13 pharmacy electives offered**

- **Curriculum changes: 4th year thesis required**
Figure 5: UBC pharmacy curriculum development, 1958-1972

Graduate program established; Master of Science in Pharmacy (MSP) offered; disciplinary structure, affiliation in Faculty emerging.

Universal health care adopted by all provinces

Cunningham Building officially opened

Last admission to 3 year BSP program

1958 - 1959

1960 - 1961

1961 - 1962

1962 - 1963

1963 - 1964

1964 - 1965

1965 - 1966

1966 - 1967

1967 - 1968

1968 - 1969

1969 - 1970

1970 - 1971

1971 - 1972

PEBC established

First MSP graduate

First graduates of 4 year BSP program

ADPC established

CCPF discusses need for modern sciences in BSP program

BCPhA Pharmacy Planning Commission

New Dean
Dr. Bernard Riedel

National PEBC exam in place; voluntary in BC

Canada’s Centennial

Degree name changed to BSc (Pharm). Faculty name changed to “Pharmaceutical Sciences.”

Curriculum changes minor but significant: decreasing emphasis on pharmacognosy, move towards human biology, and consolidation of basic sciences in first year

Curriculum changes: consolidation of modern scientific disciplines; basic and biomedical sciences (biochemistry, microbiology, physiology) in first two years, pharmaceutical sciences in last two years; pharmacognosy eliminated, pharmacology increasing, drug synthesis and testing reduced; in 1971-72 anatomy and pathophysiology added and first experiential course in hospital pharmacy added

Curriculum change: only 4 year BSP available; disciplinary basis of courses introduced [pharmaceutics, pharmaceutical chemistry, pharmacognosy, pharmacology, pharmacy administration], four “Options” for career specialization introduced in fourth year through electives (retail, hospital, industry and government, and graduate studies), graduate thesis required; 1st year science or equivalent required for admittance, one year practical training required to be completed prior to acceptance or after completion of program (program 5 years in total); program focus on drug products and technical training

Curriculum changes: birth of 1+4 program; students enter directly following first year science; human physiology included; practical training reduced to 20 weeks following graduation. Pharmacist’s role changing from product and dispensing to drug use consultant and patient care

Curriculum changes: 52 weeks practical training required; 13 weeks required after program completion

Last graduates of 3 year BSP program

Building research wing opened

Hospital and Radiopharmacy Residencies established

Building Faculty research capacity a priority; PhD trained scientists recruited; PhD program established

Curriculum: 3 year “general course” available; notice of 4 year “optional course” given; pharmacognosy reaching height of importance
Figure 6: UBC pharmacy curriculum development, 1972-1985

AFPC recommends standardized 4 year BSc(Pharm) program
BCPhA and BCMA support provincial prescription labeling legislation; pharmacists could now provide drug information but not therapeutic or medical advice; new role as drug information specialist emerges

Faculty's Dean and Administration moved to UBC's Health Sciences Centre; administration and rest of Faculty separated

BC Drug and Poison Information Centre established at St. Paul's Hospital; Faculty involved in development since 1964

Division of Continuing Pharmacy Education established

Faculty disciplinary Division structure articulated

AFPC focuses on standardization of BSc(Pharm) programs; recommends significant increase in clinical pharmacy and reduction of basic pharmaceutical sciences in curricula, PharmD degree discussed

AFPC begins discussion of accreditation of Canadian BSc(Pharm) programs; PharmD programs discussed at length, post-baccalaureate program recommended

New Dean
Dr. John McNeill

Pharmaca launched in BC

1972-1973
1973-1974
1974-1975
1975-1976
1976-1977
1977-1978
1978-1979
1979-1980
1980-1981
1981-1982
1982-1983
1983-1984
1984-1985

Curriculum changes:
1 + 4 structure unchanged from 1971-1972; practical training requirement of 20 weeks eliminated; no practical training requirement specified; experiential community health elective offered; represented the start of experiential learning built directly into program

Curriculum stable, minor changes only:
Biochemistry 410 switched to Biochemistry 300; Pharmacy 325 name change from pharmaceutical chemistry to pharmaceutical analysis; first aid certificate required for graduation; voluntary 2 week summer clerkship introduced

Curriculum changes significant: 4th year restructured; clinical pharmacy (Pharmacy 401) and experiential clerkships built into curriculum in ambulatory care, institutional care, and drug information (Pharmacy 402, 403, 404); pharmacology strengthened in 3rd and 4th (course names changed and 4th year pharmacology course added; 4th year electives reduced from 13 to 8; the word “interprofessional” begins to emerge in calendar description

Curriculum changes minor but signifying shifting focus: beginning in 1980-81 pharmacology removed from 4th year and added to 2nd year (consolidation in 2nd and 3rd year); experiential clinical clerkship in 4th year reduced [drug information (Pharmacy 404) replaced with lecture-based Topics in Pharmacy Practice (Pharmacy 406)]; pharmacy administration course (Pharmacy 451) added to 4th year
Figure 7: UBC pharmacy curriculum development, 1985-1997

Pharmaceutical Care concept emerges; embraced widely by academic pharmacy
AFPC establishes an Accreditation Council after years of discussion

1985-1986
1986-1987
1987-1988
1988-1989
1989-1990
1990-1991
1991-1992
1992-1993
1993-1994
1994-1995
1995-1996
1996-1997

Curriculum unchanged: revision planning underway using “Retreats” in late 1987, early 1988 and full Faculty meetings in early 1989. Program changes were approved and implemented over several years beginning in 1991

Curriculum changes: pharmacy practice laboratories separated from pharmaceutics courses (Pharmacy 110 and 210); Pharmacy 100 and 200 course stream added, pharmaceutics course numbers changed to Pharmacy 211 and 311

E2P PharmD degree mandated in the US by 2000
CCAPP established; 1 + 4 BSc(Pharm) program established as accreditation standard
BC Seniors Medication Line (BC SMILE) established in the Faculty

Curriculum changes: “Drugs” course added to 4th year (Pharmacy 480); 4th year law, ethics and organizations course eliminated (Pharmacy 456)

New Dean
Dr. Frank Abbott

Curriculum renewal cycle complete: monitoring and evaluation on-going, no further change anticipated

Curriculum changes: “Drugs” courses implemented in 2nd and 3rd year integrating medicinal chemistry, pharmacology, therapeutics (Pharmacy 370, 380, 385 replaced Pharmacy 335, 340, 345); biotechnology course added (Pharmacy 360); pharmacy practice laboratory added to 3rd year (Pharmacy 300) along with self medications course (Pharmacy 301); pharmaceutics course (Pharmacy 310) replaced by pharmacokinetics (Pharmacy 315)

Curriculum adopted with minor changes: Pharmacy 469. Professional Practice Clerkship made compulsory prior to 4th year (4 weeks); clerkships included in program totaled approximately 8 weeks including Pharmacy 402 and 403
Figure 8: UBC pharmacy curriculum development, 1996-2003

AFPC Educational Outcomes published (May 1998)


New Associate Dean, Professional Programs appointed (1998-1999)

AFPC’s “Levels and Ranges” published (March 1999)

CCAPP Standards revised to reflect AFPC outcomes (1998-1999)

NAPRA Mutual Recognition Agreement signed (April 2000)

SPEP Director hired to develop experiential program (1999-2000)

PEBC national OSCE implemented (May 2001)

CCAPP Accreditation Review (November 1999; BSc(Pharm) approval extended to 2001)

CCAPP Accreditation Report (April 2001; approval for BSc(Pharm) granted 2001-2005)

Romanow Report on health care reform published recommending greater role for pharmacists (2001)

Faculty’s Professional Practice Lab upgraded (September 2001)


Curriculum changes: experiential clerkships unchanged (12 weeks total in program); development of enhanced Pharmacy 402 community clerkship (directed studies); preceptor training actively under development (2001-2003)

Curriculum changes: experiential clerkship increased; community clerkship (Pharmacy 402) and institutional clerkship increased by 2 weeks each (12 weeks total in program); preceptor training initiated in 4th year (2002)

Curriculum changes: enhanced clerkships and preceptor training development underway (2002-2003)


New Outcomes-based BSc(Pharm) Curriculum under development (1997-2001)


Curriculum adopted unchanged (1996-1997)
Figure 9: UBC pharmacy curriculum development, 2003-2013

- UBC launches Trek 2010: A Global Journey
- Faculty’s Strategic Plan 2005-2009 developed; new building planned
- First E2P PharmD in Canada (Montreal)
- First graduates of new BSc(Pharm) program
- UBC External Faculty Review
- Faculty’s Office of Educational Support and Development launched
- New building opens
- CCAPP Accreditation approval granted for BSc(Pharm) program

Old Curriculum changes:
- Experiential clerkships increased; community clerkship (Pharmacy 402) increased to 8 weeks, a second 8 week community clerkship (Pharmacy 369) added after second year (20 weeks total in program);
- Year 1 of new BSc(Pharm) curriculum implemented

New curriculum changes:
- Names changed on experiential clerkships (Pharmacy 402 to Pharmacy 479; Pharmacy 403 to Pharmacy 489); 4th year split into two cohorts to make effective use of available practice sites
- New curriculum changes: curriculum stabilizes during this time; Pharmacy 400 (Pharmacy Management) moved from third to fourth year; Pharmacy 454 (Pediatric and Geriatric Therapeutics) included in third year; Pharmacy 460 (Non-prescription and Natural Products) added; in 2009-2010 Physiology 302 (Physiology Laboratory) removed from the program. Curriculum optimization the focus of curriculum change through integration, assessment and evaluation

New curriculum:
- BC Health Professions Act passed
- UBC Launches Place and Promise: A UBC Plan
- Faculty’s Strategic Plan 2012-2017 developed
- New E2P PharmD program planning initiated

AFPC revised educational outcomes published
- CCAPP revised; review of BSc(Pharm) program (November 2012)
- Associate Dean, Practice Innovation established
- New Dean Pro-Tem Dr. Wayne Riggs, new Dean appointed August 1, 2013

CCAPP Accreditation Review of new BSc(Pharm) program (November 2005); approval granted 2006-2012
- NAPRA, PEBC and CCAPP initiates regulation of pharmacy technicians
- Last graduates of old BSc(Pharm) program; White Coat Ceremony implemented
- New Outcomes-based 1 + 4 BSc(Pharm) program implemented September 2003
the 3 and 4 year BSP degree programs were proposed in 1949 and 1956, respectively. In addition, the changes in deanship of the Faculty during this time period (1945, 1951 and 1952) and the introduction of universal health care in Canada by the federal government (in 1957) were key contextual factors impacting pharmacy education during this period. Below the timeline shows the incremental changes in pharmacy curricula during the time period beginning with the BCPhA self-study curriculum available prior to the opening of the first UBC program and ending with a fully mature 3 year BSP degree (1957-1958). While the curriculum development timelines in Figures 4-9 provide a sense of the contextual complexity in which pharmacy education and curricula developed at UBC and the tremendous effort expended regarding curriculum renewal and revision, they will not be described in detail here. Instead the timelines are provided as a visual representation of the extent of historic analysis undertaken to identify specific conceptual orientations towards pharmacy curricula evident in this history and will be drawn on as needed to help guide the historical discussion. Broadly, the UBC pharmacy program has included the 3 year BSP degree (in place for 16 years beginning September 1946 and ending with the last graduating class in 1962), the 4 year BSP degree (for 7 years beginning in September 1961 and graduating its last class in 1968) and the 1 + 4 year BSc(Pharm) degree (in place for the subsequent 45 years). During its 67 year history the UBC pharmacy program has developed under the leadership of 6 Deans (appointed in 1945, 1952, 1967, 1984, 1996, 2002, and most recently, 2013), 2 Acting Deans (appointed in 1951 and 2012) and has graduated over 5000 pharmacists. Specifically, four conceptual orientations toward pharmacy education describe these programs including the empiricist apprentice, pharmacist basic scientist, pharmacist pharmaceutical scientist and the pharmacist clinician curricula. Each will be described next including the historical context influencing their development.\footnote{Readers are encouraged to have ready access to Figures 5 to 13 while reading.}
**The Empiricist Apprentice Curriculum**

Until the availability of the first BSP program at UBC in 1946 apprenticeship training, ranging from 4 to 7 years, was the only form of educating pharmacists in BC and formal education of any kind was limited and unstandardized (Fullerton & Enves, 1951). In larger cities like Vancouver, many practicing pharmacists, as apothecary masters to the apprentice, had completed apprenticeships or graduated from established schools in other jurisdictions (e.g., eastern Canada, eastern US and Britain). For students of means for example, the first school of pharmacy providing formal university-based education was the Philadelphia College of Pharmacy in 1821. By 1905 eighty schools of pharmacy were in operation in the US for those that could afford to attend them (Louis & Twaites, 1996; MacCara, 2012). In Canada, formal education for pharmacists was available at non-university-based programs in Manitoba, Ontario and Quebec as early as 1868 while the first university-based program in Canada was opened in Ontario at the University of Toronto in 1892. These programs were typically completed towards the end of the apprenticeship period and comprised one year of lecture-based course work in the empirically-based sciences of chemistry, pharmacy, materia medica and botany (Raison, 1967).

The roots of formal education for pharmacists in BC can be linked to the passing of province’s first Pharmacy Act in 1891 establishing the BCPhA to oversee and regulate the standards of pharmacy practice and education (Fullerton & Enves, 1951). Drawing from the British model of apprenticeship training and early formal programs in Canada, the original Pharmacy Act included educational standards comprising two courses of lectures in chemistry, pharmacy, and materia medica, and one in botany. Each course was equivalent to 50 lectures and although often unenforced, proof of completion (or equivalent) was required for BCPhA registration and licensure regardless of origin of training. A revised curriculum of formal course
work, published in the BCPhA Poisons Act of 1911 as the Outlines of Studies for Minor and Major Examinations, added the subjects of practical dispensing and practical prescriptions along with a series of supporting textbooks to the existing curriculum\textsuperscript{40} (BCPhA, 1911). Minor and major curricula focused on varying levels of understanding of the same 6 subjects. In terms of educational requirements for licensure, the rank of Certified Apprentice (granted with BCPhA registration, successful completion of a preliminary knowledge exam and the appropriate fee paid) was promotable to Certified Clerk after 2 years of Certified Apprentice experience and successful completion of written and oral minor exams. The rank of Licentiate of Pharmacy (fully qualified pharmacist), obtained after at least 2 years of Certified Clerk experience, required successful completion of both written and oral examination of the major curriculum. Diplomas and certificates for advancement were issued by the BCPhA Board of Examiners. Entirely self-study and voluntary, this curriculum formed the basis of formalized pharmacy education in BC for almost four decades (Louis & Twaites, 1996; Stewart, 1957). Founded on empirically-focused sciences and recommended textbooks, the purpose of this curriculum was to augment one-on-one apprenticeship training with the latest knowledge about drugs and the scientific advances and analytical procedures available for compounding, establishing purity and ensuring safe storage and handling of drugs and medicines (Hurst, 1934; Stewart, 1957). Designed on the finishing school model, the curriculum required extensive reading, much rote memorization and included high stakes examinations. Although private schools\textsuperscript{41}, correspondence courses, refresher courses, summer schools and articles were developed to address BCPhA concerns about the lack of educational standards for apprenticeships in BC, the curriculum for apprentices and clerks preparing for licensure exams remained unchanged (Stewart, 1957). After more than

\textsuperscript{40} Typical textbooks for this pharmacy curriculum, published in the late 1800s, have been listed Footnote 20.

\textsuperscript{41} Private schools in the Vancouver area included the Vancouver School of Pharmacy established in 1914, the BC School of Pharmacy and Science in 1920 and the Western School of Pharmacy in 1920 (Stewart, 1957).
30 years of unsuccessful negotiations with the provincial government and the UBC administration (once formed in 1908) regarding establishment of a pharmacy program at UBC (Moir, 1957), the BCPhA revised the curriculum in 1940 in anticipation of opening a private school offering a compulsory one-year required program for all apprentices and clerks seeking licensure in BC. As shown in Table 7, the first standardized education for pharmacists in the province, conceptualized as the empiricist apprentice curriculum, included the familiar empirical sciences and an updated set of textbooks (BCPhA, 1940).

In August 1945 the UBC Board of Governors and the Senate of the University approved the establishment of a pharmacy program. Influenced by CCPF efforts nationally and existing programs at the University of Alberta and University of Saskatchewan a 3 year BSP degree was offered in September 1946 within the Faculty of Arts and Sciences. Admittance was based on senior matriculation or completion of first year basic sciences (including chemistry, physics, and mathematics) and one full year of apprenticeship (Moir, 1957).

The Pharmacist Basic Scientist Curriculum

Conceptualization of the pharmacist basic scientist curriculum emerged from meta-analysis of the first approximately 25 years of pharmacy curricula offered at UBC. Referring to Figures 4 and 5 this included the 3 and 4 year BSP programs (offered between 1946 and 1968) and the first years of the BSc(Pharm) extending to the early 1970s. While influences of the empiricist apprentice curriculum persist throughout and the basic pharmaceutical sciences (medicinal chemistry, pharmaceutics and pharmacology) become increasingly important in curricula of the mid-1960s and early 1970s, the basic, analytical and physical sciences related to botanical basis of drugs dominate pharmacy curricula during this period. Reaching peak importance in the late 1950s and early 1960s, the 3 year BSP curriculum offered at UBC in 1960
Table 7: The empiricist apprentice curriculum

<table>
<thead>
<tr>
<th>Subject</th>
<th>Curriculum Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>Principles of general, inorganic and organic chemistry including preparations, properties, purification, standards of purity and conformity testing for aliphatic and aromatic substances and drug substances. Elementary stoichiometry was also included (percent composition and molecular formula calculations).</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>Knowledge of metrology (weighing and measuring), heat measurement, proper drug storage of botanical drugs, common laboratory methods (solution, precipitation, filtration, extraction, decantation and sublimation) and poisons.</td>
</tr>
<tr>
<td>Materia Medica</td>
<td>Knowledge of the official drugs listed in the British Pharmacopoeia (official names, source, active constituents, and official preparations), dosage forms (including mode of administration and routes of absorption and elimination), posology (principles of dosing), toxicology (classifying poisons and antidotes), therapeutic definitions, and forensic pharmacy (knowledge of the BC Pharmacy Act and all local and Dominion Laws that affected the practice of pharmacy and sale of poisons and habit forming drugs in BC).</td>
</tr>
<tr>
<td>Botany</td>
<td>Knowledge of the divisions of the vegetable Kingdom and the origin of plant-based drugs (including taxonomies, habitat, structure, nutrition, and reproductive characteristics), and vegetable histology and physiology.</td>
</tr>
<tr>
<td>Practical dispensing</td>
<td>Knowledge required for preparing, labeling, wrapping and dispensing prescriptions from among the following dosage forms: solutions and mixtures, pills, emulsions, capsules, lotions, ointments, pills, powders, plasters and suppositories.</td>
</tr>
<tr>
<td>Practical prescriptions</td>
<td>Knowledge of interpretation of prescriptions, translation from Latin to English, criticism of prescription labeling and British Pharmacopoeia prescription preparation (compounding methods, weights, measures, and dose).</td>
</tr>
</tbody>
</table>

42 Required textbooks for self-study included: Botany: A textbook for colleges by Hill, Overholts and Popp (1936) and Aids to Botany” by H.J. Bonham, B.Sc. (1934); The British Columbia Pharmacopoeia and Addenda (for Materia Medica); “Text Book of Pharmaceutics” by A.O. Bentley (1936) or “Aids to Dispensing” by A.O. Bentley (for dispensing and prescriptions; 1928); The British Pharmacopoeia, “Aids to Chemistry” publishes by Bailliere, Tindal & Cox, and “Smith’s College Chemistry –revised by Kendall (1935 Edition) (BCPhA, 1940).
conceptualizes the pharmacist basic scientist curriculum and is provided in Figure 10. Colour-coding (as specified in the figure key) is meant to delineate content areas in the curriculum while the size of the content blocks is meant to signify relative weighting. Three broad themes inherent in this curriculum become important for making sense of Figure 10 and describing its conceptualization. The first is the dominance of the science content indicated by the green, orange, yellow and blue areas of the figure. Within this scientific core, pharmacognosy, indicated in yellow, represents the central science while the green and orange areas represent the basic chemical, analytical and botanical sciences deemed important for understanding drug identification, isolation, synthesis and analysis processes and procedures involved in the preparation and safe use of drug products. The blue block, pharmacology, provided rudimentary understanding of drug action and toxicity in human systems and the treatment of disease. Of the approximately 50 units of core curriculum course work required to complete this program 37 (75%) were science-based. The second theme evident in this curriculum is the modest attention paid to pharmacy practice. Indicated by the light purple areas of Figure 10, this aspect of the curriculum focused on compounding, dispensing, and drugstore management and ownership (about 25% of the core program). The last theme is practical training (dark purple area). A legacy issue from the empiricist apprentice curriculum and hotly debated provincially and nationally for 15 years in terms of relevance to the BSP trained pharmacist, the pharmacist basic scientist curriculum required 12 months of practical training under the tutelage of a qualified pharmacist (either before or after the program) for licensure (Riedel & Stieb, 2001). Interestingly, practical training was reduced to 20 weeks following graduation in 1968 and eliminated entirely by 1972; a voluntary 2 week summer clerkship was introduced in the mid-1970s for students interested in gaining additional practical experience before licensure (Figures 5 and 6).

43 The focus of pharmacognosy content in the curriculum was still largely empirical, qualitative and descriptive.
Figure 10: The pharmacist basic scientist curriculum (UBC BSP, 1960)

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Before or After</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>Organic Chemistry</td>
<td>Elective</td>
<td>Practical Training (12 months)</td>
</tr>
<tr>
<td>2 Physical Education activities</td>
<td>(included lab)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choice of Zoology Or Physics</td>
<td>Plant Physiology</td>
<td>Plant Biochemistry</td>
<td></td>
</tr>
<tr>
<td>(included lab &amp; tutorial)</td>
<td>(included lab)</td>
<td>(included lab)</td>
<td></td>
</tr>
<tr>
<td>Physical Chemistry</td>
<td>Pharmaceutical</td>
<td>General Pharmacognosy</td>
<td></td>
</tr>
<tr>
<td>(included lab)</td>
<td>Chemistry (included lab)</td>
<td>(included lab)</td>
<td></td>
</tr>
<tr>
<td>Bacteriology</td>
<td>Pharmacy Accounting</td>
<td>Organic Medicinals</td>
<td></td>
</tr>
<tr>
<td>(included lab)</td>
<td>(Commerce Faculty)</td>
<td>(included lab)</td>
<td></td>
</tr>
<tr>
<td>Botanical Basis of Pharmacognosy</td>
<td>Drug Store Retailing</td>
<td>Pharmacology</td>
<td></td>
</tr>
<tr>
<td>(included lab)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Principles of Pharmacy</td>
<td>Pharmacy Law &amp; Ethics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(included lab)</td>
<td>Compounding &amp;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Introduction to Pharmacy</td>
<td>Dispensing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(history, terminology, literature)</td>
<td>(included lab)</td>
<td>Prescriptions</td>
<td></td>
</tr>
<tr>
<td>Metrology</td>
<td></td>
<td>(included lab)</td>
<td></td>
</tr>
</tbody>
</table>

Key

- Basic Sciences
- Botanical Sciences
- Pharmacognosy
- Pharmacy
- Pharmacology
- Pharmacy Practice
- Practical Experience
Legitimized by university affiliation, the pharmacist basic scientist curriculum provided standardized education for pharmacists in BC and signified the rightful place of pharmacy as a health profession within the Canadian health care system (MacPhee et al., 1967). Felt to be state-of-the-art and representative of the world-wide standard for becoming a licensed pharmacist, the qualitative, descriptive and voluntary focus of the empirical apprenticeship curriculum was replaced with modern sciences, experimentation and structured, compulsory courses. Intended to address the explosion of knowledge, technological innovation and medical advances since the turn of the century, the pharmacist basic scientist curriculum embodied the aspirations within the profession, at least academically, to contribute to drug discovery, medical knowledge and the treatment of disease. The Master of Science in Pharmacy (MSP) degree, first offered at UBC in 1960 (Figure 5), was indicative of the growing importance of drug research and development in the persona of the profession, its professionals and the image of pharmacy education. The stated purpose of the program was to prepare graduates for a range of careers associated with pharmacy including industry, government, research, retail establishments and hospitals. In terms of pharmacy practice, the curriculum provided a minimum basic training necessary to provide adequate and safe pharmaceutical service to the public (MacPhee et al., 1967). Although the building blocks approach was emerging, its design and structure lacked clear definition and could be characterized as the purposeful selection and sequencing of courses needed to support the pharmacognosy core and meet the program’s purpose. Approximately half of the curriculum was taught by non-pharmacists in UBC Faculties and Departments other than Pharmacy. Laboratories, required in most courses, and traditional 50 minute lectures represented the predominant teaching methods and in any given week students completed up to 16 hours of laboratories, almost half of the required contact time. Laboratory reports, practical testing and
written midterm and final examinations were prominent strategies for student assessment and evaluation; much memorization was required. While the pharmacist basic scientist curriculum emphasized product chemistry and scientific technical laboratory skill development, for many critics it provided too much education for what pharmacists did in reality (in retail) and not enough of what society needed (drug-use-consultation) (MacPhee et al., 1967).

The profession at this time in BC was at a particularly low ebb that seemed to reflect the increasing disconnect between pharmacy education and the realities of practice. Both provincially and nationally, there was broad recognition of the impacts of industrialization on the role of the pharmacists, particularly in the community setting. Significant reduction in compounding alongside the concurrent growth of prefabricated drug products had affected their function dramatically. As the basis of pharmacy practice for decades, the art and mystery of medications and the craftsmanship in their preparation had largely disappeared. While most pharmacists maintained a high level of professional conduct and community service, amongst practitioners including new graduates, the image of pharmacy was waning. Increasing commercialization within drugstores, poor income for owners, the lack of salary advancement for employee pharmacists, long hours of operation (including night work, holidays and Sundays) and concern that retail pharmacy was being monopolized by big business⁴⁴ was having detrimental effects on professional identity, job satisfaction and the profession’s image. Although pharmacists were well-regarded by physicians, their roles were clearly delineated and the power differential stark. Diagnosis, drug therapy and patient care were the sole responsibility of the physician while pharmacists filled prescriptions. Until 1972 and the passage of prescription labeling legislation, a collaboration between the BCPhA and the British Columbia

⁴⁴ The number of corporate licenses issued in BC had risen steadily from 196 in 1956 to 353 in 1966 (MacPhee et al., 1967).
Medical Association (BCMA) (Figure 6), pharmacists in BC were not allowed to talk to the patient about the prescription, what it was for, or name the drug; their primary role was dispensing and drug distribution. Pharmacists were isolated within the health care system\textsuperscript{45} and were the only health professionals that did not have a direct patient care element. Many pharmacists felt their expertise was underutilized and that they were over-educated for the typical jobs in retail pharmacy (Dove, 2011; MacPhee et al., 1967).

While the sense of discontent and unhappiness amongst pharmacists was growing there was also optimism about the future. Pharmacists were well regarded by the public for their professional status and enjoyed high customer loyalty. Demand for prescriptions, on the rise\textsuperscript{46} with the increasing population and new drug therapies, was coupled with an impending pharmacist shortage due in part to a shortfall in supply of pharmacy graduates from UBC. The role of the pharmacist was also being recast more broadly from a product focus to one of advisor and consultant to the physician on drug therapy (MacPhee et al., 1967) and the demand for hospital pharmacists was increasing steadily\textsuperscript{47}. Curriculum changes over the next 20 years would attempt to address many of these issues as described next.

\textit{The Pharmacist Pharmaceutical Scientist Curriculum}

The pharmacist pharmaceutical scientist curriculum was identified by analysis of the incremental curriculum and contextual changes affecting the 4 year pharmacy programs offered at UBC. The conceptualization of this curriculum is represented in Figure 11 by the 1 + 4 year

\textsuperscript{45} This sense of isolation within the health care system was not the sole responsibility of practicing pharmacists. Both the BCPhA and the UBC Faculty seemed disconnected from the profession and their purpose of educating professionals. The Faculty had drifted away from community practice and faculty members were openly discouraging students from entering community pharmacy. On the other hand, the Faculty appeared to be well-connected within the university, share a close relationship with the BCPhA and to be heavily involved pharmacy governing bodies nationally (MacPhee et al., 1967).

\textsuperscript{46} For the ten year period between 1956 and 1965 the number of prescriptions in Canada had increased by 72%, the total value of prescriptions by 129% and the price per prescription by 33% (Dove, 2011).

\textsuperscript{47} The number of hospital pharmacy licenses issued in BC had tripled from 12 in 1956 to 36 in 1966. Early hospital practice often involved retired pharmacists interested in a secure government position (MacPhee et al., 1967).
Figure 11: The pharmacist pharmaceutical scientist curriculum (UBC BSc(Pharm), 1980)

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electives</td>
<td>Microbiology</td>
<td>Electives</td>
<td>Electives</td>
</tr>
<tr>
<td>(Non-Pharmacy)</td>
<td>(included lab)</td>
<td>(Non-Pharmacy)</td>
<td>(Pharmacy)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Human Pathology</td>
<td></td>
</tr>
<tr>
<td>Practical Writing</td>
<td>Biochemistry</td>
<td>Pharmaceutical Analysis</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(included lab)</td>
<td></td>
</tr>
<tr>
<td>Either* Biology</td>
<td>Pharmacology III</td>
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BSc(Pharm) curriculum offered at UBC in 1980. With roots in the BSP and early 1 + 4 year BSc(Pharm) curricula of the mid-1960s and early 1970s, respectively, the pharmacist pharmaceutical scientist curriculum reached peak importance in the late-1970s and early 1980s (Figure 6) though its legacy extends through to contemporary programs of the mid-2000s to today. While this conceptualization of pharmacy education shares similarities with the pharmacist basic scientist curriculum it has distinct differences. Shifting slowly over 2 decades from plants and products towards human biology and drug therapy, curricula of the pharmacist pharmaceutical scientist replaced pharmacognosy and the botanical sciences with biomedical and the basic pharmaceutical sciences. Inspection of Figure 11 reveals, however, that although the content domains and curriculum focus were revised dramatically during the transition, the continued dominance of science in the education of pharmacists had not. Indicated by the green, orange, yellow and blue areas of Figure 11 the scientific core of the pharmacist pharmaceutical scientist curriculum extended throughout all years of the program with the basic biomedical sciences earlier in the curriculum supporting the development of the basic pharmaceutical sciences towards the end. Over 80% of the core curriculum comprised science-based courses (43% biomedical sciences; 38% basic pharmaceutical sciences). Particularly evident was the centrality of the basic pharmaceutical sciences disciplines of pharmaceutics, medicinal chemistry and pharmacology for understanding the impacts of drug structure and chemistry on product formulation and mechanisms of drug action in human systems. The disciplinary nature of these content areas became deeply rooted in the pharmacist pharmaceutical scientist curriculum and the persona of pharmacy education at that time. Understanding the basic pharmaceutical sciences at the molecular level underpinned the heavy theoretical focus of course content and reflected the traditions and approaches of independent scientific disciplines (FPS, 1995; Louis & Twaites,
1996; Riedel & Stieb, 2001). Pharmacy practice courses, shown towards the end of the curriculum as the light purple areas of Figure 11, received minimal attention although development of compounding and dispensing skills important for community and institutional practice were typically subsumed within pharmaceutics laboratories (a legacy of the practical pharmacy courses of the empiricist apprentice and pharmacist basic scientist curricula). Although the practical experience requirement for licensure in BC was eliminated in 1972, passage of prescription labeling legislation that same year signaled emergence of new clinical roles for pharmacists and opportunities to embed practical training within curricula (FPS, 1995; Dove, 2011). As an integral component of the pharmacist pharmaceutical scientist curriculum, clinical and experiential training is represented by the dark purple segments of Figure 11 and included 4th year practica in community, institutional and drug information settings. It should be noted that even though discussion of treatment and amelioration of disease pervades the historic literature describing this curriculum, like the pharmacist basic scientist curriculum before it, the focus remained on drugs, drug products and technical skills as opposed to patients and drug therapy (FPS, 1995).

The impetus for reform of the pharmacist basic scientist curriculum can be linked, in part, to the BCPhA Pharmacy Planning Commission implemented in 1966 and completed in 1967 (MacPhee et al., 1967). Intended to address the low ebb in the profession in BC at that time, the Commission was charged with inquiring into and reporting back on all aspects of the practice of pharmacy in the province and making recommendations about the future directions for the profession. Curriculum revision focusing on human biology, modern pharmaceutical sciences and disease treatment as well as accommodation of new roles for pharmacists as clinicians and drug use consultants was one of the Commission’s final recommendations. Interestingly, Donald
Brodie from the University of California, San Francisco, School of Pharmacy, one of the earliest and strongest advocates of clinical and advisory roles for pharmacists in health care in the 1960s (Hepler & Strand, 1990; Manasse, 1989), was consulted by the UBC Faculty for their submission to the Commission (MacPhee et al., 1967). Within one year of the Commission’s final report the pharmacist basic scientist curriculum was revamped with reduced emphasis on pharmacognosy and the basic botanical sciences and increased focus on the biomedical sciences, basic pharmaceutical sciences and the introduction of a practical clinical program (Figure 5). The first clinical course offered was a hospital clinical pharmacy elective in 1971 followed, over the next few years, by the establishment of a series of compulsory practica in community, hospital and drug information practice settings. This was a time of resurgence, optimism and rekindled interest in the profession in BC. In addition to educational change, prescription labeling legislation (mentioned earlier) and the implementation of Pharmacare in 1974 addressed many of the issues affecting the profession in the 1960s (Figure 6). In addition to dispensing and drug distribution, pharmacists were encouraged to assume the role of drug information specialists to the public while business benefited significantly as a major demographic in their customer base, senior citizens, received their prescriptions at no cost48 (Dove, 2011; FPS, 1995).

While the work of the Pharmacy Planning Commission signaled the reconceptualization of pharmacy education at UBC, the emergence of clinical pharmacy in the province, and the birth of clinical experiential learning in curricula, the resulting pharmacist pharmaceutical scientist curriculum reified the basic pharmaceutical sciences in the education of pharmacists. As curriculum change stabilized in the decade following the Commission (Figures 5 and 6), the Faculty directed a great deal of attention to development of its research capabilities, graduate

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48 When launched in 1974 the Pharmacare program covered all prescription drugs and those OTC drugs that could only be sold in pharmacies for 250,000 BC seniors over 65 years of age. The government would cover 100% of the prescription cost and paid pharmacists the cost of the drug plus a professional fee (Dove, 2011).
programs and contributions to the scientific community. The dominance of the basic pharmaceutical sciences and the ethos of discipline-based scholarly research and research divisions were strongly reflected in the conceptualization and enactment of the pharmacist pharmaceutical scientist curriculum (Louis & Twaites, 1996). The Faculty’s research capacity grew significantly at this time with the opening of its research wing and the addition of PhD trained basic pharmaceutical scientists to the Faculty roster (see Figure 13), many non-pharmacists. The dean of the Faculty at that time fought strenuously with the UBC administration and the Faculty of Medicine to create a pharmacy-specific pharmacology division within the Faculty to develop the research expertise in this area and teach the pharmacology courses in the program. The stated purpose of the curriculum, like that of the pharmacist basic scientist, was the preparation of students for a range of science-based careers as well as community and hospital pharmacy. The 1 + 4 building blocks design clearly defined the structure of this curriculum and included a pre-pharmacy year of sciences (students entered directly out of high school) followed by a 4 year program of the pattern: basic sciences, basic biomedical sciences, basic pharmaceutical sciences, applied pharmacology, clinical clerkships and electives. Independent autonomous discipline-based courses made up the majority of the curriculum. The first two years of the curriculum were taught by non-pharmacists outside the Faculty with minimum exposure to pharmacy courses or the profession while the last two pharmacy intensive years taught in the Faculty. Year 3 was a particularly challenging year for students as it represented an intense emersion in their professional knowledge; the limited

49 During Dean Riedel’s term, the Faculty roster increased from 13 full-time faculty in 1967 to 33 in 1984. Most new hires were PhD trained basic pharmaceutical scientists. The research wing of the George T. Cunningham Building, home of the Faculty since 1960, opened in 1971. During the same period graduates from pharmacy programs grew from 24 BSP graduates in 1967 to 96 BSc(Pharm) graduates in 1984 (Louis & Twaites, 1996). 50 To have a separate pharmacology division within a Faculty, School or College of Pharmacy in Canada is unusual as most pharmacology research and teaching is provided through Faculties of Medicine (Riedel & Stieb, 2001).
connection to practice of some of the basic pharmaceutical sciences and lack of integration between disciplines made it difficult for many students to see relevance (Albon, 2010; Louis & Twaites, 1996). Laboratories, up to 12 hours per week, and traditional 50 minute lectures were the predominant teaching methods while laboratory reports, practical testing and written midterm and final examinations formed the basis of student assessment and evaluation; teacher-centered approaches to classroom practice were prominent, students were passive participants in the learning process and memorization was a major aspect of student learning. While the pharmacist pharmaceutical scientist curriculum had shifted the content focus of the pharmacist basic scientist curriculum, the move towards patients, drug therapy and new clinical roles for pharmacist was only slight; the curriculum itself continued to reflect the strong scientific perspectives of the scientists responsible for curriculum decision-making. Amongst the biggest criticisms of the pharmacist pharmaceutical scientist curriculum were the fragmentation, isolation and siloing of content areas and autonomous experts along disciplinary lines and the lack of professional socialization (FPS, 1995). In the case of the basic pharmaceutical sciences, irrelevance of much of the science-based content to practice exacerbated the growing disconnect between education and practice. While too slow for some, curriculum revision in subsequent decades would help narrow the divide.

**The Pharmacist Clinician Curriculum**

The conceptualization of the pharmacist clinician curriculum is represented in Figure 12 by the current 1 + 4 year BSc(Pharm) curriculum offered at UBC during the 2010-2011 academic year. This program represents the case in this case study. Evolving over a 30 year period beginning with subtle curriculum changes as early as 1981, the pharmacist clinician curriculum evolved in stages from the dominance of the basic pharmaceutical sciences and a
### Figure 12: The pharmacist clinician curriculum (UBC BSc(Pharm), 2010-2011)

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
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<tr>
<td>Organic Chemistry</td>
<td>Electives</td>
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<td>Electives</td>
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<td>Organic Chem Lab</td>
<td>Biochemistry</td>
<td>Pathophysiology II</td>
<td>Pharmacy Management</td>
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<tr>
<td>Microbiology</td>
<td>Biochemistry</td>
<td>Pathophysiology III</td>
<td>Cases in Pharmaceutical Sciences IV</td>
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<td>Statistics</td>
<td>Pathophysiology I</td>
<td>Drugs and Enzymes</td>
<td>Practicum (Community)</td>
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<td>Anatomy</td>
<td>Pharmacogenomics</td>
<td>Pharmacology III</td>
<td>Practicum (Community)</td>
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<td>Biophysical Pharmacy I</td>
<td>Pharmacokinetics</td>
<td>Pharmacology IV</td>
<td>Practicum (Community)</td>
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<td>Biophysical Pharmacy II</td>
<td>Pharmacology I</td>
<td>Therapeutics III</td>
<td>Practicum (Community)</td>
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<tr>
<td>Physiology</td>
<td>Pharmacology II</td>
<td>Therapeutics IV</td>
<td>Practicum (Community)</td>
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<tr>
<td>Physicochemical Properties of Drugs</td>
<td>Pharmacology Intro</td>
<td>Therapeutics I</td>
<td>Non-Rx Products III</td>
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<td>Pharmacology Intro</td>
<td>Pharmacokinetics</td>
<td>Therapeutics II</td>
<td>Non-Rx Products IV</td>
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<tr>
<td>Pharmacist, Patient, Society</td>
<td>Pharmacology I</td>
<td>Natural Health Products</td>
<td>Practicum (Institutional)</td>
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<td>Pharmacy Practice Lab I</td>
<td>Therapeutics II</td>
<td>Pediatric and Geriatric Drug Therapy</td>
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<td>Cases in Pharmaceutical Sciences I</td>
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**Key**
- Basic Sciences
- Biomedical Sciences
- Medicinal Chemistry
- Pharmaceutics
- Pharmacology
- Pharmacy Practice
- Practical Experience
drugs, drug products and technical skills focus towards clinical pharmacy, pharmacy practice and direct patient care. Significant stepping stones in this transformation resulted from retreats and full curriculum reviews between 1987-1989 and 1997-2001, respectively (Figures 7 and 8). Curriculum changes resulting from the first review were initiated in 1991 with the revised curriculum fully implemented by 1994. Characterized by external review as a reorganization of the previous curriculum with slight movement towards earlier development of clinical skills and fiercely defended by the dean at that time as state-of-the-art, the curriculum maintained the dominant characteristics of the pharmacist pharmaceutical scientist curriculum (FPS, 1990). The biomedical sciences, basic pharmaceutical sciences, and ethos of scientific research and training remained embedded in the curriculum while the revised design added streams of therapeutics and professional practice courses\textsuperscript{51} earlier in the curriculum to existing summer, community and institutional practica, prior to and during Year 4. Years 1 and 2 continued to be taught largely outside the Faculty. The first UBC pharmacy program to be successfully accredited by the newly formed CCAPP national accreditation body\textsuperscript{52} (FPS, 1994), the design and dominant weighting of the scientific core of this “clinically enhanced” pharmacist pharmaceutical scientist curriculum remained intact through the BSc(Pharm) programs of the mid-2000s\textsuperscript{53}. It is important to note that the pharmaceutical care concept emerging at that time (Hepler & Strand, 1990) was to many in the Faculty an “ethereal concept” only and its influence on curriculum conceptualization was

\textsuperscript{51} Articulated by the dean as a major innovation in the revised curriculum, therapeutics content was included in a stream of “Drugs” courses, offered in Years 2 to 4, integrating therapeutics with medicinal chemistry and pharmacology. Professional practice courses were uncoupled from existing pharmaceutics courses and offered as independent courses in Years 1 to 3.

\textsuperscript{52} The 1994 BSc(Pharm) program received accreditation for a 5 year period ending in 1999.

\textsuperscript{53} The last graduates of the clinically enhanced pharmacist pharmaceutical scientist curriculum were in 2006. Although the scientific core of these programs remained stable, the curriculum was continually enhanced with experiential learning opportunities, particularly after 1999 and the hiring of a Structured Practice Experience Program (SPEP) Director. Practica expanded from 8 weeks in 1985 to 20 weeks in 2004. Room for these changes in the curriculum was made by inclusion of a second summer clerkship and reduction in elective requirements for graduation.
minimal; criticisms of this curriculum echoed those of the pharmacist pharmaceutical scientist of the 1980s (FPS, 1990, 1994, 1995).

The second curriculum review, an intensive undertaking between 1997 and 2001 with implementation of a new BSc(Pharm) curriculum in 200354 (Figure 9), conceptualized the pharmacist clinician curriculum. Benefitting from several years of optimization, the recently accredited 2010-2011 BSc(Pharm) curriculum (Figure 12) embodied 3 decades of intense, often painful, self-examination and introspection by the Faculty about its own as well as the profession’s role and significance in addressing the health care challenges in BC and Canada (FPS, 1999, 2001, 2005, 2007). While the seeds of the pharmacist clinician curriculum may have been sown in the 1980s, major contextual influences, particularly after 1995, were instrumental in shaping its conceptualization (Figures 8 and 9). At the national level for example, AFPC deliberations about the profession and pharmacy education had embraced the pharmaceutical care concept and a move towards outcomes-based education in alignment with changes adopted earlier in the decade by US schools of pharmacy; adding to this national dialogue was the requirement that by 2000 the 6 year PharmD program would be the mandatory entry-to-practice qualification in all US schools (Wolf et al., 1993). By the late 1990s AFPC had developed and published two seminal documents to guide the development of pharmacy education and the CCAPP accreditation standards nationally.55 The work of the National Association of Pharmacy Regulatory Authorities (NAPRA), the Pharmacy Examining Board of Canada (PEBC) and the Romanow Report on national health care reform also had a significant impact on educational

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54 At this time two entry-to-practice pharmacy curricula were operating requiring double teaching for faculty. Following the 2005-2006 academic year, the final year of the clinically enhanced pharmacist pharmaceutical scientist curriculum, only the pharmacist clinician curriculum was offered.

55 These influential AFPC documents included the “Educational outcomes for a Baccalaureate Pharmacy Graduate in Canada” and “Development of Levels and Ranges of Educational Outcomes Expected of Baccalaureate Graduates: A Supporting Document to the Educational Outcomes for a Baccalaureate Pharmacy Graduate in Canada” documents published in May 1998 and March 1999, respectively (FPS, 1999, 2001).
reform at that time\textsuperscript{56} (Figure 8). At UBC, significant changes were also taking place under the leadership of Dr. Martha Piper, the university’s 11\textsuperscript{th} President (1997-2006). Her Trek 2000 visioning process engaged the entire campus community in rethinking the university’s role in society and the world. A central aspect of the Trek vision was the importance of teaching, learning and the quality of instruction in the student experience at UBC. The Faculty embraced national level change and the President’s vision creating its first strategic plan in 1997 reasserting its purpose and mission. Among the plan’s 4 goals was the development of an outcomes-based curriculum that emphasized learners (to this point in the Faculty’s history students played only a minor role in issues of curriculum development), learning, and learning-centered approaches to curriculum design and teaching practice. Along with a strong scientific core and increased emphasis on clinical and pharmacy practice, development of active learning strategies in the classroom, more comprehensive approaches to assessment and evaluation at the course and program levels, and “practice ready” graduates emerged as important (FPS, 1999, 2001). While the conception and enactment of the pharmacist clinician curriculum were often out of sync in the decade after implementation in 2003, many subsequent national and local contextual factors such as CCAPP’s regulation of pharmacy technicians, CPhA’s Blueprint for Pharmacy, AFPC’s revised educational outcomes and UBC’s Trek 2010 initiative, helped focus optimization efforts (Figure 9). According to the Faculty accreditation and review documents, the 2010-2011 BSc(Pharm) program not only represented contemporary pharmacy practice and the evolving scopes of practice for pharmacists but personified the Faculty’s growth, maturation

\textsuperscript{56} NAPRA’s Mutual Recognition Agreement was signed in April 2000 by all provinces and territories in Canada allowing pharmacists to practice anywhere in the country (this mobility agreement aligned with the Federal Agreement on Internal Trade that came into effect in 1995); PEBC changed its national comprehensive certification process to include the practical objective structured clinical exam (OSCE) in May 2001 (a similar practical exam had been in use in BC the 1970s; the development of the national OSCE exam drew heavily from the BC experience); the Romanow Report recommended a greater, more prominent role for pharmacists in the Canadian health care system (FPS, 1999, 2001).
and renewed self awareness about the profession’s critical role in health care, the need for comprehensive approaches to curriculum design, implementation, and pedagogical practice, and its critical role in educating pharmacists to address the increasingly complex and ever-changing health care landscape. While the research mandate of the Faculty remained important the educational mission surged. Positioning pharmacists and its graduates as the drug experts on the health care team, revising curricula to reflect a new specialized practical knowledge of medication therapy management, and reaching out beyond the Faculty to reconnect with its social responsibility as a profession and the needs of society were strong messages in the curriculum reform process (FPS, 2005, 2007, 2012).

Reflecting these Faculty perspectives Figure 12 depicts many important characteristics that distinguish the pharmacist clinician curriculum from its predecessors. As shown by the yellow, orange, green and blue areas, the dominance of the scientific core, typical of previous conceptualizations of pharmacy curricula, has been reduced while clinical pharmacy and practice pharmacy, represented by the purple areas, has increased. Clinical and pharmacy practice courses infuse Years 1 to 3 with experiential learning and practica incorporated earlier in the curriculum (including the summers), and becoming the primary focus in Year 4. Within the scientific core of familiar subjects, the biomedical sciences (shown in orange) and the basic pharmaceutical sciences (yellow, green and blue sections) have been reduced and found in Years 1-3 only; the scientific foundations comprise approximately half of the core curriculum down from over 80% in 1980 (25% each of the biomedical and basic pharmaceutical sciences down from approximately 40%; clinical and practice contributions increased from 13% to 50%). Pharmacogenetics was added to the medicinal chemistry stream (Kunzli, Riggs, & Reid, 2012). Amongst other distinguishing features, the stated purpose of the pharmacist clinician curriculum,
Unlike its antecedents, was to train “competent generalist pharmacists” capable of providing pharmaceutical care and medication therapy management to patients across health care settings and developing the self-directed learning skills to adapt to the ever-changing health care environment; references to training students for careers other than pharmacy were largely removed from program descriptions (FPS, 2005, 2007, 2012). Built on a philosophy of pharmaceutical care and nationally-accepted educational outcomes reflective of contemporary pharmacy practice, the program maintained the 1 + 4 building blocks design and the traditional disciplinary knowledge domains but emphasized learning-centered approaches to curriculum design and teaching practice throughout (Hubball & Burt, 2004). To improve curriculum coherence for example, course streams were implemented to facilitate vertical integration of disciplinary knowledge while case-based Cases in Pharmaceutical Sciences (CAPS) courses in each year, encouraged horizontal integration between disciplinary streams. Earlier socialization into the profession was addressed in 2 ways. The proportion of the curriculum taught outside the Faculty by non-pharmacists was limited to the 1st year basic natural and biomedical sciences courses (i.e., anatomy, microbiology, physiology, and organic chemistry; biochemistry was taught in 2nd year) while introduction into the profession included a unique “White Coat” ceremony in Year 1 (implemented in 2005 and attended by family members) in which 1st year students were “cloaked” by dignitaries and professional leaders (Figure 9). In terms of teaching and learning practices, the 50 minute lecture continued to be a principal teaching method although active learning strategies such as case and problem-based learning, participatory workshops, web-based learning, oral presentations, literature evaluation and interprofessional learning opportunities were increasingly employed. Traditional science laboratories were eliminated from the program in 2006 while streams of pharmacy practice laboratories and
experiential courses throughout the program provided extensive pharmacy skills training and both introductory and advanced community and hospital clerkship experiences, respectively. Assessment practices included a variety of formative and summative assessment strategies used to measure cognitive learning, practical skills, problem solving abilities and achievement of program outcomes. In comparison with former curricula, reconceptualization of pharmacy education as the pharmacist clinician curriculum embraced a significant shift away from the centrality of understanding of the basic pharmaceutical sciences as scientific disciplines in their own right towards selective inclusion of these scientific foundations to support understanding of disease, drug therapy decisions and direct patient care. Graduates of the program were no longer considered scientists but as clinicians and practitioners with unique understanding of drugs and expertise in pharmaceutical care and medication therapy management (CPhA, 2013; FPS, 2007, 2012). While conceptually the pharmacist clinician curriculum articulated the Faculty’s optimism about the future of the profession, professional education and its role in each, optimization of this curriculum challenged decades of historical precedent regarding the role and status of the basic pharmaceutical sciences in the education of contemporary pharmacists (FPS, 1995). Key criticisms of the program lay rooted in the past and its inner workings (Stake, 2010) including limited practice exposure, students not being practice ready, fragmented and siloed disciplines and isolated autonomous disciplinary experts, limited integration, content weighted towards the sciences instead of practice, irrelevance of some of the basic pharmaceutical science content, and students being over-educated for the typical jobs in practice, particularly in community pharmacy57 (FPS, 2005, 2007, 2012).

57 The mood in the profession at this time varies depending on the practice and geographic setting. Within urban BC, the pharmacists practicing in institutional settings (hospital practice) are able to practice to scope leading to high levels of job satisfaction. As government employees their mood and satisfaction levels fluctuate with the fiscal realities of governments. Hospital pharmacists represent only about 16% of the approximately 5000 pharmacists
Program Enrollment and Roster Analysis

Providing potential indicators reflective of changing perspectives and emphases within the UBC pharmacy programs and curricula, Figure 13 presents the plots of historic program enrollment and roster information collected from 1946 to 2011. Plot A provides program enrollment along with the changing roster composition over time while Plot B provides an expanded view of roster changes only. Analysis of program enrollment (Plot A) seems to support the findings of the Pharmacy Planning Commission (MacPhee et al., 1967) particularly prior to 1970. Despite program enrollments being capped at 50 to 75 students due to restricted teaching space in the Faculty, between 1950 and the mid-1960s the 3 and 4 year BSP programs did not attract a full contingent of students. Prior to 1950 enrollments exceeded the established cap to accommodate World War II veterans (Louis & Twaites, 1996). Particularly low enrollments in early 1960s corroborates the Commission’s findings regarding reduced interest in pharmacy as a career, low self image within the profession and the predicted pharmacists shortage.

Interestingly, the curriculum changes in the late 1960s sparked by the Commission’s recommendations along with the passing of the prescription labeling legislation in 1972 seems to be associated with as resurgence of interest in the profession. As shown in Plot A, despite an enrollment cap of 75 students, the program enrollment climbed sharply exceeded the cap by the mid-1970s when it was eliminated. Enrollments from that point rose steadily to approximately currently working in BC. In the urban community setting where most pharmacists practice there appears to be significant tension due to economic pressures on chain drug stores brought on by increasing numbers of pharmacies and competition, over-supply of pharmacists for available full-time positions, and loss of employment to cheaper certified pharmacy technicians. Within this practice setting pharmacists continue to focus much of their time on drug dispensing and distribution activities; job satisfaction is variable. Much like the situation in the 1960s community pharmacy is being driven by commercial interests rather than the improvement of health care and many pharmacists are feeling over-educated for the jobs available. The dynamics in rural practice are exacerbated by the difficulty in attracting and retaining qualified practitioners. There is also optimism regarding changing scopes of practice and the potential to move beyond drug distribution activities (College of Pharmacists of British Columbia, 2012; Dore, 2013).
by 2011 the capacity of the teaching facilities in the Faculty; in September 2011, enrollments climbed to 224 accommodated by the opening of the new pharmaceutical sciences building.

In terms of the Faculty roster, Plot B in Figure 13 shows not only the steady growth of faculty members overall since program inception but also how the roster composition changed with curriculum change. Associated with the increasing significance of the basic pharmaceutical sciences, the pharmacist pharmaceutical sciences curriculum and the Faculty’s research mandate, the number of PhD trained basic pharmaceutical scientists rises steadily until the mid-1980s and then begins to fall as the importance of clinical and pharmacy practice in the education of pharmacists builds. Simultaneously the clinical and practice faculty contingent rises steadily from the mid-1960s to accommodate the changes in curricular focus and the emergence of the pharmacist clinician curriculum. In 2005 the number clinical and practice faculty (increasingly PharmD trained) surpassed PhD scientists for the first time in the Faculty’s history. This reflects in part, the changing ethos of the Faculty and the reallocation of resources towards the faculty expertise and credentials necessary to develop, implement and teach the pharmacist clinician curriculum.
Figure 13: Program enrollment data and roster analysis, 1946-2011
CHAPTER 6: ROLE AND STATUS OF THE BASIC PHARMACEUTICAL SCIENCES

Chapter 6 provides the results of interview analyses regarding the role and status of the basic pharmaceutical sciences in UBC’s current BSc(Pharm) program. The intent is to answer research question two as well as continue to build understanding about the case. This chapter also provides further context for examination of the basic pharmaceutical sciences and associated pedagogical practices in research question 3 (Chapter 7). While Chapter 5 helped situate the current BSc(Pharm) program historically and conceptualize it as the pharmacist clinician curriculum, the use of interviews allowed examination of its inner workings (Stake, 2010). The ability to draw on the collective experiences and perspectives of the study participants, most of whom helped create the current program, have taught in it, and continue to be involved in its optimization, provided rich insight and a unique vantage point for informing the study. As key working parts of the case their voices, as scientists, practitioners, scholars and educators, were crucial for exploring the importance of science and the basic pharmaceutical sciences in the program as well as the extent to which the basic pharmaceutical sciences have a place in the knowledge base of the contemporary pharmacist.

The approach to exploring issues of role and status with study participants was purposeful. The semi-structured interviews began by collecting demographics along with viewpoints on issues felt important for prefacing and providing context for the discussions about role and status. Prefacing issues included participant’s perspectives on what the basic pharmaceutical sciences are, practice experience, its impact on teaching practices and whether or not it is required to teach in the program, the future of the profession (CPhA, 2013), and their approaches to teaching and learning. The intent of exploring role and status last was to attempt to build rapport and establish a reflexive, conversational rhythm during the interviews that would
facilitate in-depth discussion of the topics. Where necessary, issues were explored from different angles using different questions to help clarify and triangulate meanings (Mathison, 1988; Stake, 2010). While this added to the complexity of the interview analysis it provided a very rich interview data set for answering the research question, informing the study and learning about the case.

The interview results presented in this chapter are selective. The chapter begins by introducing the study participants including a description of study sample demographics and general impressions of the group. Introductions are followed by a description of their views on the prefacing issues mentioned above. Approaches to teaching and learning will not be discussed here but are the primary focus of Chapter 7. The chapter finishes with the study participant’s perspectives on the role and status of the basic pharmaceutical sciences in the current program. For comparison, the perspectives of basic pharmaceutical scientists and clinical and pharmacy practice faculty have been presented separately. It is hoped that once readers have completed this chapter they will have a sense of who this group of scientists, clinicians and practitioners is, some of their views on the practice-education interplay within the current BSc(Pharm) curriculum, the future of the profession, and in particular, their perspectives on the importance of science and the role and status of the basic pharmaceutical sciences in pharmacy education in the pharmacist clinician curriculum.

6.1 Introducing the Study Participants and Prefacing Role and Status

The purposive sampling procedures employed in this study provided a sample representative of the Faculty and those teaching in and contributing to the optimization of the current BSc(Pharm) program. Review of Table 5 indicates inclusion of approximately 40% of the Faculty roster at the time of the study (23/60), 46% of the initial volunteer pool (23/50), and
all academic disciplines and ranks. The wealth of faculty experience brought to bear on this study spanned 60 years and comprised early, middle and senior career faculty with intimate knowledge of the current BSc(Pharm) program (the pharmacist clinician curriculum) as well as emeritus faculty that added knowledge of the early 3 year BSP (the pharmacist scientist curriculum) and 4 year BSc(Pharm) (the pharmacist pharmaceutical scientist curriculum) programs offered at UBC. Senior administrative ranks were also part of the sample and the insider knowledge of the researcher helped to address selection criteria during purposive sampling. Approximately 80% of study participants (18/23) had earned previous pharmacy degrees and had at least some practice experience. Most basic pharmaceutical scientists with pharmacy degrees had minimal practice experience compared with their clinical and pharmacy practice colleagues and had not practiced in many years. All those that had neither a pharmacy degree nor practice experience (5/23) were basic pharmaceutical scientists. In terms of teaching, most study participants had minimal experience prior to joining the Faculty (Table 5).

The study sample itself was a highly engaged and strong-minded group of people. Made up of renowned scientists, clinicians and educators, each openly shared their views on the future of the profession, what they do in their classrooms, their opinions of the internal dynamics of the current program, and the place of science and the basic pharmaceutical sciences in the education of contemporary pharmacists. It was clear each had and continued to grapple extensively with what the focus of the curriculum should be, how it should and does align with pharmacy practice, and their roles and responsibilities as content experts and educators in the process of curriculum design, delivery and revision. While perspectives differed sharply, the group appeared to thrive in their work, enjoy the people they worked with and share a strong sense of collegiality and cooperation; the passion, commitment, and dedication towards the profession, program
improvement and the possibilities for the future was palpable and inspiring. In terms of participation in this aspect of the study, the group was accommodating, cooperative and a privilege to interview. At the same time a sense of despondency and isolation seemed pervasive regarding the Faculty’s inability to deal with longstanding issues and barriers impacting curriculum reform, many of them political. Frustration about the lack of progress on curriculum revision and optimization was evident in comments like, “we just go round and round at the Faculty. We’re like a broken record. It’s like, what gets done? …we are spinning our wheels and we don’t seem to know how to get beyond ourselves.” There was also praise for this study as a possible way forward: “I applaud your willingness to take on this challenging and fraught sort of an area…I think it’s a very important conversation that we need to have…because this is a way that change can happen.”

**Congruency on What Constitutes the Basic Pharmaceutical Sciences**

Establishing the meaning of the basic pharmaceutical sciences amongst study participants was important for prefacing the interviews. Three interview questions were used to establish the degree of congruence between perspectives: What is your discipline affiliation?, When you hear the phrase “basic pharmaceutical sciences” what disciplines of pharmacy come to mind?, and How do you self-identify in terms of your expertise by completing the statement, “My background is in ______ and my area of specialization is ___________?.” No prompting about traditional views of the disciplines of pharmacy was given and if asked by participants for clarification, none was given.

Based on analysis of participant responses to these questions there was congruence between basic pharmaceutical scientists and clinical and practice faculty regarding the meaning of the basic pharmaceutical sciences. These views also aligned well with those of the researcher
and the historic views of the disciplines of pharmacy as described in Chapters 2 and 3 (Skau, 2007). While there was some variation, over 80% of study participants (19/23) mentioned medicinal chemistry, pharmaceutics, and pharmacology as the main basic pharmaceutical sciences disciplines. Pharmacokinetics, pharmacodynamics, toxicology, and pharmacogenetics were added amongst the basic pharmaceutical sciences by approximately 20% of participants (5/23). One clinician described them this way: “the basic pharmaceutical sciences are anything that is not applied.” Interestingly, to some emeritus faculty educated in the early 3 and 4 year BSP programs at UBC and elsewhere in Canada, the basic pharmaceutical sciences were remembered vividly as the natural sciences of chemistry, biology, pharmacognosy, and physics. Based on this analysis the meaning of the basic pharmaceutical sciences adopted for this study referred to the disciplines of medicinal chemistry, pharmaceutics and pharmacology.

**Pharmacy Practice Experience and Teaching Practices: Emerging Differences**

Practice experience and its impact on thinking about curriculum and teaching practices was another important contextual issue for this study and prefacing the discussions of role and status. Interview questions asking about previous practice experience, strategies for keeping current and the impact of practice experience on their classroom practices were used to explore these issues.

As mentioned previously, most of the basic pharmaceutical scientists (8/13) had pharmacy degrees but had not practiced in years. While they openly acknowledged that they were not in tune with the day to day practice of pharmacy, most felt they were current in terms of the general trends and tensions impacting the profession. Keeping up was facilitated mainly through involvement in the Faculty community and was not a significant aspect of their scholarly activity. Learning vicariously through the experiences of clinical and practice colleagues along
with some reading, attending conferences and involvement in Faculty committees and meetings were important strategies for keeping current. As one basic pharmaceutical scientist put it, clearly I don’t keep current with actual pharmacy practice, but you can’t really hang around a place like this and not be aware of what’s going on in very general terms. I’m surrounded by pharmacy practice people, I talk to them, they’re my friends and colleagues…I think [keeping up is]…a process of osmosis and just keeping my ears open.

In terms of the clinical and practice faculty interviewed, all had practiced before joining the Faculty, many extensively (practice experience averaged 15.6 years in either the community or hospital settings). Half continued to practice either as frontline pharmacists or as clinical consultants and most felt well-connected with the profession and day-to-day practice. Keeping up was a proactive, disciplined aspect of their scholarly activity whether currently practicing or not. In addition to the strategies used by the basic pharmaceutical scientists, giving lectures to external groups and participation in continuing pharmacy education events, extensive reading of practice-related journals, involvement in professional pharmacy organizations, and accessing well-established networks of community and institutional practitioners were identified as important strategies for keeping current.

For basic pharmaceutical scientists, the issue of whether or not a pharmacy degree and practice experience impacted their teaching practices or was necessary to teach in a pharmacy school generated a lot of discussion. To those with the credentials, having both made a difference to their perceptions of themselves as educators and what they did in their classrooms. Previous practice experience, regardless of extent, gave the faculty member a sense of credibility and security that was not apparent for faculty that had not completed a pharmacy degree or practiced. For them, their classrooms reflected their practice experience often including examples and stories from personal experiences and the ability to tailor course materials and content for “what the students need to know.” In the words of one emeritus scientist,
I didn’t ever hide the fact that I practiced because I think students, when they know you’ve actually been there…they regard you in a whole different light. Even though it was many, many years before I would use examples from my practice whenever it applied to the drugs I was teaching. It was very useful.

For those that had neither a pharmacy degree nor practice experience the impact on their teaching practices and self-perception as educators was more pronounced amongst junior scientists whereas senior faculty in the same position had grappled with and resolved the issue during their career:

It’s taken me a long time to sort of come to the understanding that I have now of pharmacy practice…[W]hen I first started, which is a long time ago…I taught [my area]…as a sort of independent science almost…not feeling that it was…particularly necessary for us to have…knowledge of what was happening [in practice]…[W]ith time though…I think it’s become more important to understand what the scope of practice is for pharmacists…and to position the material in a way that makes it more relevant to the students.

Although this issue was of concern to all basic pharmaceutical scientists, amongst those that had not practiced it appeared to have little impact on their ability to teach the fundamental basic pharmaceutical sciences content they were tasked with. While some basic pharmaceutical scientists felt that practice experience was not really necessary “to teach the fundamental science stuff” most had implemented strategies, to varying degrees, to improve connections between their course content and practice (e.g., talking with students and collaborating with practitioners and clinicians to keep course materials current and more aligned with therapeutics and practice).

Regarding whether or not a pharmacy degree and practice experience was necessary to teach the basic pharmaceutical sciences was summarized succinctly in the following comment:

That is a complicated issue, because I think in some cases you don’t necessarily have to be a pharmacist to be teaching at a pharmacy school, but you have to be positioned in the right place, so if you’re teaching some fundamental…knowledge…you don’t need to be a pharmacist, as long as you’re an expert and you know that stuff cold…but in certain areas, pharmacy practice for instance, therapeutics for instance, I think it’s very important that you be a pharmacist.
It was also important to note, as pointed out wisely by an emeritus faculty member, that “being a pharmacist doesn’t make you a good educator….and [does not] ensure you will get good teaching.”

For clinical and pharmacy practice faculty, practice experience was a major contributor to and an essential part of the faculty member’s perceptions of themselves as educators and what they did in their classrooms. Being intimately connected to practice gave these faculty members a strong sense of credibility, security and identity as educators. When asked how their practice experience impacted them as educators and what they did in their classrooms the answer was typically,

the impact is huge, huge, and one of the things every year my students tell me in their evaluations and the informal feedback I receive is they appreciate the “real” piece that I bring to the classroom…it gives it more credibility, you need that credibility when you’re teaching.

To many, having the ability to draw on their practice experiences for real life examples was particularly helpful for adding relevance to the classroom environment and introducing an element of tangible practicality. Regardless of practice setting, their teaching practices attempted to model their practice role, approach to practice, and practice environment; creating reciprocity between practice and their classrooms was an important aspect of the types of classroom experiences they strived to create. Said one clinical pharmacist,

in my course I try to embody my approach to clinical practice. You know, for me to do a job in an ICU critical care ward, you really have to be on top of things. You really have to understand, you think, you have to apply, you really have to stand on your feet and do it right there. This is what I want to instill in the students.

In general, clinical and practice faculty perspectives regarding the impact of practice experience on themselves as educators and their teaching practices were uniformly positive with the
importance of practical knowledge outweighing theoretical understanding. This point was made concisely by a community practitioner,

I think it’s very important to be able to take the concepts that you’re discussing in the classroom and relate it to something in practice. And my experience is that the more you can do that, the more the students connect with it. And the more they see relevance to what you’re talking about. If you can’t relate it to practice, then they see it as somewhat theoretical and they don’t pay a lot of attention.

Practical experience also helped them feel well connected with the challenges in health care generally, those faced by pharmacists specifically, and the relationships of pharmacists with other health professionals.

**Congruency on the Blueprint for Pharmacy and the Future of the Profession**

All study participants were familiar with the Blueprint for Pharmacy and were attuned to its implications for the profession. While there was some disagreement about the wording of the Blueprint’s vision of “optimal drug-therapy outcomes for Canadians through patient-centred care” (CPhA, 2013, p. 6) there was unanimous agreement with the strategic direction advocated. Both basic pharmaceutical scientists and their clinical and practice colleagues felt that the goal of the Blueprint initiative was a good one but achieving it would be challenging. Expressing the need for pharmacists to take on a more prominent role on the health care team, provide more direct patient care and high-level medication management services, and show proactive leadership regarding health care reform, concerns were raised about whether either the profession or pharmacists were ready and able to accept the challenge:

There are major uncertainties about whether pharmacists will be able to achieve what the Blueprint articulates they will be doing, there’s uncertainty in my mind about whether pharmacists, and even the pharmacists of the future want to do the things that the Blueprint says they will be doing, and there’s uncertainty about whether pharmacists…will actually more deeply integrate into care than they already are.
Others felt that while the Blueprint’s vision was laudable it did not translate well into the community pharmacy setting where most pharmacists work and “the reality is that we still have people working as pharmacists counting pills.” The explosion of medical knowledge, the rapid change in medical technology and the increasing complexity of drugs and drug therapy were also cited as conspiring against the transition. While many felt the profession did not have a choice regarding change, others felt pharmacists were at risk of becoming obsolete if they did not embrace the Blueprint’s vision. Regarding the future of the profession one senior scientist put it succinctly, “I think if we don’t get more concerned about individual drug therapy and making sure that outcomes that reach individual patients are optimal, then we’re lost as a profession. It’s pretty much that straightforward in my mind.”

6.2 Faculty Perspectives on Role: Growing Solitudes

At this stage in the interviews study participants were sharing freely and openly. They were clearly engaged in the discussion as evidenced by long impassioned answers during the interviews and passages in the transcripts. Requiring little intervention, probing or further questioning on the part of the researcher, there was an obvious urgency and intention in their words and a distinct sense they wanted to be heard. As the interviewer it felt as though study participants were tapping deeply into their backgrounds, their experiences as faculty members, and their perspectives on the importance of their respective disciplines and content expertise in the knowledge base of pharmacists and the curriculum. Presented below are their perspectives on role. The corresponding views on status are presented later in the chapter. Once again the perspectives of basic pharmaceutical scientists and clinical and pharmacy practice faculty have been separated for comparison. Three broad questions were used to probe the issue of role: What is the role of the basic pharmaceutical sciences in the pharmacy curriculum?, What if we got rid
of them?, and What do you think the knowledge base of the contemporary pharmacist should be?

**Exploring Role With the Basic Pharmaceutical Scientists**

When asked about the role of the basic pharmaceutical sciences in the current curriculum and the education of pharmacists, the response from basic pharmaceutical scientists was consistent and clear. Each was adamant that the basic pharmaceutical sciences formed the scientific foundation of the knowledge base of the pharmacist and were critically important for understanding therapeutics and making informed decisions in practice. While there was acknowledgement that the knowledge base of contemporary pharmacists was changing and that the scientific foundations of pharmacy practice were becoming increasingly applied, the basic pharmaceutical sciences disciplines remained essential to the knowledge base of pharmacists and the core curriculum. Many articulated well-formulated mental schema and models explaining why the basic pharmaceutical sciences were a critical aspect of educating pharmacists as well as how they did and should continue to build and align in the current curriculum to support drug therapy decisions in practice. Although the importance and contribution of each basic pharmaceutical science discipline varied with discipline affiliation, to the basic pharmaceutical scientists generally, the disciplines were almost inseparable and presented as an integrated whole. Knowing how the body works and its impact on drug chemistry, delivery and action were essential for understanding drug behavior in human systems, the proper use of drugs in drug therapy and how to solve drug-related problems encountered in practice. Along with the prerequisite and biomedical sciences, the knowledge base of the contemporary pharmacists was presented as a continuum, transitioning smoothly from the basic and natural sciences to the biomedical sciences to basic pharmaceutical sciences to therapeutics and practice. For the basic
pharmaceutical scientists there was a direct link between theory and practice; between the scientific foundations and decision making in practice. Summarizing the thoughts of many basic pharmaceutical scientists regarding the theory-practice link, a senior scientist stated cogently,

> the basic pharmaceutical sciences should teach the students how to explore…[they] should cause the students to look more deeply into the therapeutics of the drug… make the students more creative in the therapeutic area. The more you understand the fundamentals, and the deeper you can go into the fundamentals, the more creative you can be in the application of those fundamentals.

Interestingly, the underlying assumption that the scientific knowledge base they were describing did support clinical decision making and was being used in practice in the way they envisioned went unquestioned.

When intentionally provoked about whether or not the basic pharmaceutical sciences had a place in the education and curricula of contemporary pharmacists and that some were suggesting they be severely reduced or eliminated entirely, the response from basic pharmaceutical scientists was blunt. Responding emphatically an emeritus professor stated,

> I think it’s wrong-headed. I believe that it would be a disaster because you would have persons who didn’t have the basic skills. They might have some superficial knowledge of the various things, but they wouldn’t have the depth to respond to that unusual patient, and every other patient is unusual.

Adding a touch of sarcasm, a senior scientist echoed,

> I guess if you don’t want pharmacists out there who have the slightest understanding of how drugs get to where they’re supposed to go and what makes a drug stable or not, why is there a shelf life for a drug, why do we care so much about purity… then I would say, “Yeah, sure, throw it out.”

These comments, along with many other more lyrical ones, alluded to commonly held sentiments about this issue. For the basic pharmaceutical scientists the ability of pharmacists to practice was intimately connected to their unique knowledge of drugs. To them the basic pharmaceutical sciences formed the basis of this specialized knowledge and getting rid of them would not only
be a mistake but would seriously undermine the ability of pharmacists to resolve practice-related problems. Many voiced concerns, should this happen, that drugs and drug products would be known in name only, and that drug therapy would be relegated to the notion of a black box in which patient health outcomes would be measured in terms of drug inputs and effectiveness outputs without any knowledge of how and why drugs do what they do in the treatment of human disease. Quoting one mid-career scientist,

if you don’t know how it works, if you don’t know the context in which it works, if you don’t know what the alternatives are and why structures are changed such that you end up with different drugs. If you just go by the name of the drug what have you got but a black box thing.

Some lamented the deemphasizing of scientific knowledge of drugs in the curriculum and wondered who would fill the drug knowledge gap on the health care team if pharmacists didn’t:

I’ve looked at medicine and medicine has gutted their basic medicinal sciences…we have guys writing prescriptions about drugs they do not understand at all, only what they’re supposed to do…I think their fundamental knowledge about drugs and what they do is wrong…we have people in medicine that really don’t understand much chemistry. That’s terrible. And I don’t want pharmacy going that route.

To most, the specialized knowledge of drugs uniquely positioned the pharmacist as the drug expert on the health care team and the basic pharmaceutical sciences, in particular, provided the foundation on which to build understanding about the proper use of drugs. Regarding the curriculum one emeritus faculty member cautioned,

I’m not saying we don’t review the basic sciences on a fairly regular basis because they’re important, but we should never kind of just say, well all [students] need to know is how they should be used and side effects…That’s not enough.

When asked what the knowledge base of the contemporary pharmacist should be most felt the pharmacist would fill the emerging niche as drug expert. In the eyes of the basic pharmaceutical scientists, the pharmacist of the future would have a thorough understanding of science and the basic pharmaceutical sciences, expert-level ability to apply it in practice and
possess the professional skills needed to communicate the science of drugs effectively and efficiently to both patients and physicians. In terms of curriculum junior scientists summed up the sentiments of the basic pharmaceutical scientists concisely,

I think that we are not training pharmacy technicians here who are just dispensing drugs. We are training people who need to be able to think, they need to be able to understand what they’re doing… they really should be able to stand up to the doctor and the patient and say, why this [drug] was chosen or actually make recommendations… and that should be based on science.

*Exploring Role from the Clinical and Practice Faculty Perspective*

Perspectives voiced by clinical and practice faculty regarding the role of the basic pharmaceutical sciences in the current curriculum and the education of pharmacists contrasted those of their basic pharmaceutical scientist colleagues. Whether from community or institutional practice, when asked about role the responses were thoughtful but tepid. It seemed clear however, that most had wrestled extensively with this issue. As evidenced by the high level of engagement, the long pauses needed to collect thoughts, and the paraphrasing required when formulating responses, reconciling the role of the basic pharmaceutical sciences in the current curriculum and the education of pharmacists continued to challenge them as faculty members, content experts and educators.

While all clinical and practice faculty felt the basic pharmaceutical sciences were and should remain part of the foundational knowledge of the pharmacist and the curriculum, most felt their role was a small one. Unlike the basic pharmaceutical scientists, there was no well-developed schema or mental models describing why the basic pharmaceutical sciences were important or how they figured into decision making in practice. Instead, the basic pharmaceutical sciences together with the prerequisite and biomedical sciences were seen as one of many important, and often competing, aspects of the knowledge base and education of practitioners.
To them the basic pharmaceutical sciences were not central to the knowledge base of the pharmacist but did provide important background knowledge about how and why drugs and drug products work as well as a general understanding of the complexities of drug action in human systems. Regarding their importance in day-to-day practice or in decision making about drug therapy both clinical and practice faculty felt they played a very minor function and that the theoretical understanding of drug chemistry, delivery and action as espoused by the basic pharmaceutical scientists did not support or translate well, if at all, into the realities of practice and therapeutic decision making for real patients. Contrary to the views of the basic pharmaceutical scientists there was no direct link between theory and practice and the connection between the scientific foundations and decision making in practice was tangential at best. When questioned about their current understanding of the basic pharmaceutical sciences, several had only vague recollections of what they had learned as students or had forgotten them completely. Pressing them to find instances where they actually used the basic pharmaceutical sciences in practice most struggled. If accessed in practice, pharmacology was seen as most relevant followed by pharmaceutics. Medicinal chemistry seemed to have very little usefulness in any practice setting. Specific examples cited were typically context specific. One pharmacy practice member stated for example,

one thing that does come to mind, physical, chemical properties of things is important in compounding, so [pharmaceutics] probably comes up a little bit…there is [also] crucial elements of that in the selection of a particular product; long acting things vs. injectable, all that kind of stuff makes a difference to drug therapy outcomes, so…the pharmacist needs to understand those if they’re to play a part in decision making about what patients get.

Others found the basic pharmaceutical sciences sometimes useful for solving rare practice-related problems that were not well supported by existing literature or evidence. Asked if the
basic pharmaceutical sciences impacted their practice one mid-career clinician summed up the feelings of many:

You know, it does. It’s not everyday. It’s on occasion when you’re trying to explain things. . . So if you’re making choices that you don’t have a lot of information on, then you go to what you do know. So you keep working your way down. What about the pharmacology of it? What receptor does this bind to?...sometimes you actually work your way down to the structure to explain things.

Of note, those practitioners that had completed science degrees prior to entering pharmacy school or were currently operating conventional science laboratories as part of a clinical research program felt differently:

I cannot see you teaching a student, or any person how a drug works without chemistry, biology, even physics background. You really have to understand science and how it works. I’m a strong advocate there. Some people think I’m nuts though.

When challenged about whether or not the basic pharmaceutical sciences were needed in the education and curricula of contemporary pharmacists, the response from faculty practitioners was measured. While most felt they did and could practice with limited knowledge of the basic pharmaceutical sciences they stopped short of recommending their removal from the program.

To the clinical and practice faculty knowledge of the basic pharmaceutical sciences helped distinguish pharmacists amongst health professionals but in the current program was disconnected from the realities of drug therapy decisions and treating disease in real patients. Despite the assertions of basic pharmaceutical scientists, practitioners felt that drug therapy was fraught with uncertainty regardless of the level of scientific understanding brought to bear on treatment options. Instead, working with real patients was still very much a black box situation and knowing the scientific basis of how and why drugs and drug products work was not nearly as important as knowing if they worked as judged by the available clinical evidence. Stated a clinical pharmacist,
the scientific landscape is absolutely littered with clinical trials that were based on an awesome concept of how this drug works mechanistically and it had absolutely no beneficial effect in reality, and/or caused a net harm, so I caution our students, “Whenever you fall back on a mechanistic explanation or rational, meaning a pharmacology based rational you’re in trouble.” It might be better to do nothing, than to do something based on that.

Guided by the realities of practice, their views about curriculum reflected this perspective. To many the strong emphasis on the basic pharmaceutical sciences in the program could be deemphasized significantly in favour of therapeutic skills building without degrading the clinical and practice decision making ability of the pharmacist. In addition, the science that did remain should be honed to a subset of theoretical knowledge for understanding in more general terms how and why drugs and drug products work and the complexities of drug action in patients.

Using a specific example to illustrate this point a seasoned clinician stressed,

it’s enough to know that an ace inhibitor can lower your blood pressure and reduce your glomerular filtration rate by blocking angiotensin II production because angiotensin II does these five things, and blocking it’s production therefore should cause the following physiologic effects. That’s enough. And that’s as much therapeutic reasoning as goes into my practice and physicians’ decision making about this sort of thing.

In stark contrast to the perspectives of the basic pharmaceutical scientists, when asked how much of the basic pharmaceutical sciences are needed in the curriculum another clinician echoed, “I suspect we don’t need much more than what our colleagues in medicine get, which is, as I understand it, not very much.” Interestingly, most clinical and practice faculty did not seem aware of how or if their own scientific backgrounds as pharmacy graduates factored into the practice decisions they did make and few questioned whether relearning the basic pharmaceutical sciences would improve their effectiveness as practitioners. Reflecting on this very issue one basic pharmaceutical scientist speculated,

I think our clinical scientists and clinicians don’t even know that they’re using basic science all the time because it’s encoded in their DNA. When making therapeutic
decisions, it’s so buried, embedded, that they don’t even realize that they’re using it on a day-to-day basis.

When asked what the knowledge base of the contemporary pharmacist should be most felt the pharmacist would fill the emerging niche as drug therapy expert. In the eyes of the clinical and practice faculty, the pharmacist of the future would have some understanding of science and the basic pharmaceutical sciences, expert-level knowledge and ability to apply clinical evidence to therapeutic decision-making, and possess a broad range of professional skills needed to participate as integral members of health care teams and manage drug therapy for patients. In terms of the focus of the curriculum and the types of graduates the program should be producing one faculty practitioner summed up the sentiments of the clinical and practice faculty well:

My feeling is we haven’t got it right yet. And by getting it right, I mean we should be turning people out of here who are excited about pharmacy, who can go out and truly make a difference for patient care and build relationships with physicians. I’d like our graduates to be individuals that physicians want to associate with. And you know, the reality is that very few of our graduates are at that level yet. So, I think there’s a lot of work to be done. And it could be exciting work.

With the realities of the current workplace in mind, this sense of optimism shared by many practitioners was tempered by the need to move cautiously on curriculum reforms emphasizing practice over science:

I think we’d be doing a huge disservice to our students if we didn’t prepare them, at least in part, for the existing work place, because that Blueprint vision is well beyond a lot of the existing workplaces, and so we need to be careful. We’re already over-educating our students hugely for the job market that they enter often, and we could do an even more extreme job of that by losing some of that [science] stuff.

6.3 Faculty Perspectives on Status: Recognition and Convergence

The issue of status of the basic pharmaceutical sciences in the current program seemed to hit a nerve with study participants. While initial open-ended interview questions were intended to
gather general perspectives on the topic, the interviews quickly turned to curriculum critique and the politics of curriculum change. Asking interviewees to make judgments about the importance of the basic pharmaceutical sciences in the program seemed to trigger the response. Allowed to develop reflexively during the interviews, these conversational threads opened cracks in the otherwise collegial and cohesive persona of the study group exposing some of the underbelly of the case. Along with valuable insights into faculty perspectives and frustrations regarding the current curriculum, long held tensions emerged providing an opportunity to explore some of the internal case dynamics impacting curriculum design, emphasis and reform. It was at this point during the interviews that the sense of despondency and isolation mentioned at the beginning of this chapter began to surface. Based on initial responses, protocols for subsequent interviews were revised to allow greater attention on these issues. The subsequent questions and probes used to explore status focused on gathering general perspectives on the issue including value judgments about the current level of importance afforded the basic pharmaceutical sciences in the program, identifying supporting evidence and indicators of current status and whether or not it had changed over time, and finding strategies for addressing tensions that emerged regarding in particular, how much of the basic pharmaceutical sciences should be included in the curriculum.

**Status and the basic pharmaceutical scientists**

When study participants of all discipline affiliations were asked about the status of the basic pharmaceutical sciences in the current program the typical response was, “that depends on who you ask.” Amongst basic pharmaceutical scientists for example, the basic pharmaceutical sciences played a key role in the education of a well-trained pharmacist (reiterating perspectives voiced earlier) and were felt to be highly valued within the curriculum and broadly supported by
the faculty community. As renowned researchers and content experts in their fields most
considered the number of basic pharmaceutical sciences courses in the program as well as the
high proportion of distinguished professorial scientists teaching those courses to be evidence of
importance and status. Recent and impending faculty hires into their disciplines were also cited
as important indicators of the value the Faculty placed on the basic pharmaceutical sciences to
address teaching and research mandates (see Figure 13 for modest roster changes following
implementation of the current program in 2003). However, beyond the basic pharmaceutical
scientist’s own opinions about the value and status of the basic pharmaceutical sciences in the
program very little additional corroborating evidence was provided to support their claims. To
them, the importance of the basic pharmaceutical sciences in the program seemed almost
unquestionable and went largely unquestioned. As one emeritus scientist stated, “science and the
basic pharmaceutical sciences have always had a role in the education of pharmacists and
curriculum…it should continue that way.” At the same time the basic pharmaceutical scientists
were keenly aware of the reduced overall weighting of the basic pharmaceutical sciences in the
current program due to recent curriculum reforms and openly acknowledged the need for these
revisions. In light of practice, health care and technological change most felt the recent reforms
had helped modernize the basic pharmaceutical sciences and transition them from the isolated,
stand-alone disciplines of the past to the contextualized, more applied focus of today; these
curriculum changes were not perceived as a loss of status. When asked how much of the basic
pharmaceutical sciences should be included in the program most could not provide a clear
answer to this question but appeared comfortable with current emphases and felt they should not
be reduced further. While the majority of basic pharmaceutical scientists had apparently accepted
these changes and had adapted, some were more resolute and resistant continuing to complain of
the devaluing of the sciences in the program. Said one scientist, “we are not a BCIT, we’re not a technical school…as long as this stays a Bachelor of Science degree, I think we should be teaching some science. In fact, we under-teach science in this program in my opinion.”

Probing further by deliberately asking basic pharmaceutical scientists if they had discussed the basic pharmaceutical sciences with other faculty, particularly their clinical and practice colleagues, and whether or not they had heard anything from students, generated a lot of animated discussion and insight into their perspectives on the current curriculum. Exposing many long-held tensions, most seemed keenly aware of and sensitive to criticisms of the basic pharmaceutical science courses from clinical and practice faculty as well as students. Based largely on what seemed to be unsubstantiated rather than definitive evidence (other than the occasional mention of teaching evaluations) the criticisms they spoke of were focused on placement in the curriculum and relevance to practice. In terms of student concerns most had heard them and were resigned to a perceived hierarchy of importance set by students. Although annoyed at having to “justify” to students what they did in their courses one basic scientist summed up these perceptions clearly,

I know that the students classify their courses in terms of importance, right? So in their minds therapeutics beats out everything, but it’s not far above pharmacology. They see the value of pharmacokinetics, and the rest is this sort of big, amorphous lump underneath, so I know that’s how the students perceive and stratify importance. It’s a fact of life, right?

Asked where pharmaceutics and medicinal chemistry might fit in the student’s hierarchy, the same professor laughed, “down in the dungeon probably.” While most basic pharmaceutical scientists acknowledged this hierarchy amongst the student’s perceptions and agreed with it reluctantly, of these last two, medicinal chemistry seemed particularly isolated within the curriculum; an issue clearly frustrating its teachers. Directly attributed to discipline-based design
issues associated with the last curriculum reform many felt it had developed a reputation as a stand-alone course and though important, was being increasingly devalued by scientists, practitioners and students. One scientist stated the issue clearly,

the one that’s taken the hardest hit…is med chem…it’s actually gotten so compartmentalized out of the mainstream of the program, just because of the way the current curriculum topics are ordered…it’s out of order so by the time students are getting to it…they can’t quite see what the relevance is.

Perceived criticisms from clinical and practice faculty challenging the relevance of the basic pharmaceutical sciences in the curriculum raised deeper concerns for basic pharmaceutical scientists. Associated with isolation and a lack of meaningful communication between the scientific disciplines, its disciplinary experts and an inability to work towards broader integration with the practice disciplines and practice faculty, many spoke passionately about the lack of clear vision about what the program should be producing, what the knowledge base and skill set of its graduates should be, the difficulties of curriculum change in an autonomy-based university system, and the detrimental effects of the disciplinary “turf wars” of the past. Among the many issues raised by basic pharmaceutical scientists the science-practice divide was particularly emotive. While some felt clinical and practice faculty did not appreciate or respect the basic pharmaceutical sciences and its contribution to practice others felt simply that faculty practitioners “didn’t care. It didn’t matter to them. It wasn’t important.” Articulating the situation well one scientist described her perspectives this way:

Where basic sciences sit is very polarized in this Faculty. There are people that find it extremely important and they’re people who find it completely unimportant, that the things that directly relate to practice are the most important aspects or the only thing that matters…And, it’s really unfortunate because I think this place would provide a much better set of deliverables if, instead of having a tug of war, we actually worked together, and we’re tugging in the same direction.
Recognizing that “we have a tendency to kind of stick with what we’re familiar with” there were strong sentiments amongst basic pharmaceutical scientists that the Faculty dynamics of the past had to change. Calls for “taking a hard look at what we do,” creating a “blueprint for knowledge,” “letting go” of engrained disciplines and “reverse engineering” the curriculum starting with practice were some of the many suggestions for moving forward. Regarding relevance and the need to bridge science and practice in the Faculty and within the curriculum one scientist seemed to sum up the emotional spirit of this discussion well:

I think every discipline needs to look at how it integrates with the others in a more objective way,... I think we should all be able to really...critically say, what are those building blocks that are just strictly essential to the students... so that they can truly say that they know fundamentally what they’re giving to patients,... I think if we value that, then I think that the next lens through which we translate that, is relevance. I really do...And I don’t give a [hoot] if the material illustrates principles if nobody uses them anymore, come on, do you mean to tell me you’re not creative enough to build those principles based on relevance to what is needed in practice? So that’s the kind of lens I’m talking about, and I don’t think I can articulate it any more clearly than that.

At the heart of these discussions seemed to be the need and desire to get together to talk seriously about curriculum, to find the balance between science and practice and how to integrate them effectively. Even if it meant “gang wars” or “starting fresh” possibly with a 2 + 4 PharmD model, moving away from individual disciplines and towards interdisciplinary teams was suggested as a way to start the discussions. Stated succinctly by one scientist,

I think that what has to happen is we’ve got to get everybody in a room and start to have those discussions, and I think we have started to do that...I think more importantly we need to educate each other about why this is important to everybody, and also educate the different constituencies how everybody actually wins.

Many also felt that navigating these curriculum changes would not only take strong leadership but a particular kind of leadership that included both an intimate knowledge of curriculum history and the people involved:
One thing’s for sure whoever’s going to drive the next state in this curriculum has to be someone with a lot of seniority around here, and who knows the people and what we’ve done, and how we’ve done it. Leadership is going to be the most important thing.

Interestingly, even though progress was variable, all basic pharmaceutical scientists had taken conscious steps of some kind within their disciplines to address these concerns. For many this included collaboration with clinical and practice faculty.

**Status and the Clinical and Practice Faculty**

Exploring the issue of status with clinical and practice faculty seemed to have a different feel. While equally intense and emotive as the discussions with their basic pharmaceutical scientist colleagues, the overall tone appeared less defensive. While this may have had more to do with the study design and the specific focus on the basic pharmaceutical sciences, there was a quiet confidence amongst clinical and practice faculty that was less evident amongst basic pharmaceutical scientists. The interviews and transcripts contained less evidence of self-reflection about the relevance of their course content and more confidence that their classroom practices were aligned with practice and the changes advocated for contemporary pharmacy education. Based on their own descriptions as presented earlier in this chapter they appeared to feel little need to justify the contributions they were making to the curriculum and the program. At the same time, there was a greater sense of urgency regarding the need for curriculum change.

Perhaps not surprisingly, clinical and practice faculty offered differing perspectives to their scientist colleagues on status of the basic pharmaceutical sciences in the current program. Based on similar evidence most agreed with the basic pharmaceutical scientists that the basic pharmaceutical sciences received high status and strong representation in the program but questioned their role in the education of contemporary pharmacists (reiterating perspectives described previously). While respectful of the current contributions of basic pharmaceutical
scientists as well as their status as distinguished professors, most clinical and practice faculty felt the theoretical focus and time devoted to the basic pharmaceutical sciences in the program was excessive, misaligned with practice and out of kilter with preparing “practice-ready” graduates. Contrary to the perspectives of the basic pharmaceutical scientists, the value and relevance of the basic pharmaceutical sciences in the program was questionable and required serious reexamination. When asked how much of the basic pharmaceutical sciences should be included in the program, like their scientist colleagues, most could not provide a clear answer to this question but many wondered why topics like pharmacology and pharmacogenomics received more attention than the therapeutics knowledge and skills critical for practice. Stated one faculty practitioner succinctly, “when everything we do is about optimal drug outcomes…we clearly don’t have enough of therapeutics in our curriculum. How did that happen?” For many clinical and practice faculty the excessive weighting of the basic pharmaceutical sciences in the current program, a result of the last curriculum review, was directly related to and reflective of the status of the basic pharmaceutical scientists as professors, renowned experts and members of the traditional power base in the Faculty. To them, the influence over curriculum decisions afforded basic pharmaceutical scientists by virtue of their academic status directly affected the composition and focus of the curriculum. Exacerbating the issue was a lack of professorial ranked clinicians and practice faculty amongst the power base (comprised largely of non-practitioners), the limited influence lower ranked clinical and practice faculty felt they had in curriculum decisions, the inherent conflict between research and teaching mandates of the professorial scientists, and the competing interests of the Faculty. Articulating the issue well one faculty practitioner summed up the sentiments of many:
It’s complex but my sense of it, having observed the functioning of our Faculty for [many] years, is that decision making is not centered in people who are practitioners…decision makers who are not practitioners are not incentivized by people below them and there’s no pressure being put upon them by other faculty members, because there’s not a critical mass of practitioners at that level when curriculum decisions are being made. I also think the competing priorities of being a Faculty significantly undermine our willingness and ability to retool and give appropriate weight to training excellent practitioners, by that I mean the way the university is structured in terms of what people get praised for is completely and utterly divorced from the mission of training practitioners.

Deliberately asking clinical and practice faculty if they had discussed the basic pharmaceutical sciences with other faculty including basic pharmaceutical scientists, and whether or not they had heard anything from students, generated some additional perspectives on status and the focus and organization of the current curriculum. Citing hearsay rather than specific evidence many of the issues raised by clinical and practice faculty echoed those of the basic pharmaceutical scientists described earlier. In terms of student feedback many had heard “general grumblings” from students about the basic pharmaceutical sciences, iterations of “Why do I need to know this?, Am I ever going to use it?” type questions and the pharmacology-pharmaceutics-medicinal chemistry hierarchy of importance. Interestingly, medicinal chemistry including pharmacogenomics, was cited repeatedly as being “out of step” with the rest of the curriculum and the focus of much student criticism. Others felt the level of status and importance proffered by students regarding the basic pharmaceutical sciences “may not be so much on the content as on the person teaching it, and the person’s willingness to make a connection to practice.” In this regard, many spoke of specific faculty members that teach the basic pharmaceutical sciences yet are rated by students as top teachers in the Faculty’s for their ability to help make theoretical content accessible and relevant to practice.
With respect to what clinical and practice faculty were hearing from their colleagues about the status of the basic pharmaceutical sciences in the program (there was no indication that they discussed these issues with their scientist colleagues), the issues raised touched on many of the tensions and internal dynamics voiced by the basic pharmaceutical scientists. While no one recommended removing the basic pharmaceutical sciences completely from the program, the lack of clear vision about what the program should be producing, what the knowledge base and skill set of its graduates should be, disciplinary isolation, and lack of meaningful interdisciplinary dialogue were among some of the factors impeding more realistic weighting, meaningful integration and broader acceptance of the basic pharmaceutical sciences in the program. The comment, “[a]cross my therapeutics colleagues, we speak the same language. Across that other continuum, we don’t speak the same language at all” was offered by a faculty practitioner to illustrate the extent of the current divide between science and practice and the magnitude of the challenge required to address the gap. There was also a perception among some that the basic pharmaceutical scientists were out of touch with the changes in education and practice, and particularly resistance to change. Articulating this common sentiment along with sensitivities witnessed, one faculty practitioner stated,

the importance of the pharmaceutical sciences in relation to what has been the traditional curriculum is changing. And its relative importance is not as great as it was at one time. And some people have a big problem with that…you know, everybody needs to change with the times and make themselves much more relevant. So, I think that if the basic pharmaceutical sciences could, by working together with all of the faculty, demonstrate the relevance of that information, then I think that would be a big improvement. So it’s declining and I can see people are upset about that.

While much of this discussion seemed laced with a sense of futility, like their basic scientist colleagues there was also an emergent sense that “things had to change, we need to do things differently.” In terms of possible suggestions for moving forward many felt that despite
recent hires in clinical and pharmacy practice (see Figure 13 for significant roster changes following implementation of the current program in 2003) that a stronger voice from clinical and pharmacy practice was necessary in curriculum discussions, setting up electives and honours degrees for those interested in greater exposure to the basic pharmaceutical sciences, and the notion of “reverse engineering” the curriculum were suggested. In addition, the use of collaborative, interdisciplinary groups instead of the isolated discipline-based discussions of the past was recognized as critical for future curriculum deliberation and decision-making. Realizing the “personality clashes,” “negotiations” and “compromise” inherent in this path, some were skeptical that the Faculty had the vision, leadership or will to set the priorities needed to make the tough decisions:

If something’s a priority,…the way you’ll know it is a priority is you are able to name the things that have to die as a result of you accomplishing that thing. If you are unable to name those things, then it’s no more of a priority then all the other things you’ve got swirling around going on that you need to do. If someone wants to say, “We’re going to cut med-chem out of the curriculum, as controversial, horrible, or even ill advised as that might be, at least that would be able to say, “We have a priority, and here are some things that are going to die as a result.” Nothing has died [in the program] in 15 years. Nothing.

Others suggested “[w]e need a leader to take us down that path, and just be committed to it, realizing they’re going to get a lot of [grief] and just do it.”
CHAPTER 7: CURRICULUM AND PEDAGOGICAL PRACTICES OF THE BASIC PHARMACEUTICAL SCIENTISTS

Chapter 7 explores the curriculum and pedagogical practices of the basic pharmaceutical scientists that have contributed to and are currently teaching in the BSc(Pharm) program. The intent is to answer research question three while adding to the growing understanding about the case. While Chapters 5 and 6 provided valuable insight into the part that science and the basic pharmaceutical sciences have played and continue to play in the curricula and education of pharmacists at UBC, Chapter 7 focuses specifically on those responsible for teaching them. The chapter is presented in two parts. The first provides a broader examination of the curriculum and pedagogical practices of the basic pharmaceutical scientists developed through interview and course document analyses. In this section, interview questions focused on the study’s theoretical framework of curriculum dimensions and documentation representative of current course design, teaching and assessment practices form the basis of the analysis and discussion provided. Included as well is a sense of the characteristics and qualities of the scientists themselves as critical working parts of the case, active participants in the curriculum and educators. The second section of the chapter is more specific using visits to the classrooms of basic pharmaceutical scientists to observe what actually happens there. Entitled “Three Classes in a Week,” this section provides a closer look at the range of classroom practices used to teach the basic pharmaceutical sciences in the program through first-hand accounts of classroom experiences. While the chapter does not include broader analysis about how these practices might influence the role and status of the basic pharmaceutical sciences in the current program, it is hoped that once the chapter has been finished, readers will have a good sense of the curriculum and pedagogical practices used to design and teach the basic pharmaceutical sciences in the program,
the content currently taught, and the basic pharmaceutical scientists responsible for their designing and teaching.

7.1 Curriculum and Pedagogical Practices: Exploring Broadly

As mentioned above, this section of the chapter provides a broad examination of the curriculum and pedagogical practices of the basic pharmaceutical scientists participating in this study. Interviews with all members of this key group of study participants along with course documents from those actively teaching provided entry points for the examination. Mentioned briefly in Chapter 6 as important for prefacing and providing context for exploring the role and status issues described there, the interview components looking specifically at the approaches to course design and teaching practice voiced by basic pharmaceutical scientists provide the focus here. Responses to interview questions seeking information about previous teaching experience, current teaching responsibilities, and thoughts and perspectives on the dimensions of curriculum underpinning the study together with course outlines, class hand-outs and example exam questions provided the basis for analysis and summaries generated. As presented below, the broad examination of the curriculum and pedagogical practices of the basic pharmaceutical scientists provides insight into the decision-making processes and choices made regarding approaches to course design, what is taught in their courses and their teaching and assessment practices; issues of purpose and context also emerge. Table 8 provides a synopsis of the curriculum and pedagogical practices of the basic pharmaceutical scientists.

Setting the Stage

Prior to broader examination of their pedagogical practices each basic pharmaceutical scientist was asked about their prior teaching experiences as well as their teaching responsibilities in the current program. It seemed clear from their response to interview questions
Table 8: Curriculum and pedagogical practices of basic pharmaceutical scientists

<table>
<thead>
<tr>
<th>Approaches to Course Design</th>
<th>Content Focus in Courses and Modules</th>
<th>Use of Learning Objectives</th>
<th>Teaching Methods</th>
<th>Active Learning Strategies</th>
<th>Assessments Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Approach:</strong> design based on selection of disciplinary content knowledge at curriculum and course levels; sub-disciplines delegated to individuals for course or module development and teaching; seniority, expertise, interest and left over topics used as delegation criteria; content and course design left to content expert, autonomy-based decisions; honed incrementally with teaching experience, trial and error, and scientific advancement; no formal models of course design used</td>
<td><strong>Purpose:</strong> molecular-level knowledge of drug chemistry, delivery and action in the treatment of human disease, how and why drugs work; selection based on interest, intuition, time available and conceptual frameworks; teaching language of science, concepts over memorization and transferability key; depth and scope choices influenced by time, experience, scientific advancement and pragmatics</td>
<td>Used in all disciplines and courses; adjusted as course material changed with scientific advancement; used for broad understanding and as a study guide for students; perspectives on usefulness variable; included in course outlines</td>
<td><strong>Major:</strong> approaches variable</td>
<td><strong>Major:</strong> recapping, current events and news; questioning</td>
<td><strong>Major:</strong> summative; midterm and final exams; multiple choice, short and longer answer questions; calculations; some higher order case-based questions; exams not released to students, questions reused; supervised exam review</td>
</tr>
<tr>
<td><strong>Context:</strong> changing; connection to practice increasingly emphasized</td>
<td><strong>Integration:</strong> minimal; limited sense of other disciplines; isolation and autonomy within and between disciplines evident; pharmacology increasingly integrated with therapeutics</td>
<td><strong>Coherence:</strong> objectives linked to exam questions tangentially</td>
<td><strong>Minor:</strong> learning-centered; active learning; teaching to comprehensive notes packages; team-based learning; students engaged, teacher as guide</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Coherence:</strong> limited; course content and objectives linked to assessment and exam questions tangentially</td>
<td><strong>Outside Class Time:</strong> blogs and discussion boards; community service opportunities; practice problem sets and exams</td>
<td><strong>Coherence:</strong> exam questions linked to objectives tangentially</td>
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that this group of scientists enjoyed their teaching, their roles as professors and educators, and the on-going challenges of developing their courses and teaching practices. Even with limited teaching experience or background in education prior to joining the Faculty (see Table 5), many had received student- and peer-nominated Faculty and university teaching awards for their classroom work, impacts on student learning and growth as educators. During this discussion many raised conflicts between research and teaching commitments. Despite openly acknowledging the importance of their research programs, the increasingly competitive nature of grant funding, and their obligations to the research mandates of the Faculty and university they took their teaching responsibilities seriously. Each described attempts to balance research and teaching responsibilities accepting that changes in their classrooms were often slow in spite of on-going commitments to improvement. In addition, most had engaged in some form of professional development activities to improve their teaching practices including teaching seminars and workshops. Many were also graduates of UBC’s Faculty Certificate Program in Teaching and Learning in Higher Education, a one year in-depth and structured teacher training program for faculty, offered in partnership with the UBC Centre for Teaching, Learning and Technology.

In terms of current teaching commitments, each basic pharmaceutical scientist taught approximately 23 hours per year in the program. Courses taught were part of the core curriculum, scheduled in Years 1 to 3, and were lecture-based. Basic pharmaceutical sciences lectures were evenly distributed throughout the week, comprised of either 1 or 2 hour blocks and scheduled in one of the major theatre style lecture halls available to the program. Enrollments in these courses were approximately 150 students. Interestingly, emeritus scientists had taught
approximately double that amount at approximately 47 hours per year likely due in part, to the increased emphasis on the basic pharmaceutical sciences in previous curricula.

**Approaches to Course Design**

The approach to course design was consistent for most basic pharmaceutical scientists regardless of discipline affiliation. When asked during the interviews about designing their courses and whether or not a particular process was used, most needed time to articulate their thoughts on the issue; for many the design process was not immediately clear. Said one senior scientist and seasoned educator, “it’s hard to describe. It’s funny because you do it, but you don’t really think about the process.” While a more junior scientist stated, “I primarily have winged it,” closer examination of interview responses to this question revealed an informal but time tested approach in place. Drawing on disciplinary expertise and broad understanding of their fields of research, the process of course design amongst basic pharmaceutical scientists was described at two levels both almost entirely focused on selecting appropriate content. The first, associated with broader curriculum design, involved delineating and selecting the particular sub-disciplines or knowledge domains within each discipline that represented core disciplinary knowledge required of students. Typically, this selection process was decided through small group discussion amongst disciplinary experts and influenced by historical curricula, current conceptualizations of the field, knowledge gaps and the specific disciplinary expertise available to teach the material. In the current BSc(Pharm) program for example, medicinal chemistry had been divided into foundational principles of drug chemistry (i.e., exploring, for example, the impacts of drug structure on solubility, stability and drug disposition in the body), drug targets in human systems (i.e., examining drug interactions with enzymes including metabolic enzymes and drug biotransformation, receptors and ion channels) and pharmacogenomics (i.e., exploring
genetic influences on drug disposition and action) while pharmaceutics had been organized into oral dosage forms (e.g., tablets, capsules and liquid dosage forms) and other drug delivery systems (e.g., injectable, parenteral, pulmonary and ophthalmic systems, among others). Pharmacology had identified foundational concepts of drug action and an extensive series of body systems-based disease state modules aligned with “some of the most important conditions [in society] that need to be taught” (i.e., mechanisms of drug action in diseases of the autonomic nervous, immune, pulmonary and gastrointestinal systems, among many others). While decisions about inclusion and sequencing of these major content blocks within the curriculum were made within each discipline by the disciplinary experts, ratification required broader Faculty approval. For the present curriculum this had taken place during an exhaustive curriculum renewal process prior to implementation in 2003 and although optimized considerably, the original curriculum design regarding the basic pharmaceutical sciences had remained almost unchanged.

The second level of course design involved delegation of sub-disciplines or knowledge domains to individual faculty members for development into full courses or specific modules within courses. This selection process was often based on seniority, expertise, interest and those areas that “nobody else wants to teach.” At this stage, faculty members were given responsibility and autonomy as content experts for course or module development and teaching. While some variation in course design was evident amongst current basic pharmaceutical scientists, the process of course design began for most with syllabi and notes “inherited” from predecessors; some of this course material had existed, in part, for years and was representative of more traditional approaches to teaching the basic pharmaceutical sciences and past generations of pharmaceutical scientists. Regardless, the majority described approaches to course design focused primarily on appropriate content selection and sequencing. Although augmented with
rigorous research often involving textbooks, online resources, comparison with similar courses at other universities, review of relevant research literature and discussions with disciplinary colleagues, some described their process informally:

All I do is I just think about the core content that I need to deliver to them. I put in my power points and I sort of tweak here and there, seeing what I want to emphasize, whether I highlight key concepts, and then follow up with some questions that I think will be important. For the last year I started doing a couple of demonstrations in class, just to sort of break up the routine.

Those that had inherited courses or modules requiring limited modification typically replied, “[t]he material is already designed, that’s just historical.” For others the course design process appeared more deliberate and stepwise:

Assuming that I don’t have all of the information at my fingertips, I do a review of what are the drug therapies…for a particular condition…and then I would read the literature on those therapies and…determine what their mechanism of action was, what was known about how effective they were, and their adverse effects and so on. And then I would begin to create…the framework…around the drug. The focus is the drugs….how they work…their absorption, distribution and metabolism, and you know…adverse effects, and in all cases, it’s informed with the mechanism of action.

Interestingly, even though most basic pharmaceutical scientists had engaged in professional development programs and workshops to enhance their pedagogical practices, they openly acknowledged that they did not use formal approaches to course design informed by particular teaching models or the educational research literature; content selection including issues of scope and depth, seemed to take precedence over other dimensions of curriculum or coherence between them. On a historic note, the time tested nature of this approach to course design was verified by emeritus scientists. When asked how they went about designing their courses and whether or not they used particular models the typical response was,

not that I recall. You looked back at what you did, and what the Faculty agreed on and how it should look, and then that content was more yours, like in a particular time slot you knew you had to cover classes of drugs, but you might vary that depending on a teacher’s or professor-specific kind of area… I had some fundamentals I had to get across
and I would just try to figure out ways to do it…I also used 2 or 3 of the major textbooks by people I respected very much or the ones that students all used like Remington’s Pharmaceutical Sciences, Goodman and Gilman and then I supplemented that with the newest literature that I could find.

A Closer Look at Content Selection: Exploring Issues of Scope and Depth

Basic pharmaceutical scientists talked openly about the courses or modules they were responsible for and the challenges experienced and decisions required regarding issues of content scope, depth and selection. Immediately obvious during the interviews was the command each had of the subject areas and how they had attempted to translate that expertise into their courses and classrooms. Emphasizing the scientific foundations required for understanding at the molecular level, how and why drugs and drug products work in the treatment of human disease appeared to be the primary purpose of their course design and teaching efforts. To provide a sense of the theoretical nature of course content taught, one basic pharmaceutical scientist described it this way:

I deal with mostly how drugs have molecular interactions with enzymes and inhibit them. So I describe the process of enzyme inhibition. And then the different types of inhibition. I go through molecular interactions. I try to break down what type of molecular interactions can be important and actually at that level in the class, we quantitate those. And then we go through different examples of drug classes and the way that they inhibit different enzymes. There’s a small [amount of] pharmacology…to it, just in terms of providing some context, of why some enzymes are being inhibited and targeted in the human body…one of my favourite interactions is looking at antibiotic interactions with a transpeptidase enzymes, which form bacterial cell walls. I show why those inhibitors sort of act as suicide substrate inhibitors and how they form a covalent interaction.

When basic pharmaceutical scientists, like the one just quoted, were asked how they decided what content to include in their courses or modules, most had exercised their autonomy suggesting that although previous curriculum deliberation, former syllabi and broader research were helpful, personal interest, intuition, and the time allotted in the curriculum had the greatest influence on content selection. This latter point evoked much discussion at both the curriculum
and course levels of course design. Still fresh almost a decade after implementation, many scientists continued to lament the lack of time allocated to science in the current curriculum and recalled vividly the content decisions necessitated by the most recent curriculum reforms. Facing significant reductions in some areas as a result of increasing emphases on clinical and pharmacy practice in the curriculum, content decisions regarding the basic pharmaceutical sciences required serious rethinking and fundamental decisions about what was core disciplinary knowledge and how it could be better contextualized, particularly regarding pharmacy practice and the broader changes in the profession and health care. Identifying fundamental concepts, navigating the balance between scope and depth of topics with time available in the curriculum, and finding relevant illustrative examples that remained true to the fundamentals while making broader connections to practice were critical considerations in these deliberations and decisions. In addition, requiring greater reliance on student’s prior knowledge and ability for self-directed learning were also seen as important. One senior scientist described content decisions during the last curriculum reform this way,

we got cut by half, and so…we had to make some very tough decisions and choices, because there was no way that we were going to be able to teach what we did in 72 hours] in 36 with quality and so…we had to make two fundamental decisions. Number one, what are the key issues and specifics that we want our students to get, and then the other question was how much depth you could do in each…We made a fundamental decision [about] the major oral dosage forms that patients get…tablets and capsules…and then we clumped the liquid dosage forms altogether under one area…There was all sorts of specialty type things that had to be thrown out because we just didn’t have the time, so we stuck to the fundamentals…we had to really assume that the students had a much better understanding of physical chemistry…one of the reasons why the prerequisites I think are really critical…We decided that we would give readings or other things for the students to look at and say, “You need to be familiar with this, but we will not go into depth over this issue.” I think that’s good, because they have to do some self learning, we can’t be spoon-feeding them everything.

It is interesting to note that while the demands of curriculum reform had focused attention on integration between the science and practice disciplines, there was only limited discussion of or
call for greater integration between the basic pharmaceutical sciences disciplines themselves. While the purpose of the revised basic pharmaceutical sciences curriculum remained on the fundamentals, the basic pharmaceutical scientists and their disciplines appeared isolated from each other.

The dynamics of content decision-making within individual courses reflected those described for curriculum level reforms but provided greater insight into individual decision-making practices. Although nuanced, the process of choosing course content in individual courses could be described as an iterative process of continual refinement. “That’s been an incremental process over 30 years” stated one senior scientist. Constrained by time in the curriculum and honed with the wisdom of teaching experience, most had attempted to distill their content expertise into broader frameworks of core concepts that provided a logic or rationale for making decisions about content scope, depth and selection. Conceptualized by some as “how things fit together” in their courses and that “less is more,” these frameworks often resembled clusters of key principles necessary for understanding complex scientific content while others provided “an infrastructure or a skeleton” for students to “fill in.” Still others talked about core concepts built around “good scientific stories” that provided a “very logical flow of information.” One such framework was described this way:

Part of [selecting content] is building up a logic…you can’t understand, for example, what influences the onset of action and the duration of action and what physicochemical and physiological things influence getting your drug to its target site….if you don’t start by making sure the students know how the drug is transported to the site, so…I’m coming to it from a quality perspective, because quality encompasses stability, release of the drug, getting the drug to the target site, safety, and effectiveness. So [content selection] comes from the students needing to understand what this triad of quality, safety, and effectiveness means, and then teaching those bits.

While the central purpose of these frameworks emphasized key scientific principles, helping students become conversant in the scientific language, reducing memorization and developing
broader understanding of the phenomena in ways that were transferable to novel situations provided impetus for ongoing refinement. Decisions about scope and depth resulting from incremental changes in the frameworks over time often “worked themselves out” by trial, error and technology in the classroom, student performance on exams, scientific advancement and relevance to practice. In terms of depth issues for example some “stopped short of going as deep as possible” because they “didn’t want to bore them” or “turn them off.” Others felt that both better scientific knowledge as well as modern learning technologies allowed exploration in greater depth:

I would say that my strategy in the beginning was less detailed than I am now. And I think the reason for that is number one, our knowledge has increased, so there’s a lot better knowledge base. Number two, we have much better ways of presenting our material. So, you know, I’m really old school. When we started, we had overhead projectors and pens, and the students had the handouts with big gaps on them and you had a heading on your, what do you call it…transparency! Now we have better characterization, better pictures, more understanding of diseases and newer drugs and better opportunity to present the material in a more sort of comprehensive way than I think that we did in the past.

Relevance to practice was particularly influential in scope and depth decisions for some.

Signaling an important historic shift from the “absolute” disciplinary focus of the past towards greater practical and contextually-bound applications aligned with contemporary practice and curricula one scientist remarked succinctly,

when I think about content decisions in my course over the years it’s had to be relevance that has had the biggest impact. You can teach [my area] in a very fundamental way, but it has no relevance to the students, so I’ve always tried to focus it in on what do the students need to understand about what they’re actually giving to patients.

While medicinal chemists were often less emphatic about connecting with practice saying, “where you can make the connection you make it,” many pharmacologists had made purposeful connection with practice faculty, particularly in the area of therapeutics, to better integrate science with practice and address relevance of their course content:
So how I deliver the material in [my area] is based on the clinical person that I’m working with. For them I say, “Okay, what are the drugs that are currently used?” so they’ll say, ‘this and that.’ So then these are the key kind of drugs that are then discussed in my lectures, so how we do it is really based in what’s happening in the trenches. I think that’s the important part. I think we really do that very well, we’ve taken what happens in the trenches and we put the bullets into the gun.

Although all basic pharmaceutical scientists had grappled at some point with scope and depth decisions in their courses, in the end simple pragmatics was often the basis for many decisions:

So it’s a question of balancing out with the amount of time I have, what are the critical things that the students need to know, and also can I be sure that they’ll understand… so dealing with scope and depth on any particular [issue] really depends on whether I think there’s value in understanding some peculiarity of drug action.

It is important to note that although the energy and time spent by basic pharmaceutical scientists grappling with content scope, depth and selection in their own courses was clearly evident, the understanding of what was happening in other courses was surprisingly limited. Asked, for example, if there was consensus amongst their disciplinary colleagues about what they taught in their courses the typical response was, “[y]ou know, realistically they don’t normally know what I’m doing… my course is a one person operation, right, so I don’t tell anybody what I teach, nobody asks me what I teach.” Although they did acknowledge that disciplinary collaboration was part of early development, most had apparently not talked to colleagues about their courses in years. The sense of autonomy and isolation at play was stark. Said one scientist,

I don’t think anyone really cares what I do… I don’t need anybody’s permission about what I put in my courses. At least I didn’t ask anybody’s permission… I don’t really deal with my colleagues, they’re just expecting me to do the right thing. What material I teach is really dependant on me. I’m the boss. I never really discuss this with colleagues, because each is so silo-based.
Interestingly, there also seemed to be general acceptance of this dynamic: “I assume no news is good news. If they’re not upset about something or don’t think we’re proper or anything, I’m sure I would have heard about it by now, and I haven’t, so I think we’re fine.”

**Use of Objectives**

When asked during the interviews if they used learning objectives all basic pharmaceutical scientists said they did. Verified through analysis of course outlines and lecture handouts, most had included both global course level objectives and instructional objectives for individual lecture topics in their course design and teaching practices while some had also attempted to map their courses to the national level AFPC educational outcomes for entry-to-practice programs in Canada (AFPC, 2010). Even though learning objectives were recognized as an integral component of course design there seemed to be little consensus on the need or reasons for their use or inclusion; a few embraced them wholeheartedly, others reluctantly, and many seemed to view them as of secondary importance compared to content selection during course design. For some they represented a learning contract between instructor and student, provided an outline of the topic to be covered during lectures, and were presented to students as a study guide emphasizing examinable materials. The format of learning objectives in these cases tended to be quite prescriptive and appeared largely aimed at understanding foundational knowledge and principles. What students should be able to do following a lecture was clearly articulated in terms of action verbs such as define, list, describe and explain. When questioned about their use of detailed objectives one junior scientist replied,

> the idea of spelling it out…is part of the structured delivery of the lecture. Students know what to expect, I know that they know what to expect, so it kind of takes that unknown out of the equation, which is good in a sense, because then you don’t have all these, ‘Do I have to know this for the exam?’ type of questions.
Others felt that objectives, particularly when prescriptive, often confined learning. Asked if they used objectives one senior scientist remarked, “[r]eluctantly. I don’t believe in them, but if [students] want them I try to make them as vague as possible so that they really don’t direct the students to any particular fact in the material. I use objectives but they’re broad.” Still others questioned their overall usefulness in the learning process:

I don’t think any lecture has to have a series of objectives. I mean when I was being educated, I honestly don’t remember basic scientists saying ‘these are my objectives.’ It was . . . pretty straightforward. We’re going to learn these sets of reactions and here we go… Yeah, I use objectives, but I’m not so hot on objectives.

Despite the differing opinions, when asked if their objectives had changed over time most replied that they reviewed them regularly and that they were changed as their understanding of how to teach the topic changed or when new scientific advancements in the area emerged. This sometimes meant simply honing existing wording of the objective while complete revision or rewriting of others.

**Teaching Methods and Active Learning Strategies**

To examine the teaching practices of the basic pharmaceutical scientists, interview questions that asked about their approach to teaching, what a typical day in their classrooms might look like and whether or not their approach had changed over time were used. While analysis of interview responses indicated approaches spanning the teaching-centered to learning-centered continuum, the predominant teaching practices in use to teach the basic pharmaceutical sciences appeared more teaching-centered. Instruction in these classrooms of 150 students focused primarily on the teacher and content as opposed to active engagement of students in guided in-class learning strategies (Barr & Tagg, 1995). Within the theatre style lecture hall environment where all basic pharmaceutical sciences courses were taught, approaches to teaching were typically described as lecture-based involving power point presentations and
accompanying hard copy hand-outs. Provided at the beginning of lectures or made available online through UBC’s enterprise level learning management system, WebCT Vista, the composition of the hand-out materials ranged from power point slides only to a combination of power point slides and separate written notes to comprehensive, “full on” notes packages. Many had also opted to have their lectures recorded digitally (the recording included slides and audio only), a new learning support tool for students recently implemented by the Faculty. When asked about a typical day in their classrooms, day-to-day teaching practices or “routines” as many called them varied depending on the extent of active learning incorporated into the lecture and the roles assumed by both student and teacher. For some, transmission of factual knowledge was of paramount importance. In these classrooms active learning was minimized, students were passive and the instructor the sage. One senior scientist described classroom dynamics this way:

I say [to students] stop writing because if you write then you’re completely wasting your time….put your pens down and just listen to me, because when I’m teaching there’s 70 or 80 slides coming at you, and it’s really intense. So with the WebCT, the black and white slides, my notes, and the taping, why would you want to write, just listen to me…I actually think teaching is about performance, it’s really acting, in a professional manner.

Echoed an emeritus professor, “mine were all…strictly didactic [lectures], sage on the stage sort of thing.” While “covering the materials” remained a top priority for most lecturers, many had incorporated active learning to varying degrees, into their classes as “a very good way to wake [students] up and get some interaction going.” Some classrooms appeared more interactive than others integrating recapping and current events, questioning opportunities, in-class problem solving and quizzes, demonstrations, videos, case-based discussions, small group work or a combination of these strategies to “break up the pace.” Offered a mid-career scientist describing a particularly active-sounding classroom,

what I do is I say, “Okay, here’s the content, here’s a situation, what would you do? Let’s talk about it.” And I will actually designate five or ten minutes [for the activity]. Early
on, the first few weeks, students don’t talk, you have to drag it out of them, but once they start to see that it’s a safe environment that I’m not going to judge them…you’d be amazed, within three weeks students will start talking.

Outside of class time a few instructors offered course blogs, discussions boards, community service opportunities and practice problem sets and exams. To highlight the diversity of teaching practices amongst the basic scientists it should be noted that some individuals did not use power point presentations at all preferring comprehensive “handouts that are written in English, in full sentences, with beautiful diagrams and figures and tables…and then I go in and give examples and teach to the notes, that’s a typical day.” Others had moved away from lecturing altogether, favouring team-based learning approaches in which responsibility for learning was the student’s and teacher assumed the role of guide.

When asked if their teaching practices had changed most indicated they had. Interestingly most mentioned that they began teaching in the Faculty in the way they had been taught as students but with time and experience had grown more comfortable with their current teaching style and more confident and adventurous as teachers. Reflecting on their growth as teachers typical comments included:

What I’m doing today and what I was doing then is night and day. I mean I’d get up there and I’d basically go through a set of slides, the classic stuff, very lecture based, very one way…I did that because that was the way I knew how to do it. I didn’t know any other way at that point…I was a sage on the stage and everybody was going to listen to what I had to say, regurgitate what I told them and they were going to get their mark and that was it. If you didn’t pass it, then tough luck. See you next year…now I’m more of a guide.

Assessment Practices

To collect information about assessment practices, each interviewee was asked about the typical types of assessments used in their courses. In addition, typical exam questions, requested as part of the course documents collected, were reviewed in light of course and lecture
objectives. Analysis of the interview responses and exam questions received indicated that across basic pharmaceutical sciences courses the types of assessments used were consistent and predominantly summative and high stakes. Most employed midterm and final exams as the principal means of assessment weighted at approximately 40% for the midterm exam and 60% for the final. Typically, midterms were 1 hour in length while finals were 2.5 hours. Formative assessments in the form of graded and ungraded quizzes, administered both during and outside of class time were used occasionally in some courses. Question formats on these exams and quizzes were similar as well including mainly multiple choice, short answer and longer answer questions (i.e., requiring paragraph length answers). Within pharmacology courses, exams tended to be multiple choice exclusively while pharmaceutics and medicinal chemistry exams included a mix of question types, some involving calculation, drawing and graphing. In addition to the importance of factual recall, many exams included practice-related cases or real-life scenarios to assess higher order understanding and application of course concepts and student’s ability to think critically. Regardless of disciplinary context, exam questions appeared to align with course objectives. Although current exam formats had stabilized in recent years, a great deal of experimentation with assessment had taken place in some courses. As one scientist remarked, literally, I have dabbled in everything…I’ve done portfolios, I’ve done assignments, I’ve done literature reviews, I’ve done term papers, I’ve done small groups and had total disasters, I mean I’ve experimented…I would say in the last seven years though the course [assessment] has been very straight forward.

While most basic pharmaceutical scientists acknowledged using the same or similar exam questions each year, most recognized the need for continuous review and updating of exam questions to reflect changes in course objectives and content resulting from scientific advancement in their fields. Due to the time required to develop new exam questions, graded exams were typically not released to students but could be reviewed under supervision. In terms
of lost opportunity, many lamented the elimination of hands-on science laboratories from the program as a critical means of reinforcing concepts taught during lecture and to provide additional opportunities to assess student’s understanding of them.

7.2 Curriculum and Pedagogical Practices: Experiencing the Specific

Building on the broader examination of the pedagogical practices of the basic pharmaceutical scientists developed above through interview and course document analyses, this section of the chapter attempts to provide a first-hand look at the classroom practices of the basic pharmaceutical scientists. Despite countless hallway conversations and numerous committee deliberations about teaching and learning over the years with this group of faculty, visiting their classrooms was a rare and interesting experience. While all were subject to well-established Faculty policies requiring annual student evaluations of teaching and regular peer reviews, none had participated in a study like this or had had their pedagogical practices researched in this fashion. For some this was a welcome opportunity. For others, participation seemed to raise tensions and insecurities about their courses and capabilities as teachers. Although reassured that the visits were in no way meant as peer reviews of teaching, most could not contain their thoughts and ideas about their classroom practices, what worked, frustrations, accomplishments and areas for improvement. There was a very strong sense that visitors to their classrooms were rare, that much of their teaching and learning work was done alone, and that there was little formal opportunity for on-going discussion and sharing with colleagues. The classrooms of the basic pharmaceutical scientists felt like very private places.

Three Classes in a Week

The vignettes presented below attempt to provide a vicarious experience of being in the classrooms of the basic pharmaceutical scientists. While the teaching practices observed spanned
the teaching-centered to learning-centered continuum, 6 of 8 classrooms visited emphasized teaching-centered approaches differentiated slightly by the extent of interactivity during a lecture (typically through questioning). In most of these classrooms the focus was on the content and the instructor; the students were primarily passive. Included below is an example of one of these classrooms along with others meant to illustrate the more learner-centered teaching practices employed in the classrooms of the basic pharmaceutical scientists. Developed from the analysis of classroom visit summaries generated and member-checked for each visit, the original field notes, and the researcher journal entries, the vignettes provide a sense of the range of teaching practices experienced in the classrooms of the basic pharmaceutical scientists. It is important to note that there was congruence between the teaching practices described during the interviews and those experienced in person. In addition, even though only a small number of classes were visited for each basic pharmaceutical scientist they openly acknowledged that what was observed was typical of their day-to-day teaching practices. For confidentiality reasons pseudonyms have been chosen to identify each participant, reference to the particular discipline has been removed, and the times and rooms listed have been changed. Although all three participants have been identified as male, gender has been switched to maintain confidentiality. The focus here is on the classroom teaching practices. The vignettes are written in first person.

**Monday, 9-10am, IRC 6: Ian’s Class**

Ian invited me to join one of his Tuesday morning classes about mid-way through the fall term. I had contacted him by email at the beginning of the term to get a copy of his course outline for organizing a date for the class visit but due to our crazy schedules did not actually sort this out until a couple of weeks before. I had dropped by his office several times but we had just not connected. Once we did we were able to sort out a date relatively quickly; our interaction
was very positive and Ian said he looked forward to my visit. The course Ian was teaching in had
been organized into week-long disease state modules (typically 4 hour blocks) and was team
taught. He was scheduled to lecture on different disease states for much of the month and had
organized his teaching commitments during this time period to accommodate major grant
deadlines and responsibilities to his research program. Even though we had not been able to meet
earlier, Ian had spent time thinking about potential topics and dates asking that I attend lectures
within a specific disease state module rather than individual lectures in different modules. We
chatted a bit about the focus of each module and settled on a particular 4-lecture module about
the middle of the term. I did not know much about this topic but looked forward to learning more
about the disorder and related drug treatments. I emailed Ian a couple of days before the visit as a
reminder. He returned the message promptly suggesting we meet at his office about 20 minutes
before class to walk over together. He also provided a copy of the lecture hand-outs he used for
this lecture series. I reviewed those along with his interview the night before. The hand-outs
contained 134 slides, mostly pictures along with comprehensive written notes. The materials
looked interesting but I wondered how he was going to teach it in the 4 hours available; his
interview indicated he had taught this module many times before so I assumed he was
comfortable with his approach. When I arrived at his office on the day he was ready, suit and tie,
he looked sharp; one of his grad students was there as well to help carry hand-outs over to the
class. Ian seemed a bit tense but the three of us made small talk on our way to the class. I
reminded Ian about the purpose of the visit reassuring him this was not a peer review of his
teaching but part of my research study. We made it to IRC 6 about 10 minutes early. I helped Ian
get his computer set up while the grad student distributed the hand-outs. Once Ian was set I went
up to the back of the room to find an unoccupied seat. On the way I weaved my way through
several groups of students (approximately 155 in the class) greeting several I remembered from when I taught them. Although the room was packed with students I found a seat, spread my things out (field note form and hand-out) and got settled. My seat was in the upper left-hand corner of the lecture hall; I had a good view of Ian and the whole class.

It was strange feeling sitting in that classroom as an observer. I had taught there countless times before, felt comfortable in the space as a teacher and liked its look and feel. The recent renovations had transformed the original cement crypt (that smelled like a musty basement) into a modern space with a nice west coast feel (light wood paneling and blue carpet throughout) and a full array of technologies; I liked the lingering smell of newness. But now as an observer I felt like I was an outsider in a very private place. This was the first time I had seen Ian teach since I had joined the Faculty. I had visions of Malinowski and the exotic Other and wondered if a lab coat and clipboard would make me feel more comfortable. I was glad when the lecture started.

Ian started the class promptly at 9am. Noticing some students continuing to chat he stopped his introduction and specifically asked them to pay attention or leave. He reminded them to respect the classroom and those that were there to learn. He also asked them to put their pens down and to listen rather than taking notes since all the materials available for the lecture were available on the course’s WebCT site. Ian started the lecture by briefly mentioning the objectives and then moved right into the material. I found the lecture immediately interesting. The science was fascinating. I knew a bit about the topic but not at the level presented in this lecture. It struck me that I was experiencing some of the foundational basic pharmaceutical sciences knowledge our students were being asked to learn. Ian’s intensity and clarity drew me in. He held his green laser pointer like a light sabre (I thought he was going to break it) and changed the volume and tone of his voice to emphasize points of importance; these changes made me laugh, I thought
them endearing. Although I had not thought about or expected this beforehand, I found myself becoming a student, a learner. With my field note form and lecture hand-out in front of me I moved fluidly between Ian, recording observational notes and questions, and jotting down facts and ideas on the hand-out. I was absorbed in the moment, intensely watching and listening to what Ian was presenting and how he was presenting it (the purpose of the classroom visits). Students were the same. The room was absolutely quiet; the only sound was the clicking of pens as student wrote their notes and the collective sound of hand-out pages flipping as the lecture proceeded. I particularly liked the way Ian simplified complex physiologic cascades, isolating the key receptor targets associated with current drug therapies; he did not get hung up on minutia. About half way through the lecture I began to recognize a pattern in his presentation. He used no guiding notes (either written or on the slides) and his slides contained only pictures, diagrams and schematics. In addition, several variations of the pictures, diagrams and schematics, containing similar information, were used to convey his message from different perspectives. The approach approximated a process of “spiralling forward” through the materials (continuous review as part of the discussion of new ideas). The content in Ian’s lectures developed starting with anatomy and then moved through physiology, pathophysiology, pharmacology and biological targets, to the drugs used to interact with the targets; drugs were referred in name as opposed to structures or other chemical properties. Ian’s content expertise was obvious as was his focus during the presentation; he did not move from the podium. What struck me as well was how little he involved the students; no questions were asked and no opportunities to ask given. In addition, there was almost no mention of other basic pharmaceutical sciences or practice; the focus was primarily on Ian and the science content.
Before I knew it the class was over at 9:50 sharp; I just sat there for a moment to catch my breath. We had made our way through 34 slides; it felt like something had really happened.

After the class I made my way to the front of the lecture hall where Ian was chatting with students. He was very patient with them, particularly those that seemed a bit anxious about the material. Ian seemed ready to chat with me. On our way back to the Faculty and for about 20 minutes in the hallway we talked about the science, his approach to teaching and the way he went about designing the lecture. He spoke passionately about his teaching, his preparation (which he said he did all year long), professionalism, and the importance of recent teaching collaborations with clinical and practice faculty colleagues to improve the integration of course content across several courses in his year as well as his own lectures. As a non-pharmacist this collaboration had helped him keep current with practice and ensured that the drug examples used in his lectures were relevant. He had enjoyed these collaborations and was openly receptive to continuation. Also evident was his commitment and responsibility to students “since they…[are] paying $7K tuition each year to get an education.” When asked why he did not mention the other basic pharmaceutical sciences he replied adamantly, “I have been here for 17 years and I have not once talked to them about collaborating on teaching.” I was surprised as well to hear that in recent years he had withdrawn from the Faculty for many reasons including feelings of disrespect. On parting I indicated to Ian that I would be putting together a summary of the visit for him to review and adjust as he felt necessary. This seemed to catch him a bit off guard; I don’t think he was expecting to give input on the summary or have further input on the data.

About a week later I bumped into him in the Faculty photocopy room where we chatted briefly about the summary. While he agreed with the summary information he was not clear about how I was interpreting his approach to teaching. We discussed what I meant by “spiralling
forward” (I drew it on a piece of paper early in the conversation); the remainder focused on issues he had raised in our hallway conversation after the lecture. I asked Ian if he would like see the summary again and he said no. I felt like this was a solid piece of data.

**Wednesday, 3-4pm, IRC 2: Lindsey’s Class**

This has been a very busy week. I have had constant meetings and other work related deadlines to deal with. Getting ready for the scheduled class visit today was a real challenge; giving proper attention to study participants has been increasingly difficult and the conflict between school and work has really started to emerge. I was thankful that Lindsey and I had worked out a time for me to visit his class well in advance; we had managed to touch base on the fly at the start of the term and set a reasonable date about mid-way through. He is very organized and I was grateful he was so accommodating. He had also provided a complete copy of the notes package for the course containing the course outline and close to 200 pages of notes, pictures, schematics diagrams, old practice exams and various literature focused on the role of the pharmacist and the changing face of the profession; the first two articles in the package were on professionalism and the Blueprint for Pharmacy. Lindsey is the course coordinator and one of the principle lecturers in the course. He helped design it and had taught his section for many years. The course addresses 8 core principles or areas that he feels are important for students to know not only in terms of the fundamental science in his field but also in terms of their relevance to practice. Lindsey is a pharmacist and mentioned repeatedly, “we’re very practical but since we’re the only game on town in this area we have to make sure they get the fundamental concepts that they’re going to see in practice.” Although the course outline indicated these areas were organized and taught sequentially and we had set a date, he recommended we touch base closer to the time to see how the course was progressing. He preferred that I visit at a time when
a new core concept was being introduced and developed so I could see his approach, and since the course did not always follow the lecture outline we might need to be flexible. When the date was approaching I checked in with Lindsey to see how the course was progressing; the original date still worked for both of us. Due to our schedules we agree to meet in the class.

I arrived at the room at 2:55pm. I felt a bit haggard but did let Lindsey know I was there and where I would be sitting. He had arrived early and was busy at the front of the lecture hall getting ready for the class and chatting with some students. The lecture hall, IRC 2, seemed cavernous. The room is one of the biggest lecture halls on campus and feels a bit like a stadium. It holds over 300 people and the tiered seating seems to go on forever. Recently renovated, the orange seats and red carpets give the room some life and the full range of teaching technologies including data supports for PowerPoint and Internet use, document cameras (doc cam), wireless microphones, whiteboards and overhead projectors, make it a relatively comfortable teaching space. I had taught there only a few times previously and found it not nearly as accommodating as the smaller IRC 6, the other IRC lecture hall used for much of the program. Students were already there and seated mostly in the lower half of the room. Even though there were over 150 students in the class, the room seemed somehow empty. There was lots of motion and chatter as students readied themselves for the class; the room was filled with energy. This class knew each other well so the camaraderie amongst students was evident; lots of laughing, joking and discussion, some had their computers open surfing the Internet. I wondered if the students were sitting in their usual seats; according to Lindsey the students sit in the same seats every lecture. I found an empty seat in the lower left-hand side of the room and chatted with a few students as I prepared myself for the lecture. The chatter and murmurs continued until the instructor started the class with a yell; students settled quickly.
The class started with Lindsey briefly introducing me and the study (he had read the script to the students during the last class) and then inviting one of the students up to the podium to describe an incident experienced at the methadone clinic she worked at; an interesting example about the Downtown Eastside clientele and how the information learned in this course had helped with decision-making. Lindsey then discussed a recent example from the news (the Michael Jackson court case) and engaged the students in a discussion about the validity of the arguments made by the defense lawyers; I vowed to use this example to build an exam question for my course. The discussion, led by Lindsey, evoked many questions from students along with lots of chatter; the focus of the discussion was the connections between the course concepts and practice. This example was followed with a 10 minute video based on a news story about prescription errors at a Rite Aid® store in Washington State (a 2002 clip broadcast on a local news station). Following the video the instructor led a discussion about several issues raised in the video that again connected science and practice. The session raised many questions from the students which were readily answered. Lindsey knew many of the students by name; students appeared comfortable raising hands, asking questions and being involved. The video appeared well received by the students based on the noise level in the class and the level of interactivity. I found this a very interesting experience as well and enjoyed the back and forth of the discussion. These initial activities took approximately 20-25 minutes of the class.

The remainder of the class was focused on one of the theoretical concepts of the course (this topic had been started in the previous class). Starting with a simple schematic diagram that Lindsey had drawn on the board (based on a student-generated question from the previous class), he worked on the doc cam to recap the theoretical aspects of the topic. I found it impressive how quickly the discussion turned to the science and how the students focused. Although the topic
seemed unclear to many students, using simple, clear hand-drawn diagrams on single white sheets of paper and descriptive theory, Lindsey explained the central theories and topics of importance. The explanations were detailed and intense generating many and varied questions from students. Lindsey went over the concepts several times drawing and re-drawing diagrams as necessary interspersing the explanations with humour, stories and anecdotes; this was well-received by the students creating much laughter and chatter and helping to break the tension. Both Lindsey and the students were very engaged. Questions came freely and often from all parts of the room, many of which appeared to challenge Lindsey’s ideas and explanations. A specific example was offered by one of the students (based on his practice experience) which did not seem to clarify the issues for students. The questions continued until Lindsey ended the class on time at 3:50pm vowing to revisit the topic next class. Based on the questions being asked, it was unclear if the students understood the key concepts; I felt similarly and made a note to discuss this with Lindsey. A number of students gathered at the front of the room following the end of the class for clarification. I briefly let Lindsey know I had a prior commitment and left. That evening I listened to Lindsey’s interview and then drafted a summary of the session; there was a great deal of congruence between the interview and the in class experience of his teaching.

The summary I sent to Lindsey about the session generated a lot of discussion between us. His concern was whether the observation realistically captured what had happened in the class particularly related to the difficulty students appeared to have with the theory. Specifically he was concerned that the summary did not acknowledge the broader process that he engages students in. He indicated that many students try to apply prior knowledge in his course which leads to many misconceptions. During the course he works at “breaking down” the student’s prior knowledge and then reforming it; the breaking point in this process was typically around
the time of my visit although some years it happens earlier, others later. He recommended that I attend a specific module he was teaching next term to get a more complete picture of his approach. After some thought I decided this was not necessary and that incorporating the gist of our conversation about the class I attended was ample.

Thursday, 10-11am, IRC 6: Brad’s Class

My last visit for the week; I feel happy. I managed to touch bases with Brad in the first week of the term to set a date for the class visit; we had played a bit of email and telephone tag but had found an available time to get together to discuss his course and my visit. I had just recently completed my interview with him and although he had mentioned doing some experimenting with his course he had not spoken much about it; it sounded different from other courses and I wanted to know more before I observed his class in person. Brad had restructured his course using small group team-based learning because he “was tired of power point, students just sitting there, following the hand-out, taking notes, falling asleep. I want to engage them more.” The approach was weighted heavily towards student self-directed learning with instructor as facilitator (very few lectures were given); the class was divided into 22 small groups of 6 or 7 students that worked together for the entire term. The course was modular containing pre-readings (up to 60 pages for each class), reading assessment tests administered using clicker technology, and activity days focused on key areas of importance for the field. Brad said it did not matter what session I attended since the course was relatively unstructured. We decided I would visit one of the activity days in the middle of the term. During an activity day students discussed the questions in their groups, presented their formulated answers to the class and fielded questions generated from students or Brad. I looked forward to it.
I met Brad at the lower entrance to IRC 6 about 15 minutes before the class. We did not get into the room until 9:55 as the previous class went overtime. As there was no technology required for this session the set-up was fairly straight forward. Brad laid out a single page hand-out containing the questions for the day and the readings for the next class. He then wrote some brief instructions for the day on the board and enjoyed the last of his morning coffee and muffin. The 4 questions developed for the day probed key scientific concepts of Module 4; there was no apparent connection to practice. Brad had created them the night before. While there was a lot of commotion in the room during the changeover between classes, students quickly found their groups and settled. I decided to sit in the upper right-hand corner of the room so I had a complete view of the action. The class started promptly at 10am with a request to get settled. Brad provided the instructions for the day and read the questions; the group discussions would take place for 20 minutes followed by group presentations. As Brad preferred not to wear a microphone it was clear many students did not hear him. The students quickly retrieved the hand-out from the front of the room and group discussions started at about 10:05.

For most groups of students, it appeared to take a bit of time for the discussions to start. Some students moved around in their groups to be able to hear better and be more engaged in the discussion. As students began to add ideas the level of discussion picked up. Notes were opened, diagrams were shared and contributions were made by most group members; some group members appeared to listen only. In the room the noise level increased as the discussion intensified; there was a lot of commotion and activity. While most students remained in their seats some groups gathered in the aisles. It became clear that the students (at least the contributing students) were engaged in the activity; it was unclear whether all students were contributing to the discussions. During this time Brad wandered around the room observing the
groups and answering student questions, spending time with particular groups. The discussion sessions finished at 10:25. Three groups (out of 22; chosen randomly) were then asked to present their responses to the class (each was asked to respond to one of the questions provided). All members of the groups were asked to come to the front; each group was also encouraged to use the board to help illustrate the answer if necessary. The group presentations were led predominantly by one or two students (there were 6-7 students in a group). Most gave verbal answers to the question although one group used the board to draw a graph to support their explanations. It was clear that students were uncomfortable with this format, making jokes and using humour to deflect attention from their answers. This may have been due to the unfamiliarity of students with this learning format. It was also unclear whether the group collectively knew the answers to the questions since only 1-2 students contributed to the presentation. There were many questions from the class fielded by the presenting groups and good discussion generated. Following each presentation Brad asked additional questions of clarification and gave opportunities for students to respond. This generated additional student questions and discussion. The class presentations finished at 10:50. The class finished with announcements regarding the readings for the next class.

The summary I sent to Brad received very little comment or feedback. He was happy that the students “were doing something” in his classes. He commented that the approach received a great deal of criticism from students and that he personally had received criticism. He was satisfied with the level of learning in the class which was similar to his past courses.

7.3 Chapter Summary

This chapter has explored the curriculum and pedagogical practices of the basic pharmaceutical scientists in two parts. The first, derived from interview and course document
analyses, provided a broad examination of current practices. In addition to offering some personal characteristics of the participating basic pharmaceutical scientists, this section of the chapter provided valuable insights into their thoughts, perspectives, decision-making processes and choices regarding the dimensions of curriculum underpinning the study. Table 8 provides a synopsis of the curriculum and pedagogical practices that emerged from the broad examination. The second part of the chapter built on the first through first-hand accounts of three distinctly different but representative classes taught by basic pharmaceutical scientists. Developed as vicarious experiences for the reader, descriptive vignettes provided closer examination of the range of classroom practices. While teaching-centered approaches similar to Ian’s were prominent in the classrooms of basic pharmaceutical scientists, learning-centered practices such as those of Lindsey and Brad appeared less evident. Although the intent of this chapter was to answer research question three, broader analysis about how these practices might influence the role and status of the basic pharmaceutical sciences will be examined in Chapter 8.
CHAPTER 8: WHAT HAS BEEN LEARNED, IMPLICATIONS AND CONCLUSIONS

This chapter, Chapter 8, is the last of this thesis and perhaps the most important and challenging. The intent is to explicate what has been learned and what can be said about the role and status of the basic pharmaceutical sciences from this case study of UBC’s current BSc(Pharm) program. In a general sense (Stake, 2010), as a complex functioning system comprising many working parts, this chapter revisits what has already been learned about the case to attempt to bring an understanding of how the program is currently functioning, what may not be working, and how it’s functioning might be improved. An in-depth examination of the working parts is critical for this understanding. For this study, a qualitative theoretical empirical inquiry of a complex singularity, the challenge lies in making sense of the results in Chapters 5, 6 and 7 in a way that draws both on the historical analyses and the perspectives and opinions of study participants to provide a detailed understanding about how the current BSc(Pharm) program is functioning and to provide guidance on possible improvement. To accomplish this, the study’s research questions and associated chapters will be revisited individually to summarize what has been learned and how each contributes to the study’s purpose. Supporting arguments will be drawn from the background and literature reviews developed in Chapters 1 to 3 as necessary. Major assertions or claims emerging from the research confirming, refuting or adding new knowledge to current literature will be identified along with the case characteristics, peculiarities, and internal dynamics that have impacted and continue to influence and confound curriculum reform efforts. The implications of this research then follow and the chapter ends with the study’s conclusions. It is hoped that by the time the reader has finished this final chapter they will have a good sense of the role and status of the basic pharmaceutical sciences in UBC’s current BSc(Pharm) program, the challenges and opportunities for optimizing the program, how
this case study contributes to the scholarly pharmacy education literature, and possibilities for future research⁵⁸.

Prefacing the discussions that follow, the study’s purpose is restated: the purpose of this study is to establish the role and status of the basic pharmaceutical sciences in the current UBC BSc(Pharm) program.

8.1 Learning from Research Question 1

To help address the purpose of the study research question one asked, “What has been and what currently is the scope and depth of the basic pharmaceutical sciences in the current UBC BSc(Pharm) program?” Attempting to bring understanding and perspective to the role and status afforded the basic pharmaceutical sciences in the current program, this question addressed the study’s purpose from a historical viewpoint. Looking specifically at the importance, value ascribed, and scope, depth and weighting of science and the basic pharmaceutical sciences in pharmacy education in the province since Confederation was the focus of analyses. Presented in Chapter 5, comprehensive curriculum development timelines were used to identify pharmacy programs representative of distinctive conceptual orientations towards pharmacy education and curricula over the past 140 years. Based on the study’s theoretical framework of learning-centered curriculum dimensions, these programs were described emphasizing the science and basic pharmaceutical sciences content as well as the program context, purpose, design, teaching methods and assessments practices. While limited by the historic documents and educational literature available, the four conceptual orientations towards pharmacy education identified allowed for reasonable inferences about the history of pharmacy practice and education in BC. How this history aligned with changes nationally, how the science and the basic pharmaceutical sciences

⁵⁸ Readers are encouraged to read the footnotes included in this chapter as they make important contributions to the arguments developed.
sciences content changed in each, their individual characteristics, distinctiveness and criticisms, and how the current program was situated amongst them also emerged. Roster analysis and program enrollment information provided additional indicators of changing perspectives and emphases. The curriculum conceptualizations also provided context for the exploration of research questions two and three. As the primary focus of this study was learning about the case rather than generalizing beyond it, the historic analysis presented in Chapter 5 provided several important insights about the case.

**Broad Findings**

The curriculum development timelines and the conceptual orientations towards curriculum described in Chapter 5 provided a unique vantage point for examining the changes that have taken place in pharmacy practice and education in BC since Confederation. Broadly, this chapter illustrated the process of professionalization for occupations like pharmacy, the ebbs and flows of professional status and worth with changes in society, and the tremendous efforts required by practitioners, educators, governing bodies and political advocates to maintain professional status. The chapter also showed the complex interplay between societal change, pharmacy practice and pharmacy education along with the equally intense efforts directed at curriculum reform. Aligning well with changes nationally as described in Chapters 2 and 3 (Fullerton & Enves, 1951; Raison, 1967; Riedel & Stieb, 2001), practice roles for BC pharmacists in the past 140 years have shifted dramatically from apothecary to medication therapy experts in response to contextual pressures such as industrialization, medical advancement, and Canada’s increasingly over-burdened health care system. During the same time period equally dramatic shifts have taken place in pharmacy education and curricula. Representative of a profession’s legal obligations for establishing programs and standards of
education, the empiricist apprentice, pharmacist basic scientist, pharmacist pharmaceutical scientist and the pharmacist clinician curricula not only reflect how the specialized knowledge of the pharmacist has shifted to maintain professional status and jurisdictional claim over its services but also the actions of professions and professionals to meet their social responsibilities. Although not always in sync, Chapter 5 has provided a critical look into the dynamic interplay between pharmacy practice and pharmacy education historically, how the societal and practice context impacts pharmacy education, and why the pharmacist clinician curricula of today is different from previous conceptualizations of pharmacy education. As a dynamic and on-going process that promises to continue in BC (ADPC, 2012; CPhA, 2013; FPS, 2012) careful consideration of contextual influences from practice and society will be crucial to ensure curriculum reforms are aligned with the health care needs of British Columbians.

Of specific importance for understanding the history presented in Chapter 5 and sweeping changes that have taken place in both practice and education is the profound effects of industrialization on the profession in BC. As described in Chapters 2 and 3 this issue receives a great deal of attention in the historical literature in both Canada and the US (Hepler, 1987; Riedel & Stieb, 2001). While the details of the impacts of industrialization are multifaceted and will not be repeated in detail here, the curriculum development timelines and the conceptual orientations towards curriculum generated for this study provided valuable corroborating evidence for the arguments made by many pharmacy historians about this issue (Beales & Austin, 2006; Buerki, 1999; Riedel & Stieb, 2001; Savage, 1994). Highlighted in the BCPhA’s 1967 Report of the Pharmacy Planning Commission (MacPhee et al., 1967), the low ebb experienced in the profession at that time was directly attributable to the effects of industrialization on pharmacy practice. Impacting the traditional specialized knowledge of the
apothecary over a 30 year period, by the early 1960s the pharmaceutical industry had left pharmacists with dispensing and drug distribution as the mainstays of professional practice and no direct patient-care role. Exacerbated by the dominance of medicine and physicians in health care at that time (Dove, 2011), the ensuing history of pharmacy practice and education in the province can be viewed as the long protracted struggle of the profession to identify its new specialized knowledge, establish a new niche in the health care system and reconnect with its social responsibility to the citizenry and society. Although rationalized as contextually important for the times, the drug, drug product and scientific research focus of the pharmacist basic scientist and pharmacist pharmaceutical scientist curricula could be considered detours around the patient focus of the apothecary and empiricist apprentice curriculum before eventually reclaiming their professional purpose and social responsibility in the pharmacist clinician curriculum. Approximately five decades in the making, the recovery of the profession from the “de-professionalization that resulted from industrialization” (Hepler, 1987, p. 379) provides an appropriate backdrop for the discussion of the sweeping changes in pharmacy education and curricula that follows. It also brings understanding to the importance, value ascribed, scope, depth and weighting of the basic pharmaceutical sciences in the current BSc(Pharm) program.

Findings Regarding Scope and Depth of the Basic Pharmaceutical Sciences

The curriculum development timelines and the conceptual orientations towards curriculum described in Chapter 5 also allowed for the examination of the long term trends in the scope and depth of science and the basic pharmaceutical sciences in pharmacy education in BC. The comparisons supported by the historical analysis indicate that science generally has been a significant part of the specialized knowledge and curricula of pharmacy education in the province. While the particular type of scientific knowledge has changed and emphases has
varied, a major focus of pharmacy programs and curricula has been on the scientific understanding of drugs; how and why they work and how they can be prepared, delivered and used safely has been particularly important. Positioned historically in the pharmacy education literature as an essential aspect of the foundational knowledge of the pharmacist (Crabtree, 2012; Cutler et al., 2009; Skau, 2007; Speedie et al., 2012), the scope and depth of the science included in pharmacy programs reflects the changes in scientific advancements in society and the sophistication of the scientific knowledge available. Comparison of the four conceptual orientations towards pharmacy education presented in Chapter 5 indicates how profound these changes have been. For example, the empiricist apprentice curriculum of the finishing school models of pharmacy education emphasized the empirical and descriptive sciences of chemistry, pharmacy, materia medica and botany (Table 7). Gained from detailed observations, practical knowledge and the wisdom of personal experiences, this curriculum reflected the specialized knowledge of the apothecary and although rudimentary by today’s standards, represented the latest scientific knowledge of the time (Hurst, 1934). By contrast, the scope and depth of scientific knowledge in the pharmacist clinician curriculum felt to underpin pharmaceutical care and medication therapy management reflects the tremendous advances in science and medicine in the ensuing 140 years; molecular-level understanding of the biomedical sciences and medicinal chemistry, pharmaceutics and pharmacology now characterize the scientific content of contemporary pharmacy curricula. Transitioning from the basic and botanical sciences of the pharmacist basic scientist curriculum, the basic pharmaceutical sciences began to emerge as important in pharmacy curricula in the late-1960s becoming predominant in the pharmacist pharmaceutical scientist curricula of the 1980s and 1990s; programs of the mid-2000s maintained this prominent role. Comprising close to 40% of these heavily science-based
curricula, the basic pharmaceutical sciences were a dominant focus of pharmacy programs and curricula at UBC for close to four decades before experiencing reductions to the 25% level in the pharmacist clinician curriculum; their importance was reflected in Faculty rosters comprising largely PhD trained scientists. Today, instead of viewing the basic pharmaceutical sciences as the central focus of the pharmacist’s specialized knowledge, the current curriculum attempts selective inclusion of these scientific foundations to support understanding of disease, drug therapy decisions and direct patient care; Faculty rosters in which clinical and pharmacy practice faculty exceed PhD scientists reflect this shift. Although more detailed, this research confirms the trends citing declines in science and basic pharmaceutical sciences content in pharmacy programs described in the history pharmacy education literature and Chapter 3. It also lends support to the legitimacy of concerns raised by this study and others regarding the diminishment of the scientific foundations and the basic pharmaceutical sciences in contemporary pharmacy programs (Crabtree, 2012; Cutler et al., 2009; Skau, 2007). While the historical comparison has provided valuable insight into the scope, depth and importance of the basic pharmaceutical sciences in the current program it provides very little guidance as to whether or not current levels are appropriate or optimal. In addition, there appears to be incongruence between the conception and enactment of the curriculum (Feiman-Nemser, 1990) as manifested by the criticisms that confound curriculum optimization. Representing “significant residues and traces from the past” (Hargreaves, 2000, p. 152), isolated disciplines and disciplinary experts, limited integration, content weighted towards the sciences rather than practice, and irrelevance of some of the basic pharmaceutical science content appear to be a stubborn legacy of the pharmacist basic scientist and pharmacist pharmaceutical scientist curricula of the past (FPS, 2005, 2007, 2012). While the disciplinary nature of pharmacy education is well-known (Austin & Duncan-Hewitt, 2005;
Harrold, 2004; Holmes & Desselle, 2004) and it’s often detrimental effects on curriculum and pedagogical practices recognized (Austin & Gregory, 2007; Hubball & Pearson, 2010; Schneider & Shoenberg, 1999) neither the historical literature nor national guiding documents (CPhA, 2013; AFPC, 2010) provide further direction on how to address this issue59. Today as in the past, content decisions remain in the hands of the content experts within the Faculty.

8.2 Learning from Research Question 2

Research question two addressed the purpose of the study directly by asking the pharmacy scholars and educators participating in the study, “What are the current perspectives on the role and status of the basic pharmaceutical sciences in the UBC BSc(Pharm) program?” As key elements of the case (Stake, 2010), the voices of those that helped create the current program, have taught in it, and continue to be involved in its optimization were felt crucial for exploring the importance of science and the basic pharmaceutical sciences in the program and the knowledge base of the contemporary pharmacist. While the historical document analysis presented in Chapter 5 provided a broader understanding of the case, the semi-structured interview analysis presented in Chapter 6 helped scratch the surface for a closer look at its inner workings (Stake, 2010). Drawing on the collective experiences and views of the study participants provided rich and critical insights into their views on the profession and professional education, the role and status of the basic pharmaceutical sciences in the current BSc(Pharm) program, and the internal dynamics, challenges, and frustrations with current curriculum reform efforts. In addition to reinforcing the complex nature of curriculum and curriculum reform as developed in Chapter 3, key aspects of the case were learned from the interview analysis.

59 The national guiding documents referred to here include CPhA’s Blueprint for Pharmacy initiative (CPhA, 2013) and AFPC’s seminal educational outcomes document for Canadian pharmacy programs (AFPC, 2010).
Findings Regarding Role and Status of the Basic Pharmaceutical Sciences

The interview analyses presented in Chapter 6 revealed stark differences and contrasting perspectives amongst basic pharmaceutical scientists and clinical and practice faculty regarding the role and status of the basic pharmaceutical sciences in the current program. Drawing on the seminal work of Austin and Duncan-Hewitt (2005) regarding the complexity of curriculum reform in professional education generally and pharmacy education specifically, this research corroborates what they have speculated as intrinsic solitudes within pharmacy Faculties and curricula. With roots in the well-established knowledge disciplines of university-based pharmacy programs that include the basic pharmaceutical sciences (Harrold, 2004; Holmes & Desselle, 2004), this research adds to their arguments with a specific example documenting the solitudes between scientists and practitioners in this Faculty; it also shows how these deep divides manifest themselves in the conception and enactment of curriculum. In terms of the role of the basic pharmaceutical sciences for example, the basic pharmaceutical scientists felt strongly that the basic pharmaceutical sciences formed the scientific foundations of the specialized knowledge of the pharmacist and were critically important for understanding and supporting therapeutic decision-making in practice. To them the link between the basic pharmaceutical sciences and practice was direct and facilitated by an in-depth understanding of how and why drugs and drug products behave the way they do in human systems. Invoking the notion of the patient as a “black box,” the basic pharmaceutical scientists were adamant that an intimate knowledge of the basic pharmaceutical sciences was critical for defining and predicting drug therapy; that, scientific deductive reasoning (an inherent positivist perspective) was essential for resolving drug-related problems in practice (Bobbitt, 2004; Creswell, 2007). Felt to be an essential part of the core curriculum, getting rid of the basic pharmaceutical sciences would seriously undermine
the pharmacist’s ability to practice, address the needs of patients or contribute in a meaningful way to the health care system. Despite having minimal or in some cases only vicarious connection with the realities of contemporary practice, the importance of the basic pharmaceutical sciences and their role in the knowledge base of the pharmacist and the current curriculum appeared unquestionable in their eyes. Although when asked they could not say what the optimal weighting of the basic pharmaceutical sciences in the curriculum should be, they did feel that what was there should remain. The basic pharmaceutical scientists attributed high importance and status to the basic pharmaceutical sciences and felt its current status should be maintained. A legacy of privilege steeped in four decades of dominance of the basic pharmaceutical sciences in UBC pharmacy programs and curriculum decision-making seemed to underpin this position; that the basic pharmaceutical sciences should remain part of the curriculum because they have always been part of the curriculum is a sentiment felt strongly by many basic pharmaceutical scientists today (Cutler et al., 2009; Khan, Deimling, & Philip, 2011).

In stark contrast, the clinical and pharmacy practice faculty felt that the basic pharmaceutical sciences had only a small role to play in the knowledge base and curricula of contemporary pharmacists. Providing a general background for understanding the complexities of drug behavior in human systems, most felt they had minimal impact on day-to-day practice and therapeutic decision-making; many had forgotten much of the basic pharmaceutical sciences they had learned as students. Surprisingly, the clinical and practice faculty also invoked the notion of the patient as a “black box,” but contrary to their basic pharmaceutical scientist colleagues suggested that regardless of the level of scientific understanding brought to bear on

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60 Also implied here is the dominance of basic pharmaceutical scientists in curriculum decision-making during this period.
treatment options, working with real patients remained fraught with uncertainty. To them knowing the scientific basis of how and why drugs and drug products work was not nearly as important as knowing if they worked as judged by the available clinical evidence; inductive reasoning in practice (an inherent interpretive perspective) seemed more important for resolving drug-related problems for real patients (Creswell, 2007; Schön, 1983; Shulman, 1997). While most felt the basic pharmaceutical sciences should remain part of the curriculum, like their basic pharmaceutical scientist colleagues they could not say what the optimal weighting in the curriculum should be; many felt the current status and weighting was excessive and incommensurate with the needs of training practitioners for the realities of contemporary practice. The legacy of privilege afforded the basic pharmaceutical sciences in the program as well as the influential voice of the basic pharmaceutical scientists in curriculum decision-making historically were felt largely responsible for the excessive weighting in the current curricula and the overly theoretical focus of the program. While the theoretical focus of the curriculum has been raised as a potential barrier to practice change today (Rosenthal, Austin, & Tsuyuki, 2010), few clinical and practice faculty questioned whether relearning the basic pharmaceutical sciences would improve their effectiveness as practitioners.

As just described, answering research question two served to highlight the solitudes between scientists and practitioners in the Faculty and establish their respective positions on the role and status of the basic pharmaceutical sciences in the current program. While both constituencies felt they had a role, like the findings from research question one, little clarity was provided regarding how much of the basic pharmaceutical sciences was appropriate or what optimal levels might be. With content decisions left to the content experts and the content experts divided, there was little consensus on either role or status. What was clear however was how the
knowledge disciplines and solitudes in the program were affecting the conception and enactment of curriculum and those involved (Austin & Duncan-Hewitt, 2005; Schneider & Shoenberg, 1999). Particularly striking was the close alignment between of the tensions and frustrations voiced by scientists and practitioners in this study and the criticisms of the program identified through the historic analysis in Chapter 5. Current criticisms seemed to mirror those associated with the program for decades. Aligning well with the work of Austin and Gregory (2007) the perceived student criticisms of the basic pharmaceutical sciences and their hierarchy of importance seemed to underscore the incongruence between curriculum conception and enactment and a general devaluing of the basic pharmaceutical sciences in the program. While a sense of despondency and futility seemed evident amongst study participants, particularly important for this study was the emergent sense that current approaches to curriculum reform had to change. While many strategies were suggested for addressing the role and status of the basic pharmaceutical sciences and incongruencies in the program, there was no clear process articulated; using collaborative, interdisciplinary teams instead of isolated discipline-based discussions along with strong leadership were common themes in the suggestions made (Austin & Duncan-Hewitt, 2005).

8.3 Learning from Research Question 3

Research question three addressed the purpose of the study by asking “What has been and what currently are the curriculum and pedagogical practices used to teach the basic pharmaceutical sciences in the UBC BSc(Pharm) program?” Building on the research findings from Chapters 5 and 6, respectively, Chapter 7 focused specifically on the basic pharmaceutical scientists teaching in the program. The intent was to attempt to establish how the curriculum and

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61 Criticisms included fragmented and siloed disciplines, isolation and “turf wars,” limited integration, a sense that program content was too theoretical, graduates not being “practice-ready,” and irrelevance of some of the basic pharmaceutical sciences content.
pedagogical practices of those responsible for teaching the basic pharmaceutical sciences might be influencing their role and status in the program. Several things were learned in the process of answering research question three that added to the understanding of the case.

**Findings Regarding Curriculum and Pedagogical Practices of Basic Pharmaceutical Scientists**

The findings from Chapter 7 and research question three showed that the curriculum and pedagogical practices of the basic pharmaceutical scientists were predominantly teaching-centered. Contrary to the findings from the historical analysis developed in Chapter 5, or the suggestions from the literature reviews in Chapters 2 and 3, learning-centered approaches had not been widely adopted in the classrooms of the basic pharmaceutical scientists currently teaching in the BSc(Pharm) program. Displaying many of the characteristics of teaching-centered practices that have been well-documented in the higher education literature (Barr & Tagg, 1995)\(^6\), the practices evident amongst basic pharmaceutical scientists seemed to contradict the suggestions that learning-centered approaches had been widely embraced and adopted by the Faculty (FSP, 2005, 2007, 2012; Hubball & Burt, 2004). Providing a comprehensive analysis of the curriculum and pedagogical practices of basic pharmaceutical scientists and adding to the scant Canadian literature examining the scientific foundations of pharmacy education (Austin & Gregory, 2007), this research refutes the notion often raised in the literature that basic pharmaceutical scientists are not interested in teaching or contributing in a meaningful way to the development of curriculum (Albon, 2010; Duncan-Hewitt & Austin,

\(^6\) Barr and Tagg (1995) describe many characteristics distinguishing teaching-centered and learning-centered classrooms. Teaching-centered classrooms, reflected in the curriculum and pedagogical practices of the basic pharmaceutical scientists participating in this study, often include: a focus on content expertise and knowledge transmission, teaching rather than learning, one faculty member-one course-autonomy models of course development, faculty in the role of sage, passive student involvement, high stakes assessment practices, and limited internal coherence between curriculum dimensions within courses.
The group of basic pharmaceutical scientists participating in this study took their teaching responsibilities seriously, had recognized the need to balance teaching and research obligations, and was committed to changes in their courses and classroom practices; congruence between the interviews and first-hand observations of classroom practices supported their claims. In addition, all that had received teaching awards were proud of these accomplishments particularly when student-nominated. While not necessarily at the cutting edge of pedagogy these award winners offered students thoughtful, passionate, and enthusiastic teaching in their classrooms and were recognized for their competence and willingness to provide quality learning environments.

What this research does corroborate however, is the recognition and acceptance advocated by proponents of learning-centered approaches to post-secondary education that faculty are at different levels of development on the teaching-centered to learning-centered continuum (Hubball & Burt, 2004; Hubball & Gold, 2007). Aware that progress was slow, most basic pharmaceutical scientists described processes of incremental change in their courses that acknowledged: contextual changes in the profession and their fields of study; relevance to practice; growing pedagogical content knowledge (knowing how to teach what you teach) (Shulman, 1986); greater focus on student learning (developing conceptual frameworks emphasizing engagement and understanding over memorization); giving students greater responsibility for their learning, and; the importance of active learning strategies in the learning process. Comparison of the classroom practices of Ian, Lindsey and Brad supports the view of developmental differences. Building on the good intentions and content expertise of the basic pharmaceutical scientists Carl Weiman (2007), nobel laureate in physics and influential physics educator, reminds us, “knowing a subject is profoundly different from knowing how that subject
is best learned” (p. The Back Page). As faculty members with limited formal training in education, appropriate faculty supports and faculty development opportunities will be needed to help basic pharmaceutical scientists achieve their intrinsic commitments to their curriculum and pedagogical practices regarding the basic pharmaceutical sciences and student learning (Austin & Duncan-Hewitt, 2005; Hubball & Gold, 2007).

Examination of the curriculum and pedagogical practices of the basic pharmaceutical scientists in research question three also added further support to insights generated from Chapters 5 and 6 and research questions one and two, respectively. In terms of the scope and depth issues explored in Chapter 5 and research question one, the findings from research question three provided additional evidence about the theoretical nature of the basic pharmaceutical sciences content in the curriculum and the depth to which topics are explored. For example, the description of the enzyme kinetics taught illustrated the importance ascribed by basic pharmaceutical scientists to the molecular-level understanding of how and why drugs and drug products work in the treatment of human disease; Ian’s class reiterated this perspective. More generally, these examples reinforce common sentiments held by basic pharmaceutical scientists regarding the significance of the basic pharmaceutical sciences in the knowledge base and education of contemporary pharmacists.

In terms of the role and status issues explored in Chapter 6 and research question two, the findings from research question three reinforced the disciplinary nature of the basic pharmaceutical sciences and how this inherent faculty structure may be reinforcing the incongruence between the conception and enactment of the current curriculum. In particular, the approaches to course design described by basic pharmaceutical scientists underscored the embedded disciplinary thinking involved in content selection and the self-contained knowledge
paradigms that have characterized the basic pharmaceutical sciences in pharmacy programs of
Discipline-focused content (emphasizing the science over practice), autonomy-based
development processes, isolation, and “inherited” courses accentuate the deep disciplinary roots
in the Faculty, the lack of interdisciplinary communication between faculty members, and the
siloed nature of the curriculum. Recognized as a significant structural barrier to the development
of coherent learning-centered curricula (Austin & Duncan-Hewitt, 2005; Barr & Tagg, 1995;
Hubball & Gold, 2007; Hubball & Pearson, 2010; Schneider & Shoenberg, 1999), the siloed
nature of the current program may be perpetuating the science-practice solitudes in the Faculty
identified by research question two as well as the legacy of internal dynamics and criticisms
associated with the program for decades; the working parts of the case may not be working as
synergistically as they might (Stake, 2010).

8.4 Research Claims

The following research claims emerged from the findings of research questions one to
three:

Research claim 1: Pharmacy practice and pharmacy education in BC are intertwined through
professional obligations and responsibilities. Pharmacy practice roles since Confederation have
shifted from apothecary to medication therapy experts. Pharmacy education in BC and at UBC
since Confederation can be described by four conceptual orientations towards curriculum: the
empiricist apprentice, pharmacist basic scientist, pharmacist pharmaceutical scientist and the
pharmacist clinician curricula.

Research claim 2: Science has been a hallmark of pharmacy education in BC although scope
and depth of the science has changed dramatically. The basic pharmaceutical sciences, providing
molecular-level understanding of how and why drugs and drug products work, have been a dominant focus of pharmacy programs and curricula at UBC for close to four decades; curriculum reforms have seen them decreased from 40% in the pharmacist pharmaceutical scientist curriculum to 25% in today’s pharmacist clinician curriculum. Neither historical nor contemporary documents provide guidance on what optimal levels in contemporary curricula should be. Content decisions remain in the hands of the content experts within the Faculty.

**Research claim 3:** Science and practice solitudes exist within the Faculty confounding curriculum decisions regarding the role and status of the basic pharmaceutical sciences in the curriculum; current perspectives are deeply polarized. While basic pharmaceutical scientists and clinical and practice faculty agree the basic pharmaceutical sciences have a role in preparing students for practice, the importance, status and what the optimal levels might be remain unclear. Exacerbating this issue appears to be contrasting world view perspectives regarding the conception and enactment of curriculum; basic pharmaceutical scientists are disconnected from practice yet feel the science is critical for clinical decision-making while clinical and practice faculty prefer clinical evidence for decision-making and have forgotten much of the basic pharmaceutical sciences.

**Research claim 4:** Curriculum and pedagogical practices of the basic pharmaceutical scientists are predominantly teaching-centered. While committed teachers and educators their discipline-based practices may be contributing to the solitudes in the Faculty, the incongruence between curriculum conception and enactment, and the lack of clarity regarding the role and status of the basic pharmaceutical sciences in the current program.

**Research claim 5:** A legacy of internal dynamics and criticisms related to the disciplinary roots of the program, faculty autonomy and the privileging of the basic pharmaceutical scientists and
sciences in curriculum decision-making historically, characterize the program and continue to hamper curriculum optimization efforts.

**Research claim 6:** A coherent approach for addressing curriculum reforms regarding the role and status of the basic pharmaceutical sciences was not evident. Processes acknowledging curriculum history, the program’s inherent disciplinary structure, its legacy of internal dynamics and criticisms, the need for interdisciplinarity, and strong leadership were favoured.

### 8.5 Contributions to the Scholarly Literature

This research makes several contributions to the scholarly pharmacy education literature; it is particularly unique in that it represents the first case study of the UBC BSc(Pharm) program and is the first of its kind on a Canadian pharmacy program. It’s focus on the scientific foundations of pharmacy education adds to the growing discourse on the science foundation in health sciences education programs (DePaola & Slavkin, 2004; Mowforth, Harrison, & Morris, 2005; Whitehead, 2013). The findings from research question one while not necessarily extending the Canadian story of the professionalization of pharmacy as developed in Chapter 2, does provide a specific example at the provincial level supporting and verifying the histories available through the fragmented Canadian literature; the professionalization story developed through this research also aligns well with the extensive historical literature available in the US (Buerki, 1999; Helper, 1987). Regarding the corresponding educational changes, this research adds to the historical literature by further delineating the notion of the pharmacist-scientist commonly used to describe the conceptual orientation towards pharmacy education in the industrialization society (Table 3). The pharmacist basic scientist and pharmacist pharmaceutical scientist curricula provide a more nuanced rendering of the particular type of science content that made up the specialized knowledge of the pharmacist during that time. In the BC context
specifically, this study makes a major contribution to the existing historic literature and is unique in its explicit focus on educational change. The findings from research question two add to the pharmacy education literature on curriculum reform from a faculty perspective and are unique in their specific in-depth focus on the role and status of the basic pharmaceutical sciences. This research corroborates the work of Austin and Duncan-Hewitt (2005) providing detailed insights into internal Faculty and curriculum dynamics regarding in particular, the historic disciplinary structure of pharmacy programs, the science-practice solitudes in particular, and their impacts on curriculum conception and enactment. The findings from research question three adds to scant literature in the Canadian context providing one of the only existing studies investigating the curriculum and pedagogical practices of basic pharmaceutical scientists and the impacts of these practices on curriculum conception and enactment.

8.6 Implications

This research has provided a unique opportunity for in-depth examination of the science foundations of UBC’s BSc(Pharm) program with particular attention to the basic pharmaceutical sciences. As the first case study on the program in the Faculty’s long esteemed history, the holistic view created has opened up complicated conversations (Pinar, 2004) about curriculum, the perspectives, commitments and tensions of the people that have created and teach it, and the persistent internal dynamics and characteristics that have confounded and continue to confound curriculum conception, enactment and reform. The implications of this research offer important suggestions for possible improvement and future research.

In a broad sense this research underscores the importance of and need for scholarly approaches to curriculum reform that have been absent from curriculum deliberations of the past. While academic pharmacy’s legal obligation is to educate pharmacists, pharmacy education
research has not been viewed as a legitimate scholarly discipline amongst the established research paradigms that typically characterize Faculty research mandates (Holmes & Desselle, 2004; Pearson & Albon, 2013). This research however, provides compelling evidence suggesting why the ad hoc coping strategies and tinkering that have typified pharmacy curriculum reforms of the past (Austin & Duncan-Hewitt, 2005) have been inadequate for understanding and addressing the deep disciplinary solitudes within the Faculty and the current program. While this case study has helped raise awareness about this and other important issues impacting curriculum optimization, the insights gained emerged from a partial understanding of the case. A more complete picture would require further research focused on for example, the student perspective. Approached with equal rigour, case study research examining student perceptions on the role and status of the basic pharmaceutical sciences in their education could contribute significantly to the findings of this study. It would also add to existing Canadian research on the issue (Austin & Gregory, 2007). Analyses of student interviews, focus groups and reviews of student work related to the basic pharmaceutical sciences not only has potential to broaden current understandings of the case but could provide new and complementary insights for guiding curriculum deliberation and reform. Although controversial, access to student evaluations of teaching and course evaluations would be particularly valuable data sources for examining student perspectives, experiences and curriculum critique. Longitudinal studies following students throughout the program and after graduation could extend this understanding further by exploring retention of the basic pharmaceutical sciences in their growing specialized knowledge as students and early-career practitioners. Examining how and to what extent the basic pharmaceutical sciences are used in decision-making in practice could provide crucial information for informing decisions about optimal levels of the basic pharmaceutical sciences in
the curriculum; it may also help address findings from this study suggesting practitioners tend to forget their basic pharmaceutical sciences knowledge once in practice. These suggestions, while time-intensive, advocate for coherent, comprehensive and research-based approaches to curriculum reform to replace episodic and piecemeal efforts (Hubball & Gold, 2007; Hubball & Pearson, 2010). Doing things differently and getting beyond ourselves, sentiments voiced strongly by participants in this study, suggests that adopting scholarly approaches may help do that. As mentioned at the beginning of this thesis, establishing scholarly, contextualized and evidence-based approaches to curriculum reform emphasizing understanding is at the heart of this research and future studies (Regehr, 2010).

The findings from this research suggest that invoking interdisciplinary course development teams might be one way of helping to resolve the perspectives of basic pharmaceutical scientists and clinical and pharmacy practice faculty regarding the role and status of the basic pharmaceutical sciences. Addressing directly the inherent solitudes in the Faculty, interdisciplinary course development teams would promote: greater communication between scientists and practitioners; learning about science and practice from each other, and; greater awareness of the factors that continue to confound curriculum conception, enactment and reform63. While this suggestion is not new (Austin & Duncan-Hewitt, 2005), the particular type of interdisciplinary discussions envisioned here would include specific processes to help scientists and practitioners begin to speak the same language; gathering together in a room does not necessarily equate with meaningful conversation if neither side knows what questions to ask or how to seek common understanding. Facilitated processes emphasizing scientific solutions to drug therapy problems might provide an avenue for meaningful connection. Exciting research

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63 As identified through this study factors that may be perpetuating the solitudes in the Faculty and curriculum include the traditional approaches to course design, the one faculty member-one course-autonomy models of course ownership, and the current disciplinary isolation that exists between faculty members.
emerging from this suggestion would be the investigation of the degree of reciprocity and knowledge sharing between scientists and practitioners, what the interdisciplinary processes might look like, and the particular types of hybrid integrated knowledge generated. This work has the potential to establish a new specialized knowledge for contemporary pharmacists; an integrated hybrid of existing solitudes. Strongly supported by contemporary thinking and scholarship regarding faculty-driven curriculum reform practices and processes (Wolf & Christensen Hughes, 2007), establishing interdisciplinary course development teams would help create communities of practice to support critical curriculum conversations about discipline-specific discourses, ambiguities regarding taken for granted assumptions, values and understandings, and a common language of the curriculum (Austin & Duncan-Hewitt, 2005; Duncan-Hewitt & Austin, 2005; Fraser, 2006; Pinar, 2004). Interdisciplinary course development teamwork might also help create a sense of shared purpose, partnerships, and understandings about what contemporary pharmacy practice is and what the knowledge base of contemporary pharmacists should be (Noddings, 2003).

Another suggestion for addressing the solitudes in the Faculty and curriculum would be the establishment of a specific faculty development program designed to connect basic pharmaceutical scientists with practice. Addressing the vicarious understanding that most described as participants in this study, this program would include a combination of professional workshops, special lectures, practical experience, and assignments to enhance their understanding of practice. Workshops and special lectures would focus on the history of the profession, contextual issues affecting pharmacy professionalization, knowledge of the Canadian health care system, and current pharmacy practice research involving clinical specialists, practitioners and scientists. The practical aspects of the program would involve shadowing
experiences in community and institutional settings to become familiar with day-to-day practice; an advanced program might involve basic pharmaceutical scientists as pharmacy technicians. An important assignment of the program would be a thorough review of the basic pharmaceutical sciences content they were asked to teach and honing it for relevance to practice; drawing on the practical elements of the program as well as involvement in the interdisciplinary course development teams mentioned above would be a crucial aspects of this process (Austin & Duncan-Hewitt, 2005; Duncan-Hewitt & Austin, 2005; Fraser, 2006; Pinar, 2004). Revised materials would be implemented in their course(s) or module(s). The one-year program envisioned here would resemble the UBC Faculty SoTL Leadership Program: UBC Certificate on Curriculum and Pedagogy in Higher Education and would be a required aspect of employment for all scientists hired without a pharmacy background; the program could be prorated or adjusted based on prior learning or experience for those that have pharmacy degrees but have not practiced recently. While the logistics of this program would require careful integration with research commitments, particularly for those at the pre-tenure stage, involvement would make important contributions to their teaching dossiers and provide additional supporting evidence of educational leadership required for tenure and promotion decisions (Hubball & Gold, 2007). Faculty policies would be critical for holding faculty accountable for professional development and improvements in their teaching practices. Equally important would be the active support from Faculty administrators (Deans and Associate Deans) to fund the program, acknowledge the contributions made by basic pharmaceutical scientists to curriculum reform, and reward their efforts through internal merit and teaching awards for curriculum leadership, innovative course design, curriculum scholarship and teaching excellence.

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64 Program structure and information of UBC Faculty Certificate Program on Teaching and Learning in Higher Education can be found at http://cilt.ubc.ca/files/2012/01/fcp.pdf.
advocating for and supporting awards available at the institutional and professional levels would also be important (Hubball & Gold, 2007). The program would be developed, implemented and administered by the Faculty’s Office of Education Support and Development. Research opportunities might involve studying the impacts of the program on their teaching practices and self-perceptions as educators; the former suggestion provides opportunity for action research studies on the classroom practices of basic pharmaceutical scientists (Cousin, 2009).

It was also evident from this study that basic pharmaceutical scientists require on-going support for the development of their curriculum and pedagogical practices. Aligning more closely with learning-centered approaches to post-secondary education has potential to benefit their classroom practices, student learning, and positively impact the status of their courses and content (Austin & Gregory, 2007; Hubball & Gold, 2007). While the issue of professional development for faculty is a broad one, the approach suggested here would continue to support and encourage professional development opportunities available through UBC’s Centre for Teaching, Learning and Technology. In-house workshops developed and offered by the Faculty’s Office of Educational Support and Development would augment these (Fraser, 2006). Initial in-house workshop offerings would focus on learning-centered course design emphasizing coherence between context and planning, teaching and assessment practices; action research projects in the classrooms of basic pharmaceutical scientists would be established in conjunction with in-house workshops to establish impact from the student’s perspective (Ascough, 2011; Cousin, 2009; Hubball & Burt, 2004). Involvement in these professional development

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65 UBC’s Centre for Teaching, Learning and Technology offers a range of programs to help develop the teaching skills of faculty. A comprehensive range of faculty development programs includes three-day instructional skills workshops and course design institutes. Information on these programs can be found at http://cttl.ubc.ca.
opportunities like those described previously, would make important contributions to their teaching dossiers and provide additional supporting evidence of educational leadership required for tenure and promotion decisions; again faculty policies holding faculty accountable for professional development and improvements in their teaching practices as well as rewarding their efforts would be critical. As mentioned previously in the limitations of the study, investigating the curriculum and pedagogical practices of clinical and pharmacy practice faculty would help understand if the supports suggested for basic pharmaceutical scientists should be extended to faculty practitioners.

Faculty leadership (in particular, from Deans and Associate Deans) and policies will play a key role in curriculum reforms clarifying the role and status of the basic pharmaceutical sciences in the curriculum. As evidenced by this research, the messaging in accreditation and Faculty review documents (FPS, 2005, 2007, 2012) does not always translate into congruence between curriculum conception and enactment. In this study, despite messages to the contrary, learning-centered approaches to curriculum and pedagogical practice had not penetrated the classrooms of basic pharmaceutical scientists as significantly as hoped or articulated in those documents; additional research would be required to determine if the same could be said for clinical and pharmacy practice faculty. While the area of Faculty leadership and policies is complex and multifaceted in its own right, the challenging work of reforming the current curriculum will require individuals with an intimate knowledge of the program, its history, and the seniority and credibility to lead the process. The approach advocated here starts with understanding. Critical insights regarding the inherent underlying disciplinary nature of the Faculty, its role in enabling the science-practice solitudes, and how it is manifested in the curriculum and pedagogical practices of faculty will be crucially important for facilitating and
leading curriculum deliberation; exploring the hidden curriculum through further research may shed additional light on issues of importance for the process (Apple, 2004; Barr & Tagg, 1995). While appropriate resourcing, rewards and support systems along with policy-driven accountability measures will be required (Wolf & Christensen Hughes, 2007), the approach suggested here continues the complicated conversations opened through this research (Pinar, 2004). In addition to a critical understanding of the program, first steps for Faculty leadership would include: reiterating and clarifying existing messaging regarding the educational mission of the Faculty; reconfirming commitments to Blueprint for Pharmacy (CPhA, 2013) and social responsibilities to society; establishing the curriculum as a unifying force in which program outcomes are seen as greater than the sum of the individual parts, and; identifying internal curriculum leaders and engaging external expertise to champion the curriculum reform process (Austin & Duncan-Hewitt, 2005; Hubball & Burt, 2004; Hubball & Pearson, 2010). Making the work of educating pharmacists and curriculum reform public will be key (Smith, 2004).

Before closing this discussion of the study’s implications one final issue has not yet been addressed. While the strategies suggested above represent some of the best thinking and practices amongst contemporary learning-centered approaches to post-secondary curriculum reform, they assume buy-in from the faculty members themselves. Drawing on the insights of Thomas Kuhn (1996) and his views on paradigms of scientific research, the disciplinary roots of the BSc(Pharm) program and the potential for perceived threats to the identities of basic pharmaceutical scientists as disciplinary experts suggest the likelihood of resistance and even rejection of the curriculum reform strategies proposed. In addition, the autonomy afforded the basic pharmaceutical scientists as tenured university academics complicate the issue (Schneider & Shoenberg, 1999). From this perspective, the buy-in necessary for successful implementation
and sustainability of on-going curriculum reform efforts cannot be assured and will require special attention to the characteristics and qualities of the curriculum leaders involved and processes used (Bryman, 2007; Stark, 2002). This issue underscores the complex political nature of curriculum reform within the Faculty and highlights the sensitivities required to engage basic pharmaceutical scientists in the process (Huebner, 1999). Failure to address this reality risks what Michael Apple (2004) has called “hegemonic reproduction” (p.37); that is, curriculum reform without innovation or change. Although further research would be required to explore this issue in greater detail, replication of the dominant science-oriented ideologies of the basic pharmaceutical scientists in BSc(Pharm) programs of the past might help explain the historic incongruence between the conception and enactment of BSc(Pharm) curricula suggested by through this study. It also emphasizes the critical importance of achieving buy-in from basic pharmaceutical scientist to avoid replicating this dynamic in future curricula.

While the intent here is not to critique the body of scholarly research on effective curriculum leadership, a cursory review of the literature highlights three important issues worth considering for engaging basic pharmaceutical scientists in on-going curriculum reforms. The first is to recognize the need to develop curriculum leadership expertise amongst Faculty leaders (Deans and Associate Deans) as well as those faculty champions leading curriculum reform efforts. Ogawa and Bossert’s (1995) broad examination of educational leadership along with Fullan’s (2009) extensive work on effective curriculum leadership in the K-12 system emphasize the need for proactive professional development for faculty curriculum leaders. Contrary to popular belief, these authors contend that visionary curriculum leaders are rare and that it is a myth to expect faculty to lead complex processes of curriculum reform when most don’t know what it means or how to do it. The scholarly approaches to curriculum reform advocated by this
study suggest the importance of and necessity for strategic investment in curriculum leadership skill development for Faculty leaders and curriculum reform champions. The Faculty’s Office of Educational Support and Development can play a major role in this endeavor through workshops and engaging the expertise of external experts.

The second is to develop keen awareness of the kinds of leadership styles and behaviors associated with effective curriculum leadership. Bryman’s (2007) review of leadership effectiveness in higher education in the United Kingdom, USA and Australia provides valuable insights on this issue. His extensive analysis identified 13 forms of leader behavior shown to underpin effective curriculum leadership and reform processes. Aligning well with the scholarly literature on contemporary approaches to learning-centered curriculum reform discussed earlier (Hubball & Burt, 2004; Hubball & Pearson, 2010; Wolf & Christensen Hughes, 2007), some of these characteristics include being considerate, trustworthy and having personal integrity, creating inclusive and supportive communities of practice, establishing open communication, rewarding efforts of curriculum reformers, and securing appropriate resources. Awareness and implementation of these strategies will play a crucial role in helping to achieve buy-in from basic pharmaceutical scientists in the process and sustain their contributions to curriculum development.

The third issue is the implementation of specific models and frameworks of effective curriculum leadership to guide and inform curriculum reform processes and evaluate leadership practices. Quinn’s model of management styles (Stark, 2002), the Curriculum Leadership 360° Appraisal model (Santeusanio, 1998) and job-, organization-, and system-embedded leadership programs (Fullan, 2009) are examples of the kinds of approaches to effective curriculum leadership being implemented in both higher education and K-12 contexts. While the detailed
underpinnings of these models and studies will not be described here they emphasize the importance ascribed to the theoretical and practical rigour necessary for the successful and sustainable reform of undergraduate curricula. A comprehensive review of these and other approaches will be an important step in establishing the effective curriculum leadership necessary to assure basic pharmaceutical scientists are key contributors to on-going reforms regarding the role and status of the basic pharmaceutical sciences in the knowledge base and curricula of contemporary pharmacists.

8.7 Conclusions

The basic pharmaceutical sciences have played an integral role in the specialized knowledge and education of pharmacists in BC for close to 40 years; 70 years in the broader Canadian history. Dominant in programs of the 1980s their importance has diminished as models of pharmacy practice have shifted to meet the health care needs of British Columbians and Canada’s increasingly complex and over-burdened health care system. Curriculum reforms aligning pharmacy programs with clinical education and patient-centered care have necessitated reductions in the foundational basic pharmaceutical sciences and selective inclusion in curricula. Addressing concerns that contemporary programs may have inadequate scientific foundations for preparing today’s pharmacists, this study inquired into the role and status of the basic pharmaceutical sciences in UBC’s current BSc(Pharm) program to help inform and guide current curriculum reform efforts. As a case study, the first on UBC pharmacy programs, in-depth insights and understandings were gained about how it is currently functioning, its strengths and weaknesses, and how it’s functioning might be improved. Employing Stake’s (2010) notion of qualitative intrinsic case study and Hubball and Burt’s (2004) theoretical framework for learning-centered curricula, historical document analysis, interviews, classroom observations
were used to explore: 1) the history of the basic pharmaceutical sciences in pharmacy programs in BC and at UBC since Confederation; 2) the perspectives of participating scientists and practitioners regarding the role and status of the basic pharmaceutical sciences in the current program, and; 3) the curriculum and pedagogical practices of basic pharmaceutical scientists.

Results from the historical document analysis provided an illustrative example and valuable insights into the professionalization of pharmacy in BC. The results also showed the complex interplay between societal change, pharmacy practice and pharmacy education. Aligning well with the broader Canadian stories, pharmacy practice roles in BC since Confederation have shifted from apothecary to medication therapy experts; pharmacy education can be described by the empiricist apprentice, pharmacist basic scientist, pharmacist pharmaceutical scientist and the pharmacist clinician curricula. The basic pharmaceutical sciences, providing molecular-level understanding of how and why drugs and drug products work, have been a dominant focus of UBC pharmacy programs for close to four decades. They have decreased from 40% in pharmacist pharmaceutical scientist curriculum of the 1980s to 25% of today’s pharmacist clinician curriculum. Neither historical nor contemporary documents provide guidance on what optimal levels in contemporary curricula should be. As in the past, content decisions remain in the hands of the content experts within the Faculty.

In terms of the role and status of the basic pharmaceutical sciences in the current program, interview analyses suggest that the perspectives of basic pharmaceutical scientists and clinical and practice faculty are deeply polarized; science and practice solitudes exist in the Faculty. While both constituencies agree the basic pharmaceutical sciences have a role in preparing students for practice, the level of importance and status attributed to them varies markedly. The science and practice solitudes confound curriculum decisions regarding the role
and status of the basic pharmaceutical sciences in the curriculum; curriculum decisions regarding optimal levels, importance and status remain unclear. Exacerbating the issue appears to be contrasting world view perspectives, the lack of practice experience amongst basic pharmaceutical scientists, and limited awareness amongst clinical and practice faculty about the impact of the basic pharmaceutical sciences on decision-making in practice; many practitioners have forgotten much of the basic pharmaceutical sciences they once knew.

Curriculum and pedagogical practices of the basic pharmaceutical scientists, generated from interview and classroom observation analyses, appear predominantly teaching-centered. Although committed educators, their discipline-based practices, autonomy, and the privileging of the basic pharmaceutical scientists and sciences in curriculum decision-making, may be continuing to confound curriculum reform efforts. In particular, they may be exacerbating the science-practice solitudes, the lack of agreement regarding the role and status of the basic pharmaceutical sciences and tensions regarding curriculum optimization efforts.

Implications of the study suggest that scholarly approaches to curriculum reform and interdisciplinary course development teams would be important strategies for helping to resolve the perspectives of basic pharmaceutical scientists and clinical and pharmacy practice faculty regarding the role and status of the basic pharmaceutical sciences in the program. Furthermore, addressing directly the inherent solitudes in the Faculty interdisciplinary course development teams would promote greater communication between scientists and practitioners, learning about science and practice from each other, and awareness of the factors confounding curriculum reform. Specific faculty development programs have been suggested for connecting basic pharmaceutical scientists with pharmacy practice, honing their basic sciences content for relevance to practice and transitioning their curriculum and pedagogical practices from teaching-
centered to learning-centered approaches. A combination of university level and in-house workshops and programs are proposed to support faculty development efforts. The central role of Faculty leadership and policies as well as theoretical models and frameworks of effective curriculum leadership in on-going curriculum reforms regarding the role and status of the basic pharmaceutical sciences has also been described.
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APPENDIX A

Study Recruitment Invitations and Informed Consent Documents

Appendix includes:

- Email invitations
- Hardcopy letter of invitation
- Letter of Consent
Email Invitation

Dear [Faculty member’s name]:

I am contacting you to invite you to participate in a research study examining the role and status of the basic pharmaceutical sciences in our BSc(Pharm) program. The study, entitled “The Basic Pharmaceutical Sciences in Contemporary Pharmacy Education: The UBC BSc(Pharm) Program, a Case Study,” is part of the thesis requirements for my PhD degree in Education. Attached you will find a letter of invitation providing more details about the study and how you can be involved. You will also be receiving a similar invitation by mail in the next few days.

If you are interested in participating and/or have any questions about the study, please contact me by email at simon.albon@ubc.ca or by phone at 604-822-2497.

Sincerely,

Simon Albon

Follow-Up Email

Dear [Faculty member’s name]:

This message is a follow-up to a message I sent you earlier this month. As a significant contributor to and participant in the teaching of our BSc(Pharm) program, I would like to invite you to participate in a research study examining the role and status of the basic pharmaceutical sciences in our BSc(Pharm) program. The study, entitled “The Basic Pharmaceutical Sciences in Contemporary Pharmacy Education: The UBC BSc(Pharm) Program, a Case Study,” is part of the thesis requirements for my PhD degree in Education. Attached you will find a copy of the original letter of invitation sent to you earlier. You should have also received a similar invitation by mail.

If you would like to find out more about the study and/or have any questions, please contact me by email at simon.albon@ubc.ca or by phone at 604-822-2497.

Sincerely,

Simon Albon
Date

Dear [Faculty member’s name]:

I am writing to invite you to participate in a research study examining the role and status of the basic pharmaceutical sciences in our BSc(Pharm) program. The study, entitled “The Basic Pharmaceutical Sciences in Contemporary Pharmacy Education: The UBC BSc(Pharm) Program, a Case Study,” is part of the thesis requirements for my PhD degree in Education, under the supervision of Dr. Harry Hubball and Dr. Anthony Clarke in the UBC Faculty of Education and Dr. Wayne Riggs in the Faculty of Pharmaceutical Sciences. Your participation will make a valuable contribution to one of a very few studies in the Canadian pharmacy education context that is attempting the address the scientific foundations of contemporary pharmacy education.

As a significant contributor to and participant in the teaching of the BSc(Pharm) program, I am interested in your opinions and perspectives regarding the role, status, scope and depth of the basic pharmaceutical sciences needed in UBC’s BSc(Pharm) program and how these have changed. If you count yourself amongst current basic pharmaceutical sciences faculty, I am also interested in gathering information about the undergraduate course(s) that you teach including what you teach and how you teach it.

Along with approximately 30 current and emeritus faculty colleagues, you will be interviewed as part of this study. The interviews will take place in the spring/summer of 2011 and include questions about your discipline affiliation, rank, years of service, practice experience, the courses you teach/taught, the content in those courses, your approaches to teaching and course design, and your views and insights about the basic pharmaceutical sciences in the BSc(Pharm) program. The interviews will take about an hour and will be audio recorded. One and at most two follow-up interviews of about 15 minutes may be used to clarify issues raised during the interviews. For current basic pharmaceutical sciences faculty, I would also like to collect course documents, such as course syllabi, hand-outs, exams, problem sets and assignments and observe up to three of your 50 minute lectures to gather additional information about course content and your approaches to teaching and course design. The course document analysis and classroom visits will take place in the winter terms of 2011-12 and will not interrupt any of the regular activities or daily functioning of your classrooms. Scheduling the classroom visits and gathering course documents will take about 15 minutes. As a participant in this study you will be invited to review interview transcripts, classroom observation field notes and course document summaries for accuracy and readability, a task expected to take about 45 minutes. Including an initial information meeting, your total time commitment to this study will be about two and a half hours.

The results for this study will be published in the form of a thesis which you will also be able to read, and may be presented in other publications and at conferences. The Faculty of Pharmaceutical Sciences may use the results to help inform current curriculum design and development efforts regarding the BSc(Pharm) program.
Participation is voluntary and you may withdraw at any time. If you participate your identity will be kept strictly confidential. Interview tapes and transcripts, course documents, field notes and written summaries will be identified with a code number rather than your name and will be stored securely in a locked filing cabinet to which only I will have access. Neither you nor your courses will be identified by name in any reports of the completed study. Your responses will in no way affect either your standing at UBC or your job. There is no financial compensation provided to participants in this study.

If you are interested in participating and/or have any questions, please contact me by email at simon.albon@ubc.ca or by phone at 604-822-2497.

Sincerely,

Simon Albon, BSc, MSc, PhD Candidate
Senior Instructor
Faculty of Pharmaceutical Sciences
Consent Form

for the study

"The Basic Pharmaceutical Sciences in Contemporary Pharmacy Education: The UBC BSc(Pharm) Program, a Case Study"

Principal Investigator: Dr. Harry Hubball, Associate Professor, Department of Curriculum and Pedagogy, 604-822-9164

Co-Investigators: Mr. Simon Albon, PhD candidate, Department of Curriculum and Pedagogy, 604-822-2497

Dr. Anthony Clarke, Professor, Department of Curriculum and Pedagogy, 604-822-2003

Dr. Wayne Riggs, Professor, Faculty of Pharmaceutical Sciences, 604-822-2061

This study is being conducted by Mr. Simon Albon for his PhD degree in Higher Education. The results will be published in the form of a thesis and may be presented in other publications and at conferences. The Faculty of Pharmaceutical Sciences may use the results to help inform current curriculum design and development efforts regarding the BSc(Pharm) program.

You are being asked to participate in this study because you previously expressed an interest in doing so.

Purpose: The purpose of this study is to examine the role and status of the basic pharmaceutical sciences in the UBC BSc(Pharm) program.

Study Procedures: This study involves interviewing 30 current and emeritus pharmacy faculty for their opinions and perspectives on the role, status, scope and depth of the basic pharmaceutical sciences needed in UBC’s BSc(Pharm) program and how these have changed. The interviews will take place in the spring of 2011, at a time and place of your choosing. You will be asked questions about your discipline affiliation, rank, years of service, practice experience, the courses you teach/taught, the content in those courses and your approaches to teaching and course design. The interview will take about 60 minutes and will be audio recorded. Follow-up interviews of about 15 minutes...
may be needed to clarify issues raised during the interviews. If you are among current basic pharmaceutical sciences faculty, course documents that you provide for students, such as course syllabi, hand-outs, exams, problem sets and assignments, will be collected and up to three of your 50 minute lectures will be observed to gather additional information on course content and your approaches to teaching and course design. Field notes, recorded during the classroom visits, will include observations about the classroom context and setting, the scope and depth of what you teach and your approaches to teaching it. While the course document analysis and classroom visits are not meant to interrupt any of the regular activities or daily functioning of your classrooms, you will be provided with a short script to be read to your students, informing them about the study, the intent of the classroom observations, and ensuring them that no information on students will be collected. The classroom observations will not take place if any students object to having an observer in the classroom or being observed. Scheduling classroom visits and gathering course documents may require about 15 minutes of your time. As a participant in this study you will be invited to review interview transcripts, classroom observation field notes and course document summaries for accuracy and readability, a task expected to take about 45 minutes. You will also be able to read the final report. Including the initial meeting about this study your total time commitment to this study will be about two and a half hours.

Potential Risks: The anticipated risks for participating in this study are minimal. The data collection procedures are familiar activities for faculty members and the study procedures are designed to ensure confidentiality. For basic pharmaceutical sciences faculty the major risk may be a level of discomfort with being observed in your classrooms and having course documents analyzed. Clear, open and on-going discussions with you about these activities are expected to help address potential anxieties. In addition, providing opportunities throughout the study for you to review and provide input on data collected and summaries written will help engage you in the study and build your comfort level. If you are concerned about risks to your students during the classroom visits, clear and open communication based on the script to be provided is expected to help address student concerns and discomfort. The observations will not take place if the students object.

Potential Benefits: There are several potential benefits of participating in this study. In addition to contributing to on-going curriculum discussion and development efforts within the Faculty, you will be contributing to one of a very few studies in the Canadian pharmacy education context that is attempting the address the scientific foundations of contemporary pharmacy practice and education. While the study will provide a voice for all interested faculty regarding this issue, basic pharmaceutical sciences faculty members will have
an opportunity to examine the historical roots of your disciplines in contemporary pharmacy education and explore your approaches to course design and teaching practice.

Confidentiality: Your identity will be kept strictly confidential. Interview tapes and transcripts, course documents, field notes and written summaries will be identified with a code number rather than your name and will be stored in a locked filing cabinet to which only Mr. Albon will have access. Neither you nor your courses will be identified by name in any reports of the completed study. The study data will be destroyed in 5 years.

Remuneration/Compensation: There will be no financial remuneration or other compensation provided for participation in this study.

Contact Information: If you have any questions or desire further information with respect to this study, you may contact Mr. Simon Albon by e-mail at simon.albon@ubc.ca or by telephone at 604-822-2497.

Contact for concerns about the rights of research subjects: If you have any concerns about your treatment or rights as a research subject, you may contact the Research Subject Information Line in the UBC Office of Research Services at 604-822-8598.

Consent: Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time without jeopardy to either your standing at UBC or your job.

Your signature below indicates that you have received a copy of this consent form for your own records.

Your signature indicates that you consent to participate in this study.

____________________________   ________________
Subject Signature               Date

____________________________
Printed Name of Subject
APPENDIX B

Data Collection and Analysis Documents

Appendix includes:

- Letter of request for access to Faculty accreditation and review documents
- Written accreditation self-study and external review summaries (1999 and 2007)
- Interview preamble and questions
- Study script
- Classroom observation form
- Example classroom summary
- Example of interview analysis (Basic pharmaceutical scientists and role)
March 25, 2011

Dear Dr. Fielding:

I am writing to you with specific requests regarding the research study I am conducting as part of my PhD degree in Education. The study is examining the role and status of the basic pharmaceutical sciences in our BSc(Pharm) program and is entitled “The Basic Pharmaceutical Sciences in Contemporary Pharmacy Education: The UBC BSc(Pharm) Program, a Case Study.” The study involves interviewing current and emeritus pharmacy faculty, using classroom observations and course document analysis to gather information from current basic pharmaceutical sciences faculty, and developing a history of our BSc(Pharm) program. The requests are for accessing email and mailing addresses for study volunteers as well as major curriculum revision and review documents developed for the BSc(Pharm) program.

I plan to invite all full-time, part-time and emeritus faculty to volunteer for this study (~ 60 individuals) and request access to the email lists compiled by the Dean’s Office for this purpose. I also plan to send out hard copy letters of invitation through the Faculty mailroom. While full-time and part-time faculty and some emeritus faculty have assigned mail slots some do not. For those faculty members (particularly, emeritus faculty), I request access to mailing addresses available through the Dean’s Office. The email and mailing addresses requested will be used for no other purpose and will be stored securely in my office when not in use. My final request is for accessing the 1995, 2003 and 2007 curriculum revision and review documents if they are available. These documents represent an important data source for developing the history of the BSc(Pharm) program. The documents will be stored securely in my office and returned once the analysis is complete.

Thank you for your consideration of this request and I look forward to hearing from you. If you have any questions, please contact me by email at simon_albon@ubc.ca or by phone at 604-822-2497.

Sincerely,

[Signature]

Simon Albon, BSc, MSc, PhD Candidate
Senior Instructor
Faculty of Pharmaceutical Sciences
Document Type: Faculty On-Site Accreditation Review (available documents included the 1999 Self-Assessment Report from the Faculty and excerpts from the Evaluation Team Report found in the April 2001 Report to CCAPP regarding development of the new curriculum. The final Accreditation Review report from CCAPP was not available).

Coordinated by: CCAPP (established in January 1993)

Site Visit Date: November 3-5, 1999 (date obtained from the Dean’s covering letter to the CCAPP Executive Director). The Faculty had applied for accreditation of the BSc(Pharm) program in August 26, 1999. The BSc(Pharm) program evaluated during this Accreditation visit was the 1998-1999 curriculum. This curriculum had seen only minor changes from the accredited 1994-1995 curriculum; some of the prerequisite courses had been split into half-year from full-year courses (Organic Chemistry 230 into Chemistry 231 and 232; Anatomy 390 into Anatomy 391 and 392). In addition, Pharmacy 351, the pharmacy management course, had been removed in the 1998-1999 academic year; the social and administrative sciences were now not represented in the curriculum. It should be noted that the Division of Social and Administrative Pharmacy, which had merged with the Division of Pharmacy Practice in 1996-1997, was no longer represented in the Faculty’s governance structure. The 1998-1999 curriculum was granted accreditation status for two years (2000-2001) to allow the faculty to complete its outcomes-based curriculum under development at the time.

Site Visit Team: Exact composition not available.

The CCAPP Accreditation Process: The Accreditation process involved five steps including: 1) the application process (including three documents prepared by the Faculty: the application, a self-assessment report regarding eight specific areas of focus and 25 CCAPP Standards, and a strategic plan), 2) an on-site evaluation of the Faculty to seek information to supplement and validate the Self-Assessment report and determine the feasibility of the strategic plan; ratings scale used by CCAPP to assess each standard included “Met,” Partially Met,” and “Not Met.”, 3) a site visit report prepared for and submitted to the CCAPP Board of Directors, 4) the CCAPP Board decision regarding appropriate accreditation status, and, 5) reporting back to the University and Faculty. The documents reviewed here were the Faculty’s Self-Assessment report; the analysis paid particular attention to Standard 1 (Faculty Mission, Goals and Objectives) and Standards 8-14 (Academic Program).

Document Analysis: based on Hubball and Burt’s (2004) framework for learning-centered curricula and the following curriculum dimensions: context, purpose, what is taught (content knowledge), how it is taught (teaching methods), overall design and structure (with attention to coherence), and how learning is demonstrated and judged (through assessment and evaluation).
1) Context:

This Accreditation review represented the second for the BSc(Pharm) program. Based on the previous CCAPP Accreditation review, the 1994 program had received accreditation for a five year period ending in 2000 (1995-2000). This was a time of great change at the University under the leadership of Dr. Martha Piper (1997-2006), UBC’s 11th President. The University’s Trek 2000 visioning process revolving around five pillars (People, Learning, Research, Community, and International) included a major refocusing on the importance of teaching and learning in the student experience at UBC. More broadly, Trek 2000 involved a major rethinking of the University’s role in society and the world. At the national level in pharmacy, curriculum deliberation was moving towards outcomes-based education in alignment with changes adopted nationally by US schools of pharmacy; in addition to outcomes-based education, US schools had been mandated to implement the six year Doctor of Pharmacy (PharmD) programs as the entry-to-practice qualification by 2000. In the Canadian context, AFPC had developed and published two seminal documents that had major impact on pharmacy education and the CCAPP Accreditation standards. These included the “Educational outcomes for a Baccalaureate Pharmacy Graduate in Canada” and “Development of Levels and Ranges of Educational Outcomes Expected of Baccalaureate Graduates: A Supporting Document to the Educational Outcomes for a Baccalaureate Pharmacy Graduate in Canada” documents published in May 1998 and March 1999, respectively. Two UBC faculty members participated in the development of these documents. Three additional changes at the national level took place during this time that had significant impact on pharmacy education: 1) CCAPP accreditation standards were revised in 1999 to reflect the move towards outcomes-based pharmacy education, 2) NAPRA’s Mutual Recognition Agreement was signed in April 2000 by all provinces and territories in Canada allowing pharmacists to practice anywhere in the country (this mobility agreement aligned with the Federal Agreement on Internal Trade that came into effect in 1995) and, 3) PEBC changed its national comprehensive certification process to include the practical structured objective clinical exam (OSCE) in May 2001 (a similar practical exam had been in use in British Columbia since the 1970s; the development of the national OSCE exam drew heavily from the BC experience).

With a change of Dean in 1996, the Faculty embraced the Trek 2000 vision and the move nationally towards outcomes-based pharmacy education although the translation into the curriculum was slow. More generally, the period between 1996-2002 involved a great deal of activity within the Faculty that could be characterized as a time of extended consolidation and securing the foundations that had been established during the previous administration; the importance of broad consultation between faculty, students, staff and external stakeholders was becoming increasingly important. In the summer of 1997 the Faculty embarked on comprehensive strategic planning process culminating in the Faculty’s first official strategic plan for the period of 1998-2001 entitled, “Moving into the 21st Century: A Vision for Change.” The plan was intended to address deficiencies recognized in the 1994 Accreditation and 1995 Faculty Reviews and mirrored the five pillars of UBC’s Trek 2000 document. While the mission and vision of the Faculty did not change from that adopted in 1994, four major areas of refocusing were identified: 1) Structure, communication and development, 2) Curriculum and teaching/learning strategies, 3) Research and graduate education, and, 4) Resources. The importance of Faculty cohesiveness and inclusiveness as well as the research mandate was emphasized in the strategic plan (and throughout the Accreditation documents). The discipline-based divisional structure within the Faculty was maintained but the divisions were renamed.
“research divisions”; the engrained nature and dominance of the research mandate seemed to reach its peak of importance at this time (words such as interdisciplinary, interprofessional, and cross-faculty described the research trends to be embraced). The Faculty appeared well recognized and connected within the University and the profession; there was a greater emphasis on the role and importance of the Faculty within the University community, the profession, the health care system and society. While there was no apparent threat to the profession acknowledged or perceived in the Accreditation documents, demographic changes in the Canadian population (ie., related to aging), the increasing complexity of health care (exponential growth in knowledge, drug entities and possible therapies), competitiveness for research funding, and the growing importance of technology in all aspects research, professional practice, education and Faculty operations were recognized as contextual factors influencing the Faculty’s future. The singular goal of the “curriculum” piece was to develop an outcomes-based curriculum although emphasis on the learners (to this point in the Faculty’s history students played only a minor role in issues of curriculum development), development of critical thinking and problem-solving skills, and assessment and evaluation were emerging as important; this aligned well with the University’s focus on quality teaching. Between 1997-2001, the Faculty, through an exhaustive and inclusive process, created an abilities-based curriculum although the program evaluated in the 1999 Accreditation Review was the similar to that accredited in 1994 (the revised program was not implemented until 2003). All aspects of the program were reviewed including optimizing the educational outcomes, content, assessment and teaching practices for the revised BSc(Pharm) program; the role and impact of learners was an important aspect of the curriculum development process and for the first time a theoretical framework for curriculum development (learning-centered curriculum development framework) underpinned the developmental process. It is interesting to note that the concept of pharmaceutical care was acknowledged as important but mentioned only minimally throughout the document; there appeared to remain reservations about what pharmaceutical care meant and how it manifested in practice. These sentiments are captured in the following quote, “The UBC program is not overly dogmatic about pharmaceutical care. We recognize that pharmaceutical care represents a vision of practice that contemporary pharmacy in Canada has embraced as the standard by which the profession will be judged…there are many who see pharmaceutical care as an ethereal concept – reflective of a ‘style or attitude about practice’ rather than a ‘distinct type of practice’. The UBC undergraduate program has a tradition of offering a strong discipline-based core education that supports pharmaceutical care practice skill development in students and that also gives students reasonable flexibility to enhance the university experience through a variety of elective choices.” In general, a more global view of the pharmacist’s role in health care and the role of the Faculty in addressing the challenges faced in practice was evident.

2) Purpose:

The Accreditation documentation clearly articulates the purpose of the program, “to prepare graduates who are capable of pharmaceutical care practice.” This purpose was similar to that articulated in the 1994 Accreditation Review documents (the program accredited here was similar to that accredited in 1994). The revised curriculum retained its tradition of a strong discipline-based core that supported pharmaceutical care skill development in students and also gave students reasonable flexibility to enhance their university experience through a variety of elective choices. In addition, a long-held view that the program should support those wishing to pursue graduate studies in the pharmaceutical sciences as well as other health
professions was maintained (reflecting the strong research focus in the Faculty). While the new outcomes-based program was under development, the acknowledgement of the rethinking necessary to revise the current pharmacy curricula to educate contemporary pharmacists to practice pharmaceutical care was very evident. (see Standard 8, Academic Program).

3) What was taught (content knowledge?)

The program accredited here was very similar to the one accredited in 1994 with only minor changes. The program maintained a strong scientific foundation in the pre-pharmacy year (including biology, chemistry both general and inorganic, physics and mathematics) as well as during the pharmacy program (the biomedical sciences of anatomy, physiology, microbiology, immunology and biochemistry supported the pharmaceutical sciences of medicinal chemistry, pharmaceutics, pharmacology and toxicology; pathophysiology was incorporated into therapeutics). Biotechnology and statistics were also included in the program. Minor changes to organic chemistry and anatomy courses had been made and social/behavioral pharmacy had been removed from the curriculum (P351); while the length of the experiential component of the program had not changed, the clerkship between 3rd and 4th year had been given credit. The sequential and concurrent components of the program included basic sciences and humanities, basic biomedical sciences, pharmaceuticals sciences, experiential learning opportunities and electives; foundational biomedical and pharmaceutical sciences built through Year 1-3. The integrated “Drugs” courses had moved medicinal chemistry, pharmacology and therapeutics earlier in the program but continued to be focused in Years 3-4. Pharmacy practice courses were spread over years 1-3 with experiential and electives concentrated in the final year. The program included a 4 week community practice clerkship between 3rd and 4th year, a 2 week institutional and 2 week community rotation in 4th year (8 weeks in total); the clerkships were unstructured and preceptors received no training. Interprofessional education was identified as important.

4) How it was taught (pedagogical practices)

The increasing importance of teaching and learning was apparent; greater emphasis on active and student-centered practices was evident. Although the prominent delivery mode was the traditional lecture, problem-based learning, case-based learning, participatory workshops, web-based learning, oral presentations, portfolios and directed studies among other teaching methods were increasingly important. Emphasis on technology-based teaching practices (CD-Rom and WebCT) was evident. Laboratories including practice skills, pharmaceutical analysis and pharmaceutics continued to be important.

5) Assessment and Evaluation

Academic progress was measured predominantly through traditional coursework tests and assessments. Student readiness to provide pharmaceutical care was evaluated through performance in undergraduate courses and laboratories, preceptor assessments in clerkships and student self-assessments. The recognition of the increasing importance of assessment and evaluation was evident in the report. Additional indicators of student performance had also been identified such as exit interviews, success rate of PEBC board exams and annual success rates of those UBC students applying for registration with College of Pharmacists of BC. The language of assessment and evaluation was evident in the report (formative and summative assessment).
6) Curriculum Design
The program followed the typical pattern of BSc(Pharm) programs in Canada, the 1+4 design. The linear sequential building blocks approach included a pre-pharmacy year followed by the four year program of the pattern: basic sciences and humanities, basic biomedical sciences, the basic pharmaceutical sciences, and therapeutics. Pharmacy practice courses are found in the first three years of the program with experiential clerkships and electives offered towards the end. A total of 8 weeks of experiential training was included in the program.

7) Coherence
While greater emphasis on integration was evident only limited recognition of cohesiveness and integration of the curriculum was evident; the program remained discipline based (built around discipline streams) with the integration of the pharmaceutical sciences and therapeutics given particular attention. Integrated “Drugs” courses involving medicinal chemistry, pharmacology and therapeutics had been in place since 1993 and course streams were an important aspect of curriculum revision (pharmacy practice, pharmaceutics, and experiential courses). While integration within the program was emerging as an important aspect of curriculum design there was limited discussion of integration other than within disciplinary course streams. A teaching support group was established in April 1998; first opportunity within the Faculty to discuss issues of teaching and learning more broadly.

Overview: Review of this report indicated several key issues arising. Generally the Faculty was fully engaged in rethinking its role within the University, the health care system and society; a great deal of effort was focused on curriculum renewal even though the curriculum being accredited had been in place since 1994. While the curriculum maintained a dominant focus on the scientific foundations, the growing importance of clinical pharmacy, experiential learning, and curriculum development was evident in the report. Pharmaceutical care was recognized in the document but there was resistance to its adoption as the philosophical basis of the program; the Faculty upheld its traditional perspective to maintain a strong disciplinary science-based core education. The content of the program had not been thoroughly reviewed and there was little recognition of how the material fit together conceptually. Teaching practices other than lecturing (including technology-based approaches) were becoming increasingly important as was faculty development (many members had completed UBC’s Faculty Certificate Program). The importance of assessment and program evaluation emerged.

Areas of Deficiency identified in the 1999 Accreditation Report (similar issues were identified in the 1994 Accreditation Report):

- While the Faculty had developed a strategic plan, a plan for implementation was lacking.
- While the program had a sound scientific basis more experiential learning opportunities were required.
- Greater socialization required in the program. It was suggested that this could be addressed by introducing experiential learning earlier in the program.
- The program was not outcomes-based and not aligned with CCAPP outcomes-based accreditation standards revised in 1999.
- Our graduates were not practice ready requiring more problem-solving and critical thinking skills in disease state management; our students were having trouble with patient situations involving multiple disease states and therapy. The dominant product focus of practice remained in community pharmacy.
- The program did not have a systematic means of assessment and evaluation of educational outcomes.

**Document Type:** External Review of the Faculty of Pharmaceutical Sciences (October 2007). Available documents included the Faculty’s 2007 External Review documentation; a single binder containing 8 sections including an extensive review of the “Undergraduate Program.” The University Review Report was not available.

**Coordinated by:** UBC’s Vice President Academic and Provost in October 2007.

**Review Committee:** Details not available.

**Focus of the Faculty Review:** This Faculty review was part of the periodic reviews undertaken by the University (the last external review of the Faculty was conducted in 2001; this review was not included in this study). Key issues of focus in the review included the academic strength and balance of the Faculty in teaching, scholarly activity and service; to assess the Faculty’s standing nationally and internationally; and to advise of future development. More specific issues addressed included the Faculty’s structure and organization, adequacy of facilities and support personnel, organization and strength of graduate programs, and linkages with other UBC units and external professional organizations.

**Document Analysis:** based on Hubball and Burt’s (2004) framework for learning-centered curricula and the following curriculum dimensions: context, purpose, what is taught (content knowledge), how it is taught (teaching methods), overall design and structure (with attention to coherence), and how learning is demonstrated and judged (through assessment and evaluation).

1) **Context:**
Under the leadership of a new Dean beginning in 2002, the Faculty embarked on a period of re-branding itself. The Strategic Plan, initiated in March 2003 and approved in June 2005, for the period of 2005-2009 embodied this change, “Next Level – Pre-Eminence.” Aligned with the University’s Trek 2010 visioning process, the Faculty’s Strategic Plan revolved around guiding principles and values related to UBC’s five pillars (People, Learning, Research, Community, International); the Strategic Plan was built around “The Faculty of Pharmaceutical Sciences story” (p. 32). **Enhancing the Faculty’s profile** and communications with the University’s leadership, the Provincial Government, and pharmacy stakeholders was a major focus of the Strategic Plan (ie., building awareness about the profession’s role and Faculty’s significance in addressing the health care challenges in BC and Canada). Emphases in the Accreditation self-study document included: 1) the changing role of pharmacy and evolving scope of practice
for pharmacists in the health care system, 2) reasserting the importance of and crucial need for the Faculty’s research capabilities for tackling chronic disease and addressing the broader pressures in the health care system, 3) a heightened awareness of the central importance of curriculum renewal for educating contemporary pharmacy practitioners for the increasingly complex and ever-changing health care environment, 4) the comprehensive approach to curriculum design, implementation, pedagogical practice and evaluation, and, 5) the need for reconnection with our social responsibility to British Columbians and Canadians through “true partnerships” with pharmacy stakeholders was of primary importance. In addition, creation of a Centre for Drug Research and Development in conjunction with intensive planning and lobbying for a new Pharmaceutical Sciences building was underway. While the potential for internationalization within the Faculty was acknowledged, the mission of the Strategic Plan was national recognition, “To be the leading pharmacy school in Canada” (p. 3).

At the time of the Accreditation Review two undergraduate pharmacy curricula were operating. The first three years of the of the new BSc(Pharm) curriculum were in place. The fourth year of the old curriculum was offered for the last time in 2005/06, after which it was replaced by the fourth year of the new curriculum. A great deal of energy was focused on implementation of the new BSc(Pharm) program. The Faculty had fully embraced the direction of the University, positioned itself to achieve higher profile with external stakeholders and attempted to embody nationally accepted outcomes-based pharmacy education and pharmaceutical care (although their penetration into classrooms was variable). Regarding the new BSc(Pharm) program all aspects of the program were reviewed including optimizing the educational outcomes, content, assessment and teaching practices for the revised BSc(Pharm) program.

2) Purpose:

The Accreditation review documents clearly articulate the purpose of the BSc(Pharm) program: “The new abilities-based curriculum is designed specifically to train competent generalist pharmacists who are able to provide pharmaceutical care to patients and have the self-directed learning skills to adapt to the ever-changing health care environment” (p. 9 or p. 76). “The new curriculum retained the goal of the old curriculum, which was to have students pursue, acquire and evaluate information regarding the safe and effective use of drugs, while at the same time emphasizing the pharmaceutical care model of practice as the underlying philosophy guiding much of the curriculum design, content selection, instruction and evaluation” (p. 76). “The goal of the new program emphasized the detection, resolution and prevention of medication-related problems” (p. 76).

3) What was taught (content knowledge?)

The new pharmacy program included a comprehensive curriculum representative of contemporary pharmacy practice. The program maintained a strong scientific foundation in the pre-pharmacy year [including biology, general chemistry (inorganic had been eliminated), physics and mathematics] as well as during the pharmacy program [the biomedical sciences (anatomy, physiology, microbiology, immunology), biochemistry and organic chemistry that supported the pharmaceutical sciences of medicinal chemistry, pharmaceutics, pharmacology and toxicology; pathophysiology was incorporated into therapeutics]. Biotechnology, pharmacogenomics, and statistics were also included in the program. The sequential and concurrent components of the program included basic sciences and humanities, basic biomedical
sciences, pharmaceutical sciences, social/behavioral pharmacy, experiential learning opportunities and electives; foundational biomedical, pharmaceutical sciences and therapeutics are built through Years 1-3; pharmacy management is reserved for Year 4. Pharmacy practice courses were spread over years 1-3 with experiential and electives concentrated in the final year. The program included a 4 week community practice clerkship between 2nd and 3rd, another 4 week rotation between 3rd and 4th year, a 4-week institutional and 8 weeks community rotation in 4th year (20 weeks in total).

4) How it was taught (pedagogical practices)

The importance of teaching and learning was emphasized; greater emphasis on active, learning-centered teaching practices and student accountability for their learning was evident. Students were encouraged to engage in self-reflection about their success in achieving outcomes and to engage in self-directed learning. Although the prominent delivery mode was “standard lectures and laboratory activities…students are exposed to a mixture of independent learning, self-directed learning, small group work, and critical thinking exercises” (p. 10). A wide variety of teaching methodologies including for example, problem-based, case-based and web-based learning, the use of standardized patients, oral defenses and laboratory-based exercises, were employed. Faculty was encouraged to take professional development to enhance teaching and learning skills.

5) Assessment and Evaluation

The recognition of the growing importance of assessment and evaluation in curriculum design was evident in the report. Academic progress was measured through “a variety of assessment strategies to measure cognitive learning, practical skills and problem solving abilities” (p. 10). Student readiness to provide pharmaceutical care was evaluated through performance in undergraduate courses and laboratories, preceptor assessments in clerkships and student self-assessments. Additional indicators had also been identified such as exit interviews, success rate of nation board exams and annual success rates of those UBC students applying for registration with College of Pharmacists of BC. In addition, comprehensive program evaluation had been developed and implemented; curriculum mapping was also initiated.

6) Curriculum Design

The new program maintained the typical design of BSc(Pharm) programs in Canada, the 1+4 design. Extensive analyses of contemporary pharmacy practice and education as well as consultation with critical stakeholders were used for designing the new program (development of the new program took place between 1997 and 2001). Disciplinary course streams were introduced into the program as well as case-based courses (CAPS; Cases in Pharmaceutical Sciences) were included in each year to integrate the content and skills being taught in all other courses in that year. In addition, experiential learning opportunities were increased were increased to 20 weeks from 16 weeks with experiential training occurring earlier in the program (beginning at the end of second year instead of third year). To accommodate these changes the number of electives was reduced from 24 to 18 but the breadth of electives opportunities were expanded. Although the program was developed along disciplinary lines, greater emphasis on learning-centered curriculum design was evident and students were given more responsibility for their learning. The linear sequential approach included a pre-pharmacy year followed by the four
year program of the pattern: basic sciences and humanities, basic biomedical sciences, the basic pharmaceutical sciences, and therapeutics. Pharmacy practice courses are found in the first three years of the program with experiential clerkships and electives offered towards the end. A total of 20 weeks of experiential training was included in the program.

7) Coherence

Greater emphasis on integration was evident particularly within course streams (pharmacy practice, pharmaceutics, and experiential courses). “Concerted effort on the part of many instructors to meet regularly to discuss mechanisms to coordinate content across courses” (p. 10) provided evidence of greater program cohesion. Attention was paid to coordination of content across courses and course scheduling to facilitate greater integration. Implementation of a “Comprehensive Program Evaluation” process, curriculum mapping exercises and the indication in the Strategic Plan of a “framework for curriculum planning” (p. 8) and “horizontal and vertical integration of content, skills and learning activities” (p. 9) provides further evidence of an emerging awareness of the importance of cohesion in the curriculum. The integrated courses of earlier curricula involving medicinal chemistry, pharmacology and therapeutics had been eliminated.

Overview:

Review of this report indicated several key issues arising. Analysis of the Accreditation Review documents provided strong evidence into the growing awareness of the Faculty’s recognition of the contextual factors impacting its future. Reaching out to a broad range of stakeholders (students, faculty, university administration, professional bodies and governments) and reasserting its profile appeared to be the major thrust of the Faculty’s deliberations. Generally the Faculty was fully engaged in rethinking itself, its place within the university and amongst the health professions. A great deal of focus was on issues related to the health care challenges of the day and how to train pharmacists to meet these challenges. The philosophical basis for the curriculum was pharmaceutical care but the words “patient-centered care” or the focus on the “patient” is minimal; this may have to do with a lack of understanding about what pharmaceutical care meant, its lack of visible penetration into practice settings or the emphasis on the “patient” may have been implicit in the definition of pharmaceutical care. The attention paid to curriculum renewal and the processes and thinking that took place in developing the new curriculum were very evident; more than any previous Accreditation or Faculty Review documentation the number of pages dedicated to descriptions of the curriculum thinking and work undertaken was evident as were the intentions described in the curriculum documentation. It embraced learning-centered approaches to curriculum design, teaching practice and emphasized the accountability of students and faculty in the learning process. Through this documentation the Faculty seemed to be on the verge of a break-through regarding its thinking and approaches to curriculum design and enactment. While the curriculum remained discipline-based maintaining a focus on the scientific foundations, the importance of experiential learning dominated the report; there was more recognition of how the material fit together conceptually and the importance of coherence between content, assessment and teaching methods. The curriculum embodied curricula of the information or “patient-care” era.
The Basic Pharmaceutical Sciences in Contemporary Pharmacy Education: The UBC BSc(Pharm) Program, a Case Study

Semi-structured Interview Protocol

Interview preparations & preamble: As a significant contributor to and participant in the teaching of the BSc(Pharm) program, I am interested in your opinions and perspectives regarding the role, status, scope and depth of the basic pharmaceutical sciences needed in UBC’s BSc(Pharm) program and how these have changed. You are among approximately 30 current and emeritus faculty colleagues contributing to this study, which is one of a very few studies in the Canadian pharmacy education context that is attempting to address the scientific foundations of contemporary pharmacy education. The interviews will begin by recapping the study plans and intent, the risks and benefits of participation, and issues related to confidentiality. An overview of the interview format and questions as well as any follow-up procedures will also be given (ie., follow-up interviews, member checking activities, sharing of research findings). Interviews (~45 minutes) will be audio-taped and researcher journal notes will be generated following the interviews to capture general impressions typical or atypical of the study protocol and issues. Interview transcripts the original audio files and any completed tasks will be stored securely in a locked cabinet prior to analysis.

Background and Contextual Interview Questions (structured interview component):

1) For follow-up purposes, what is the best way to get in touch with you?

Background

2) When did you join the Faculty?
3) How many years experience as a Faculty member do/did you have?
4) What is/was your current rank and appointment status [full-time, part-time (%), emeritus, tenured/non-tenured]? Are/were you cross-appointed? What is your appointment status with the Faculty now? In the time you have been with the Faculty has your rank and appointment status changed?

Discipline Affiliation

5) What is/was your discipline affiliation? (pharm. chem., pharmaceutics, pharmacology, clinical, practice)?
6) How do you self-identify in terms of your expertise? (ie., My background is in _______ and my area of specialization is _______?)

Practice Experience & Impact on You as an Educator

7) Have you practiced before? For how long? Where and what did you do? Does/did your current Faculty appointment include a practice component? How do you keep current with what is happening in practice?
8) How has your practice experience impacted you as an educator? How does it impact what you do in your classrooms?
9) Do you need practice experience to teach?

Clarifying What the “Basic Pharmaceutical Sciences” Are

10) When you hear the phrase the “basic pharmaceutical sciences” what disciplines of pharmacy come to mind?

Clarifying What “Contemporary Pharmacy Practice and Education” Means

11) The Blueprint for Pharmacy’s vision for pharmacy practice and education is “optimal drug therapy outcomes for Canadians through patient-centred care…[and that the ]
quo is not an option.” Are you in agreement with this strategic direction for practice and education? What are your perspectives on the future of pharmacy practice and education?

**Approaches to Course Design and Teaching Practice**

12) Had you taught before you joined the faculty?
13) What courses did/do you teach? Names, year and content focus? Core or elective courses? Number of hours per year? Number of students?
14) How do you go about designing your course(s)? Do you use a process? Can you describe it? Do you use models? Intuition? Has your approach changed over time?
15) Do you use objectives? How do you decide on objectives? Have you changed your course objectives recently?
16) How do you decide on what content to include in your courses? How do you determine the depth and scope of content to include? How much is enough? Do you have a process for deciding? Has the depth and scope of the content in your course changed over time? In what ways? Why? How? Based on what evidence/indicators?
17) Is there consensus amongst your colleagues about the content in your course(s)?
18) Describe your approach to teaching? Describe a typical day in your classroom.
19) What typical teaching strategies did/do you employ? Has your approach to teaching the basic pharmaceutical sciences in your course changed over time? In what ways? Why? How? Based on what evidence/indicators?
20) What kind of assessments do you typically use in your course?
21) In what ways do you connect your course content to practice?

**Open-ended Interview Questions** (unstructured interview component):

1) What are your perspectives on the role (ie., the characteristic or expected function) of the basic pharmaceutical sciences in the pharmacy curriculum?
**Possible probes:**
- Do the basic pharmaceutical sciences have a role in contemporary pharmacy education? What is it? What about in your own teaching?
- Is there a place for the basic pharmaceutical sciences in contemporary pharmacy education? Explain. What if we got rid of them?
- Do they factor into your thinking about your area of expertise? Are they a component of the way you think about pharmacy or go about solving pharmaceutical problems? Are they an aspect of your decision making? To what extent?
- Has the role of the basic pharmaceutical sciences in your curriculum changed over time? In what ways?

2) What are your perspectives on the status (value judgment about level of importance) of the basic pharmaceutical sciences in your pharmacy curriculum?
**Possible probes:**
- Do the basic pharmaceutical sciences come up in your discussions with colleagues and at Faculty meetings? What are the key issues that emerge?
- What is its current status? What about in your own teaching? Amongst your colleagues?
- Has the status of the basic pharmaceutical sciences in your curriculum changed over time? In what ways? Why? How? Based on what evidence/indicators?
- Can you suggest any strategies that might be useful for determining how much basic pharmaceutical sciences content should be included in the curriculum?

3) What is the knowledge base of contemporary pharmacists?
Script to be Read at the Beginning of Your Class:

Dear Pharmacy Students:

Our class today is part of a research study being conducted by Mr. Simon Albon as part of the thesis requirements for his PhD degree in Education. He is working under the supervision of Drs. Hubball and Clarke in the UBC Faculty of Education and Dr. Riggs in our Faculty. The project title is “The Basic Pharmaceutical Sciences in Contemporary Pharmacy Education: The UBC BSc(Pharm) Program, a Case Study” and is examining the role and status of the basic pharmaceutical sciences in our BSc(Pharm) program. This study represents one of a very few studies in Canada that is attempting the address the scientific foundations of contemporary pharmacy education.

Simon has asked my permission to attend and observe today’s class to gather information on what I teach during the lecture and how I teach it. The focus of his observations is on me as the instructor and on the instructional process. As students attending this class today you are to be ensured that the purpose of the study is to observe what I do only and that no information will be collected on you, the students. At this time, if you have any questions or concerns about the study and the observations taking place in our class today Simon and me would be happy to try to answer them.

Thank you for your time and consideration of this matter.

Sincerely,

[Faculty Member] and Simon Albon
# The Basic Pharmaceutical Sciences: A UBC Case Study

## Classroom Observation Form

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**Initial Observations:**

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**Lecture Topic:**

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**Observations during lecture:**

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**Summary comments:**

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Classroom Observation Summary

**Date:** November 1, 2011  **Course:**  **Member Code:** PT-05  **Time:** Tuesday, 2-3pm

**Place:** IRC 6  **Topic:**  

**Summary Purpose:** The purpose of this summary is to describe what happened during the class. It is not intended as a peer review of the instructor’s teaching practice (i.e., strengths and weaknesses) and does not include broader analysis or synthesis of ideas. What is important is that the summary represents as realistic a picture of the class as possible from both the observer and observed perspectives. Please review and add any changes suggestions you think are important. The final summary will become an important data source for the research.

**Classroom summary:**

This lecture represented the first in a series of four lectures on the topic of hemostasis. This first lecture focused on the processes of hemostasis (i.e., anatomy of blood vessels and physiology of blood clot formation). Specific hemostasis topics included the processes of platelet adhesion and activation. The November 2nd & 4th lectures will complete the platelet activation and aggregation processes and proceed to the pharmacology of antiplatelet drugs, anticoagulant drugs and thrombolytic agents. This third year lecture was scheduled for 2-3pm on Tuesday afternoon in IRC 6. This room is familiar to the instructor and students as much lecture-based teaching takes place in this room (this is one of the primary teaching rooms for teaching in pharmacy’s academic programs). The room itself has undergone recent renovation and includes tiered lecture-style seating for ~180 students and a full range of teaching technologies. These include data supports for PowerPoint and Internet use, doc cams, microphones, whiteboards, overhead projectors. The instructor used a pin-on microphone throughout the lecture and had the lecture captured digitally for students to review on their own time. The room is a comfortable teaching space.

Students wondered into the room slowly at first followed by a flood of students just before the start of the class. There was lots of chatter and activity amongst students. This group of students has been together for three years (this will be their third year together) so the camaraderie amongst students was evident; lots of laughing, joking and discussion. Some students had laptops open, surfing the Internet. The chatter/murmurs continued until the instructor began the class (at 2:00pm using the pin-on microphone) with an announcement from a faculty colleague (lasting about 5-7 minutes) and then a short announcement about the research study taking place in the classroom. Students continued to chatter until the instructor specifically asked them to come to attention (on a couple of times). No students wondered into class late and there were no audible background murmurs or low grade noise throughout the class. The student remained focused during the entire lecture.

The instructor arrived at the lecture hall about 10 minutes early to get set-up for the lecture; he had walked over to the lecture hall with a graduate student who helped to carry and distribute the lecture hand-outs. Technology (PowerPoint presentation) was readily set-up (instructor used his own computer and appeared comfortable in this teaching space); the instructor chatted with the faculty colleague prior to the start of the class. The class started at 2pm followed by announcements (as mentioned above). The instructor started his lecture at
2:10pm by explaining to the students that there was a hand-out for today and that the lecture materials would be posted on Vista, including the lecture capture. The instructor emphasized that the students should just listen rather than write notes; the instructor asked the students to settle, purposefully stopping at one point to get their attention.

The lecture started with an overview of the series of lectures as well as a brief look at the lecture objectives. The instructor asked the students some questions about common (historic) anticoagulants that student might recognize (ie., ASA) and then moved into the lecture material. Using the materials on the PowerPoint slides to focus the explanations, the instructor moved through an overview of the anatomy, physiology and pathophysiology of hemostasis. During the initial explanations the instructor mentioned that the students will have seen this before (in their arthrosclerosis lectures earlier in the term; the instructor had worked this class in September) and that these materials were likely review. The overview took about 10 minutes (during this section the instructor asked students about their prior knowledge about the clotting process; students replied their knowledge was about medium). The lecture continued with a description of the events leading to thrombus formation including the processes of adhesion and activation of platelet cells. The adhesion processes were discussed for ~20 minutes (finishing at ~2:40pm) and included a description of the size of the platelets relative to RBCs and WBCs and the platelet receptors and their roles in adhesion (how platelets get initially anchored at the site of injury). The last 10 minutes of the class were spent discussing the activation processes of thrombus formation (how the anchored platelets attract additional platelets to build the thrombus); about half of this section was completed. As part of this section the instructor asked students if they knew what ASA does and where it acts in this process; students responded quickly. During these explanations the instructor did not use any notes and provided only minimal text/notes on PowerPoint slides; pictures/diagrams and schematics were used to describe the central processes. In addition, many different pictures (renditions of the same process) were used to discuss the central concepts in different ways. The approach approximated a process of “spiraling forward” through the materials (continuous review as part of the discussion of new ideas). The instructor was very intense during the lecture standing behind the lecture podium throughout the lecture and using a laser pointer to work carefully through the diagrams and pictures on the PowerPoint slides. The instructor held onto the laser pointer with both hands to ensure students attention was focused on the specific section of the picture/diagram and process under discussion; clear explanations of the processes involved appeared central to this instructor. Students were very focused throughout the lecture following the PowerPoint slides as the instructor spoke; the sound of flipping hand-out pages was audible. Some students were busy writing additional notes on the hand-out while some just sat and listened. Throughout the lecture the focus of delivery was on the instructor and the lecture content; the questions from students (1-2) were answered fully and completely. The lecture finished at 2:50pm. The instructor indicated that the next lecture would focus on the role of calcium in platelet activation. The instructor answered questions from several students at the end of the lecture spending the time to answer the questions fully.

Post-lecture discussions with the instructor indicated that this lecture was typical of the approach used in this and other courses in which he taught. In terms of content, the flow followed a similar progression: anatomy, physiology, pathophysiology moving into pharmacology and drug action. Drug names are used with limited focus on drug structure and med chem.; there was only peripheral mention of drug delivery routes. In terms of lecture delivery the instructor emphasized a professional approach and indicated that all the lecture materials were on Vista including the podcast, slides, and written notes; the instructor felt the
students had access to ample materials to learn and understand the materials. The instructor also mentioned how quickly things were changing in this area requiring constant changes to notes and specific drugs that needed to be included in these lectures.

**Additional questions for feedback:**
Was this a typical class?
Does this summary capture your experiences? Would you add/modify anything to capture your experiences?
Basic Pharmaceutical Scientist’s Responses: Addressing role

Interview Analysis Phase 1: reading original transcripts line-by-line, open coding each line or segment (shown as bolded text within the quote), and cutting and pasting from transcripts into this document.

1) Interview Question: What is the role of the basic pharmaceutical sciences in a pharmacy curriculum? (And by role, what type of function do they play? Do they have a function? What should that function be?)

PB02 (421-425): They need pharmacology and pharmaceutics but not med chem.: so do you put medicinal chemistry as a basic pharmaceutical science? It’s very important in development and so on, but is it important for a pharmacist? Maybe not, you know? I think all the other ones I think are important and (can’t reduce them) we can’t make them shorter, --- make them a bit longer, some ways. One thing that I always would like is that they actually have a lab for those guys.

PC04 (605-614): Yes as support knowledge for knowing how drugs work; reasons why it has a role: Yeh, it’s the support knowledge. It’s the knowledge that you need to have, it’s the things you need to have seen to understand how these things work.

PC05 (630-643): Yes; Sets the fundamentals, to look deeper into therapeutics: I think the basic science should . . . should teach the students how to explore. It’s . . . teach the students how to explore the mechanism . . . I’m not sure if it’s the mechanisms . . . to look more deeply into and help . . . it should cause the students to look more deeply into the therapeutics of the drug. Encourage them, at least, to see that there’s more to the drug therapy than giving a dose in a particular form to a patient and getting a response. And I think that, if you want to do it that way, you can be a good therapeutics person but you can’t be a creative therapeutics person….To make the students more creative in their therapeutic area, in their chosen profession. To make them more creative. The more you understand the fundamentals, and the deeper you can go into the fundamentals, the more creative you can be in the application of those fundamentals to whatever you’re doing.

PB01 (293-301): Yes. Model of knowledge development: Well I guess what I would say is that I regard a curriculum a bit like a pyramid, and the bottom base of that pyramid… let me step back further, the basic bio-medical sciences are the ground floor of that pyramid, so here I am talking about organic chemistry, biochemistry, microbiology, physiology, anatomy… and then the next layer up is the basic pharmaceutical sciences, and I think probably 10 years ago I’d have said practice was the layer on the top, but now I would revise that, having sort of chewed over curriculum over a long period of time and thought about the way our program needs to head, I would put it as very much a longitudinal part, that isn’t the capstone anymore that really runs the entire length of that pyramid.

PT04 (467-470): Yes as the underpinnings of therapeutics: I think that basic pharmaceutical sciences are the underpinnings of therapeutics. I think that we can’t teach therapeutics without our students knowing the basic pharmaceutical sciences. I think it’s just a question of how much we teach and how relevant it is. I think it all has to relate to the final product.

PT01 (682-689): Yes since this is a Bachelor of Science degree: Well, as long as this stays a bachelor of science degree, I think we should be teaching some science. In fact, we under-teach
science in this program and I think... the assumption is that every single student is going to be a practitioner, and arguably that’s mostly true. But the idea is to get a rounded education, and this is an academic institution and if people walk out of here, if all they could do was practise pharmacy, they cannot possibly work in the industry because they don’t even know what a suspension is, beyond that they know it’s a suspension and you have to shake it when you give it to them. Then I think we’re really losing the value of an academic degree.

EF01 (352-359): Yes as the knowledge base: Well, of course they fulfill a knowledge base. It’s important that you have that to build on your knowledge of the use, the proper use of drugs and so on, and any problems that arise. And I think that we shouldn’t ignore that in pharmacy. Now we... I’m not saying we don’t review the basic sciences on a fairly regular basis because they’re important, (It’s not enough to know just therapeutics because the pharmacists role is changing) but we should never kind of just say, well all they need to know is how they should be used and side effects and all that, and that’s all we need to do. That’s not enough. Because pharmacists are getting into roles where they do have to be decisions makers and make judgement calls. That’s a whole different ball of wax...(359- 369) Physician’s role and who is going to know the science if medicine has removed the science from its program, carving out the niche for pharmacists: Before you could always just say that’s the doctor’s responsibility. It’s not going to be that way. And so you’re going to have to live and die by the decisions you make. So, I think we have to be very careful that they get the knowledge base so they can make proper decisions. And I just... what worries me a little bit is that I’ve looked at medicine and medicine has gutted their basic medicinal sciences, and I think that’s wrong because I think that... and we have guys writing prescriptions about drugs they do not understand the drugs at all. Only what they’re supposed to do. And maybe that’s... they’re going to leave that for pharmacists to look after, that’s all part of the health team, but I think that’s wrong. I think their fundamental knowledge about drugs and what they do is wrong. I mean... and we have people in medicine that really don’t understand much chemistry. That’s terrible. And I don’t want pharmacy going that route.

EF03 (430-433): Yes, they are fundamental: I think they’re fundamental. (Part of the building blocks; model) They’re adding on to the pre-pharmacy courses that they’ve had. It’s... attempts are made in the Faculty and still are, to integrate the basic sciences with the basic pharmaceutical sciences. Model, transition between the sciences: So there’s a smooth transition, if you like, the applied use of these fundamentals, so they can develop their skills as practitioners.

PT07 (423-435) Yes; Analogy about where pharmacology fits; assumption that pharmacology is needed: You need to know pharmacology. I don’t know, it sounds very self serving, but you do need to know pharmacology. Let’s go back to the Blueprint; patient centered care. What entails patient centered care? You have to know the patient. What is a patient? A patient is a human being with a disease that needs to be treated, is in need of clinical therapy to deal with this condition. So you need to know about human biology, you need to know about the patient, you need to know about the drug, you need to know about the dosage, you need to know about the response to this drug, you need to know about drug interactions, you need to know about how this drug is used, what are the side effects, whether it’s associated with idiosyncratic reaction, that other therapies are available, why are they better than the other... so these are all the things that are associated with patient centered care. In order to know all of this, (Model) it’s almost like a series of concentric circles, knowing one, this is your goal, but in order to get to that goal you have to actually acquire all of these different levels of knowledge.
**PB03 (555-564): Yes, they are the foundation; basic science underpins health care practice:**

This won’t surprise you, they play a major role because they are the foundation to anything that builds on top of it. *(How science impacts what practitioners do)* I tell a lot of my clinician friends, PharmD colleagues, MD colleagues, that a lot of the things they do in practice today is based off of basic fundamental science, and that if you didn’t have that basic fundamental science, you wouldn’t be able to do what you do today, so a surgeon that has a new tool to try to deal with scoping your GI tract, *someone has to develop that from basic science.* You get to use it as a tool. Or some of the medications that the PharmD decides on that should go on, it’s based on fundamental science about *(Comprehensive description of why basics are important and how they merge together)* how to formulate that medication, what’s the chemistry behind that medication, which target site pharmacology, how do you deliver it, what’s the kinetics, bang bang bang… so really, *all the fundamental basic pharmaceutical sciences you get really set the stage for what ends up being applied and actually being used in the clinic that leads to an outcome for the benefit of your patients well being, and so you need to know why things happen, you need to know what things occur, what are the basics?*

**Interview Analysis Phase 2:** grouping similarly coded interview answers together (as an additional sub-section within the separate word processing documents) for closer review, further analysis and to identify broader categories and themes. Progressive refocusing on coded segments required until stable categories, themes and overall schema connecting the codes, categories and themes emerged; data discrepancies, unique responses, direct quotes, examples and historical perspectives were flagged for possible inclusion in the written summaries of the analysis. **Note:** when attempting to answer the interview question(s) about role all but the first segment (PB02) affirmed the role of the basic pharmaceutical sciences in the curriculum. This entire group of interview data was used for more focused analysis. The segments highlighted in yellow represent potential quotes for the final written analysis.

**Schema of themes developed:**

1) *Most agreed that yes, there is a role for the basic pharmaceutical sciences in the curriculum and program as a foundation and part of the core curriculum; there is acknowledgement that the science has changed and needs to be better aligned with practice.*

2) *For what purpose: i) they help understand how drugs work, ii) they underpin therapeutics, and, iii) provided longitudinal support for practice.*

3) *Scientists had created mental models as to how the fundamental scientific knowledge built up and how it connects with the tools used in practice.*

4) *Discrepancies: there is a hierarchy between the basic pharmaceutical sciences disciplines (highest to lowest: pharmacology, pharmaceutics and medicinal chemistry); there is a belief that the basic pharmaceutical sciences disciplines are used drug therapy decisions in practice.*

**Interview Analysis Phase 3:** writing the analysis to be included in the appropriate chapter.

When asked about the role of the basic pharmaceutical sciences in the current curriculum and the education of pharmacists, the response from the scientists was consistent and clear. Each was adamant that the basic pharmaceutical sciences formed the scientific foundation of the knowledge base of the pharmacist and were critically important for understanding therapeutics
and making informed decisions in practice. While there was acknowledgement that the knowledge base of contemporary pharmacists was changing and that the scientific foundations of pharmacy practice were becoming increasingly applied, the basic pharmaceutical sciences disciplines remained essential to the knowledge base of pharmacists and the core curriculum. Many articulated well-formulated mental schema and models explaining why the basic pharmaceutical sciences were a critical aspect of educating pharmacists as well as how they did and should continue to build and align in the current curriculum to support drug therapy decisions in practice. Although the importance and contribution of each basic pharmaceutical science discipline varied with discipline affiliation, to the basic pharmaceutical scientists generally, the disciplines were almost inseparable and presented as an integrated whole. Knowing how the body works and its impact on drug chemistry, delivery and action were essential for understanding drug behavior in human systems, the proper use of drugs in drug therapy and how to solve drug-related problems encountered in practice. Along with the prerequisite and biomedical sciences, the knowledge base of the contemporary pharmacists was presented as a continuum, transitioning smoothly from the basic and natural sciences to the biomedical sciences to basic pharmaceutical sciences to therapeutics and practice. For the basic pharmaceutical scientists there was a direct link between theory and practice; between the scientific foundations and decision making in practice. Summarizing the thoughts of many basic pharmaceutical scientists regarding the theory-practice link, a senior scientist stated cogently, “the basic pharmaceutical sciences should teach the students how to explore...[they] should cause the students to look more deeply into the therapeutics of the drug... make the students more creative in the therapeutic area. The more you understand the fundamentals, and the deeper you can go into the fundamentals, the more creative you can be in the application of those fundamentals.” Interestingly, the underlying assumption that the scientific knowledge base they were describing did support clinical decision making and was being used in practice in the way they envisioned went unquestioned.