MONASH University

Pharmacy and Pharmaceutical Sciences

Comparison of International pharmacy curricula

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Overview

- Which courses will be compared?
- Comparison
  - Similarities
  - Differences
- Balance between science and practice components?
- Final thoughts

Which courses will be compared?

- Australia, UK, USA and Canada
  - Europe and Asia

- Basis for comparison
  - Cyril Tonkin visits
  - Website information
  - Some assumptions made
    - representative schools chosen
    - 4 general curriculum areas
      - Basic/enabling sciences (shaded pink)
      - Pharmaceutics/Drug Delivery (shaded blue)
      - Therapeutics/Clinical sciences (shaded yellow)
      - Professional/Pharmacy Practice (shaded green)

Australian Curriculum example (Monash)

Semester 1, Year 1	Physicochemical basis of pharmacy	Introduction to physiology	Organic Chemistry	Pharmacy, Health and Society I
Semester 2, Year 1	Drug Delivery 1	Systems Physiology	Chemistry of Biomolecules	Pharmacy, Health and Society II
Semester 1, Year 2	Biochemistry and Molecular Biology	Basis of Drug Action I	Cell function, communication and pathology	Pharmacists as Communicators
Semester 2, Year 2	Drug Delivery and Disposition	Basis of Drug action II	Integrated Therapeutics- Introduction and Cardiovascular	Pharmacy in a public Health context
Semester 1, Year 3	Drug Delivery, Disposition and Dynamics	Microbiology and immunology	Integrated Therapeutics- Respiratory and Gastrointestinal	Contexts for practice I
Semester 2, Year 3	Drug Delivery II	Integrated Therapeutics- Infectious Diseases	Integrated Therapeutics- Endocrinology and Renal disease	Contexts for practice II
Semester 1, Year 4	Drug Delivery and Development	Elective	Integrated Therapeutics- Dermatology and pain	Professional Experience Placement program
Semester 2, Year 4	Advanced Clinical Practice	Integrated Therapeutics- Psychiatry	Integrated Therapeutics- Neurology and Oncology	Contexts for practice III

Australian Curriculum – BPharm/MPharm

- Based on advanced level secondary school
  - Entry pre-requisites include Chemistry, English and Mathematics
- Australian Pharmacy Council Indicative Curriculum
  - BPharm (8 semester, 4 year undergraduate program)
  - MPharm (6 semester, 2 or 3 year post-graduate program)
- Not eligible for registration on graduation
  - All graduates complete an Intern year (48 weeks)
  - Registration examination
    - Written competency examination
      - 125 MCQs: Calculations; Forensic/ethics; Practice-based questions
    - Oral examination consisting of four parts:
      - Part 1 Medication Knowledge and Counselling
      - Part 2 Primary Healthcare
      - Part 3 Legal and Ethical Practice
      - Part 4 Problem Solving & Communication (time limited open book)

Experiential learning - Australia

- Length of placements in undergraduate programs varies between schools
  - Monash has 12 weeks (432 hours) supervised placements
    - 4 compulsory, structured 3 week placements
      - 2 hospital, 1 community and 1 rural
- 12 months experiential placement prior to registration
  - Undertaken in either hospital or community setting
  - Must also satisfactorily complete an approved pre-registration training course
    - Monash course
      - Moderated on-line discussion groups (clinical and professional topics)
      - Face-to face seminars
        - » Standardised patients with small groups
        - » Lectures on selected topics

UK Curriculum example (Manchester)

Autumn –Year 1	Pharmaceutical & Biological Chemistry 1	Physiology & Pharmacology 1	Laboratory Studies in Pharmaceutical Chemistry, Physiology & Pharmacology	Cellular Biochemistry & Introductory Microbiology	Practical Dispensing & the Science of Medicines Manufacture	Professional Skills 1: Introduction to Pharmacy Practice
Spring – Year 1		Physiology & Pharmacology 2				
Autumn – Year 2	Pharmaceutics 2 : Pharmaceutical Technology	Physiology & Pharmacology 3	Laboratory Studies in Pharmaceutical Sciences	Pharmaceutical Analysis & Spectroscopy	Pharmaceutical & Biological Chemistry 2	Pharmaceutical Microbiology
Spring – Year 2	Biopharmaceutics	Physiology & Pharmacology 4			Natural Products & Medicine	Professional Skills 2: Pharmacist-patient partnerships in health and illness
Autumn -Year 3	Advanced Drug Delivery I	Molecular Pharmacology	Laboratory Studies in Pharmacology &Pharmaceutical Sciences III	Medicinal Chemistry and Drug Design 1	Nutrition in Health & Disease / Social Sciences & Pharmacy	Professional Skills 3: Pharmacy Law & Dispensing
Spring – Year 3		Toxicology - Clinical, Environmental &Experimental Aspects	Disease and the Goals of Treatment	Quality In Medicines Design and Usage	Sterile Production	
Autumn –Year 4			Bimolecular Therapeutics	Immuno-pharmacology and Treatment of Chronic Diseases	Microbial Disease and Pathogenicity	Preparation for Practice
Spring – Year 4	Project Study				Elective	Elective

UK Curriculum – MPharm

- Based on advanced level secondary school pre-requisites
  - Chemistry and other sciences
- Based on an RPSGB Indicative Curriculum
  - MPharm
    - 4 year undergraduate program (5-year 'sandwich' program)
    - No defined placements during undergraduate program
    - All students must undertake a research program
- Not eligible for registration on graduation
  - All graduates complete an Intern year (5th year) or intercalated placements
    - Supervised placement
    - Pass two written examinations
      - One closed book
      - One open book and calculations

Experiential learning - UK

- Limited placements in undergraduate curriculum
  - Range from 2-22 days in total
  - Usually shadow a pharmacist
- Research project is often practice-based
  - Provides practice exposure for some students
- 12 months experiential placement prior to registration
  - Undertaken in either hospital or community setting
    - Usually only one setting, sometimes two

USA curriculum example (Colorado)

Yr 1	Sem 1	Profession of pharmacy 1	IPPE 1	Anatomy & physiology 1	Biochemistry 1	Principles of drug action	
	Sem 2	Profession of Pharmacy 2	IPPE 2	Anatomy & physiology 2	Biochemistry 2	Drug Development 1	
Yr 2	Sem 1	Profession of Pharmacy 3	IPPE 3	Pharmacotherapy of Infectious disease 1	Pharmacotherapy of Cardiovascular disease 1	Drug Development 2	
	Sem 2	Profession of Pharmacy 4	IPPE 4	Pharmacotherapy of Infectious disease 2	Gastroenterology/ Nutrition	Drug Development 3	Advanced pharmaceutical Care 1
Yr 3	Sem 1	Profession of Pharmacy 5	IPPE 5	Immunology	Pulmonology/ Rheumatology	Endocrinology	Professional elective
	Sem 2	Profession of Pharmacy 6	IPPE 6	Oncology/ Hematology	Neurology/ Psychiatry	Professional elective	Advanced pharmaceutical Care 2
Yr 4	Sem 1	APPE1	APPE 2	APPE 3	APPE 4		
	Sem 2	APPE 5	APPE 6	APPE 7	Pharm D seminar		

USA Curriculum –PharmD

- Based on college level pre-requisites
  - basic sciences – chemistry, anatomy, mathematics (Mostly not taught in context of the pharmacy degree)
- ACPE indicative curriculum
  - 4 year PharmD program
    - Based on core competencies from CAPE outcomes
      - » Provide patient-centered care; Work in interdisciplinary teams; Employ evidence-based practice; Apply quality improvement; Utilise informatics
      - » Biochemistry, pharmaceutics, pharmacology, pharmacy practice (law, ethics, communication, dispensing), clinical therapeutics
      - » IPPEs and APPEs
- Eligible for registration on/soon after graduation
  - NAPLEX 185 item MCQ registration examination (75% pass score)
    - follow a scenario-based pattern, with each question backed with accompanying patient profile
  - provides an accurate assessment of an individual's skills and competence to practice as a licensed pharmacist

Experiential learning - USA

- 300 hours of IPPE during first 3 years of course
  - Variety of programs that may involve:
    - shadowing a pharmacist with some patient contact activities
    - Service learning experiences
    - Patient-focused community experience
- 36 weeks of APPE in fourth year
  - generally 6 x 6 week or 7 x 5 week (+1) required and elective rotations
    - 5 required rotations
      - community pharmacy, hospital pharmacy, ambulatory care, specialty populations, acute care medicine
    - Elective rotations
      - additional rotations in the core areas
      - with groups such as AACP, ASHP & FDA
      - academia

Canadian Curriculum example (Toronto)

Sem1, Year 1	Introductory Organic Chemistry I	Human Anatomy and Histology	Physical Chemistry for Pharmacy	Microbiology of Infectious Diseases	Introduction to Applied Pharmaceutical Sciences	Professional Communication Skills in Pharmacy Practice	Introduction to Statistics	Professional Practice I	Introduction to the Profession of Pharmacy
Sem 2, Year 1	Introductory Organic Chemistry II						Professional Practice I Laboratory		
Sem1, Year 2	Medicinal Chemistry	Basic Human Physiology	Introduction to Biochemistry & Molecular Biology	Pharmaceutics	Health Systems in Society I		Professional Practice II	Pharmaceutical Care Ia	
Sem 2, Year 2		Pharmacology I	Introductory Metabolic Biochemistry		Methods of Pharmaceutical Analysis		Professional Practice II Laboratory	Pharmaceutical Care Ia	
Sem1, Year 3	Pharmacology/Medicinal Chemistry Tutorial	Pharmacology II	Pharmacokinetics	Applications of Pharmaceutical Analysis	Pharmacy Practice Management I	Clinical Biochemistry/ Pathophysiology/Pathology	Pharmaceutical Care II	Pharmaceutical Care Ib	
Sem 2, Year 3		Introductory Toxicology		Professional Practice III	Professional Practice III Laboratory				
Sem1, Year 4	Pharmacy Practice Seminar	Professional Practice IV		Health Systems in Society II		Pharmacy Practice Research		Pharmaceutical Care III	
Sem 2, Year 4	Electives	Selected Topics in the Pharmaceutical Industry or Pharmacy Practice Management in the Community or Institutional Pharmacy Practice Management				SPEP - Institution (35 hours per week for 8 weeks)		SPEP - Community (35 hours per week for 8 weeks)	

Canadian Curriculum - BScPhm

- Based on first year university pre-requisites
  - Chemistry, English and Mathematics
    - Not taught in context of the pharmacy degree
- Based on Canadian Council for Accreditation of Pharmacy Programs standards and guidelines
  - BSCPhm
    - 4 year undergraduate program
- Not eligible for registration on graduation
  - To register must:
    - successfully complete a minimum of 12 weeks of Structured Practical Training (SPT) Internship
    - pass the Pharmaceutical Jurisprudence Examination
    - pass the PEBC Qualifying Examination Parts I and II
      - Part 1 is 300 MCQs
      - Part II is a 16 station OSCE

Experiential learning - Canada

- 16 weeks in undergraduate course
  - 8 weeks in community
  - 8 weeks in another institution
    - designed to provide students with a variety of opportunities to apply their knowledge and skills
    - structured around a number of formalised activities, each designed to lead to the attainment of specific learning objectives.
- 12 weeks pre-registration placement

Similarities

- Teaching Modes
  - Similar modes, different emphasis
    - Large group lectures
    - Practical classes
      - Laboratory classes
      - Dispensing
    - Tutorials
    - Flexible learning modes
      - Flexible delivery
      - Use of technology
    - Experiential Placements

Similarities with all courses

- Patient focused curricula
  - Traditional sciences
    - Basic Chemistry and Mathematics
      - Taught within program in Australia and UK
      - Taught both outside and within course in Canada
      - Mostly taught outside the program in USA
    - Pharmaceutical sciences
      - Drug action and Drug development
  - Clinical and Social sciences
    - Communication
    - Law and ethics
    - Therapeutics
  - Compounding

Differences between countries

Criteria	Australia	UK	USA	Canada
Registerable Degree awarded	BPharm or MPharm	MPharm	Pharm D	BScPhm
Average age at entry	19	19	24-25	20
Admission criteria	BPharm - ATAR, pre-requisites & UMAT MPharm - Degree GPA, pre-requisites and interview	A levels and interview	GPA, PCAT, numerous pre-requisites, essay, references, application form and interview	GPA and pre-requisites, PCAT and application form (some interview)
Undergraduate Experiential component	~ 12 weeks in undergraduate course	2-22 days in undergraduate course	As undergraduate 300 hours –IPPE 36 weeks APPE	16 weeks as undergraduate
Curriculum	Different emphasis on Basic Science, Pharmaceutics, Pharmacy Practice & Therapeutics			
Compulsory Pre-registration	48 weeks after graduation	52 weeks after graduation	none	12 weeks after graduation

What Degree is awarded?

Australia	Canada	UK	USA
BPharm	**BScPhm**	**MPharm**	**PharmD**
Entry from secondary school	Entry after 1 year university	Entry from secondary school	Entry after minimum 2 years university
4 year course	4 year course	4 year course	4 year course
Experiential placements • 12 wks undergraduate • 48 wks internship	Experiential placements • 16 wks undergraduate • 12 wks internship	Experiential placements • Limited (2-22 days) • 52 wks internship	Experiential placements • 300 hours (~8 wks) IPPE • 36 wks APPE
Research project possible, but not mandatory	Research project possible, but not mandatory	Mandatory Research project	Research project possible, but not mandatory

What about Europe and Asia??

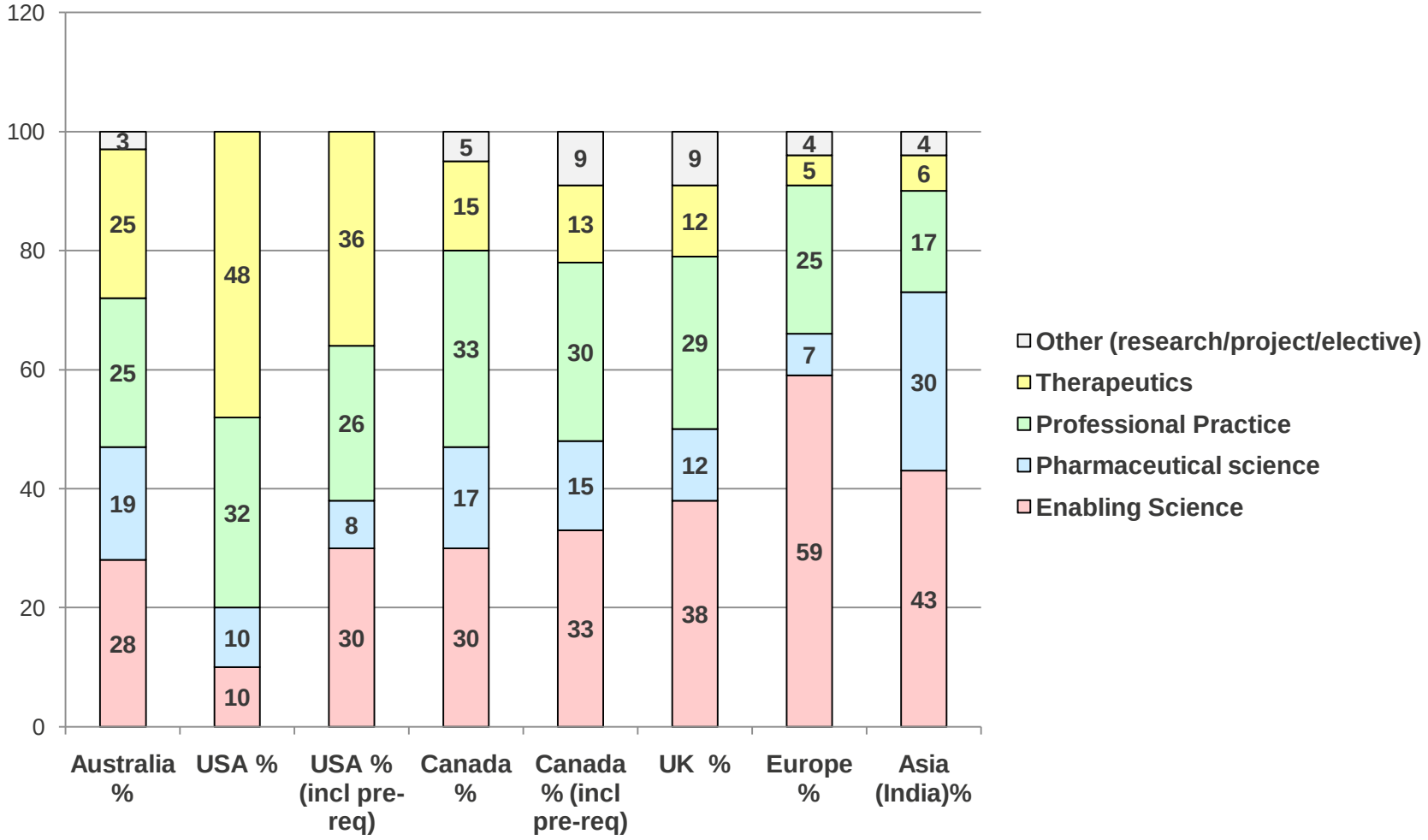
Europe - Netherlands

Year 1, semester 1a	Introduction to Life on Earth	Biochemistry: Theory	Cell Biology: Theory	Genetics	Minimal Cell: Practical	
Semester 1b	Complex Organism: Practical	Diversity, Ecology and Behaviour	Immunology and Oncology	Physiology & Pharmacology		
Year 1, semester 2a	Molecules and Reactivity	Biomathematics	Biostatistics	Pharmacy in Perspective		
Semester 2b	Human Physiology	Pathology	Pharmaceutical Analysis A			
Year2, semester 1a	Bio-organic chemistry	Receptor Pharmacology				
Semester 1b	Organic Chemistry Practical	Structure of molecules	Pharmacology: Practical	Integrative Neurobiology	Medical Genetics	Pharmaceutical analysis B
Year 2, semester 2a	Biomathematics	Biostatistics	Endocrinology	Molecular biology and Medical biology	Cell Biology II	
Semester 2b	Mathematics B	Spectroscopy	Medical Physiology			
Year 3, semester 1a	Drug Group II: Circulatory & vitamins	Drug Group IV: Infections & Tumours	Pharmaceutical Inorganic Chemistry	Therapy Supporting tools		
Semester 1b	Drug Group III: Endocrine system	Drug Production and research	Profession -Evidence Based methods for practice			
Year 3, semester 2a	Introduction to Pharmacotherapy	Pharmaceutical Compounding and Dispensing Practical	Pharmaceutical Compounding and Dispensing Theory			
Semester 2b	General Pharmacotherapy	Communication (pharmacy)	Internship - Management	Pharmacy Management		
Year 4, semester 1a	Choosing a pharmacy career	General Studies Module (AVV) (Full Year)	Pharmacy Research Project (Full Year)			
Year 5, semester 1a	Ethics and Legislation	Internship -Public Pharmacy	Pharmaceutical Biology and Phytotherapy			
Semester 1b	Communication in Care	Pharmacist and Pharmacy organisation	Pharmacist and Patient Care organisation	Specialist Pharmacotherapy		
Year 5, semester 2a	Internship -Hospital pharmacy	Pharmacy Game -GIMMICS				
Semester 2b	Internship -Practical Research					

Asia –(Amrita School of Pharmacy, India)

Sem 1	Pharmaceutical Chemistry I & II (Inorganic)	Human anatomy and Physiology	Value-based Education and environment science	Computer application and audio visual programmes	Dispensing Pharmacy I	Principles of Hospital Pharmacy
Sem 2	Pharmaceutical Chemistry –II (Elementary Organic Chemistry	Human anatomy and Physiology II	Mathematics and biostatics	Basic concepts of social life and psychology	Dispensing Pharmacy II	Drug Store management (Hospital Pharmacy II)
Sem 3	Pharmaceutical Chemistry III (Pharmaceutical Organic Chemistry)	Pharmaceutical Analysis I	Pharmaceutical Technology	Pharmacognosy I	Physical Pharmacy 1	Social and Community Pharmacy
Sem 4	Pharmaceutical Chemistry IV (Heterocyclic & Stereochemistry)	Pharmaceutical Chemistry V (Biochemistry)	General Pharmacology	Pharmacognosy II	Pharmaceutical Microbiology	Physical Pharmacy II
Sem 5	Pharmaceutical Chemistry VI (Chemistry of synthetic drugs)	Systemic Pharmacology I	General pathophysiology	Phytochemistry	Biopharmaceutics and pharmacokinetics	Pharmaceutical biotechnology
Sem 6	Pharmaceutical Chemistry VII (Medicinal Chemistry)	Systematic Pharmacology II	Pharmaceutical analysis II	Research in Pharmacy & Clinical Research trials	Pharmacy Practice-Concepts and management	Pharmaceutical Jurisprudence
Sem 7	Industrial Pharmacognosy	Formulation Technology	Pharmaceutical analysis III	Pharmacotherapy I	Project	
Sem 8	Pharmaceutical Chemistry VIII (Medicinal Chemistry and Drug Design)	Industrial Pharmacy	Biochemical Pharmacology (Biological Screening & Drug Development)	Pharmacotherapy II	Project	Clinical Pharmacy Practice

Course content comparison - units of study



Are the pharmacy curricula appropriate?

- Probably –depends on local needs
- No ‘one size fits all’
  - Australia, Canada and UK balance of sciences and practice
  - USA – leans toward practice, with science pre-pharmacy
  - Europe – more emphasis on traditional sciences
  - Asia – more emphasis on enabling and pharmaceutical sciences

	Australia	USA	Canada	UK	Europe	Asia
Traditional Sciences	47	20 (38*)	47 (48*)	50	66	73
Social Sciences	50	80 (62*)	48 (52*)	41	30	23

*including relevant pre-pharmacy coursework

Final thoughts

- Curricula
  - Similar content, different emphasis
  - Basic science underpinning practice
    - patient-focused care
    - medication management
    - therapeutics
- Not ‘one size fits all’
  - Curricula needs to graduate practitioners suitable for local needs
- Similar course length
  - If pre-entry standards and internship included
  - Generally longer in Europe
- Different selection process, but similar overall criteria
- Different Degree awarded
  - May add to/cause confusion