# A synergistic faculty leadership collaboration in developing, implementing, and evaluating a doctor of pharmacy curriculum

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**Abstract**

**Introduction:** This article describes the intricate process of establishing a Doctor of Pharmacy curriculum in a new United States pharmacy school, emphasising faculty-leadership collaboration across development, implementation, and evaluation stages.
**Programme description:** The collaboration between leadership and faculty was crucial in the curriculum development. Leadership guided faculty, offering insights and best practices throughout stages like needs assessment, design, development, implementation, and evaluation. Faculty with varied academic backgrounds played an active role in crafting a unified curriculum. Collaboratively, faculty and leadership revealed dynamic synergy throughout the process. **Evaluation:** Qualitative evaluations, including student course evaluations, standardised surveys, and faculty assessments of the curriculum review process, were used to assess curriculum structure, content, organisation, and outcomes. Feedback from stakeholders prompted improvement in the curriculum. **Future Plans:** Future plans include the imperative of continuously evaluating, monitoring, and adapting the curriculum to align with the evolving profession. Success will depend on fostering effective leadership, encouraging active stakeholder participation, promoting collaboration, and instilling shared accountability.

## Introduction

Within an educational system, the term curriculum encompasses all planned learning experiences. It outlines what students are expected to learn, how this learning will occur, and how it will be measured. Essentially, the curriculum serves as a structured framework, ensuring a cohesive and organised approach to education (Marsh, 2004). Curriculum development involves a deliberate and systematic process of designing, implementing, and evaluating educational programmes and courses. This process is influenced by various factors, including educational goals and objectives, societal needs, advancements in pedagogy, and the unique characteristics of the learners (Ornstein & Hunkins, 2017).

The pharmacy curriculum is guided by fundamental principles, including staying updated with

advancements in pharmaceutical sciences and healthcare delivery and aligning outcomes with the evolving patients' and healthcare system needs. The Accreditation Council for Pharmacy Education (ACPE) Standards 2016 mandates curricula to equip graduates with an expanding knowledge base and diverse skills necessary for practice in a complex healthcare environment (ACPE, 2016). Likewise, the Center for the Advancement of Pharmaceutical Education (CAPE) Outcomes 2013 offers a comprehensive framework for pharmacy curriculum development, encompassing clear educational goals, adaptations to evolving professional and healthcare system demands, facilitating assessment of student achievement, and promoting interprofessional collaboration in healthcare education (Medina *et al.*, 2013). Furthermore, foundational resources such as academic research, industry collaborations, and feedback from healthcare professionals play a pivotal role in shaping

and refining pharmacy curricula to align with the multifaceted field of pharmacy practice (Hussar, 2017).

The curriculum continuously evolves in response to changes in the knowledge base, available resources, the specific learners it serves, and the values held by institutions and society (Sklar, 2018). For continued effectiveness and improvement, a curriculum requires constant evaluation through a review process (Kalu & Dyjur, 2018). Curriculum reviews facilitate continuous assessment by engaging stakeholders, aligning with program-level objectives, evaluating evidence from diverse sources, and informing decision-making to enhance student learning (Briggs, 2007; Islam & Yang, 2023; Kalu & Dyjur, 2018). Faculty support is crucial for curriculum revision and review. A faculty-driven curriculum review process that encourages change relies on a shared vision and collaborative decision-making (Davenport *et al.*, 2009; Khalil & Kibble, 2014; Oliver & Hyun, 2011; Varnum *et al.*, 2020; Zelenitsky *et al.*, 2014).

Several studies have described the curriculum development process in medical education (Khalil & Kibble, 2014; Mejicano & Bumsted, 2018; Schneiderhan *et al.*, 2019). However, there is a scarcity of literature in pharmacy education that comprehensively describes the curriculum development process, encompassing implementation and evaluation (Hubball & Burt, 2007; Wright *et al.*, 2018). This paper elucidates the collaborative efforts between faculty and leaders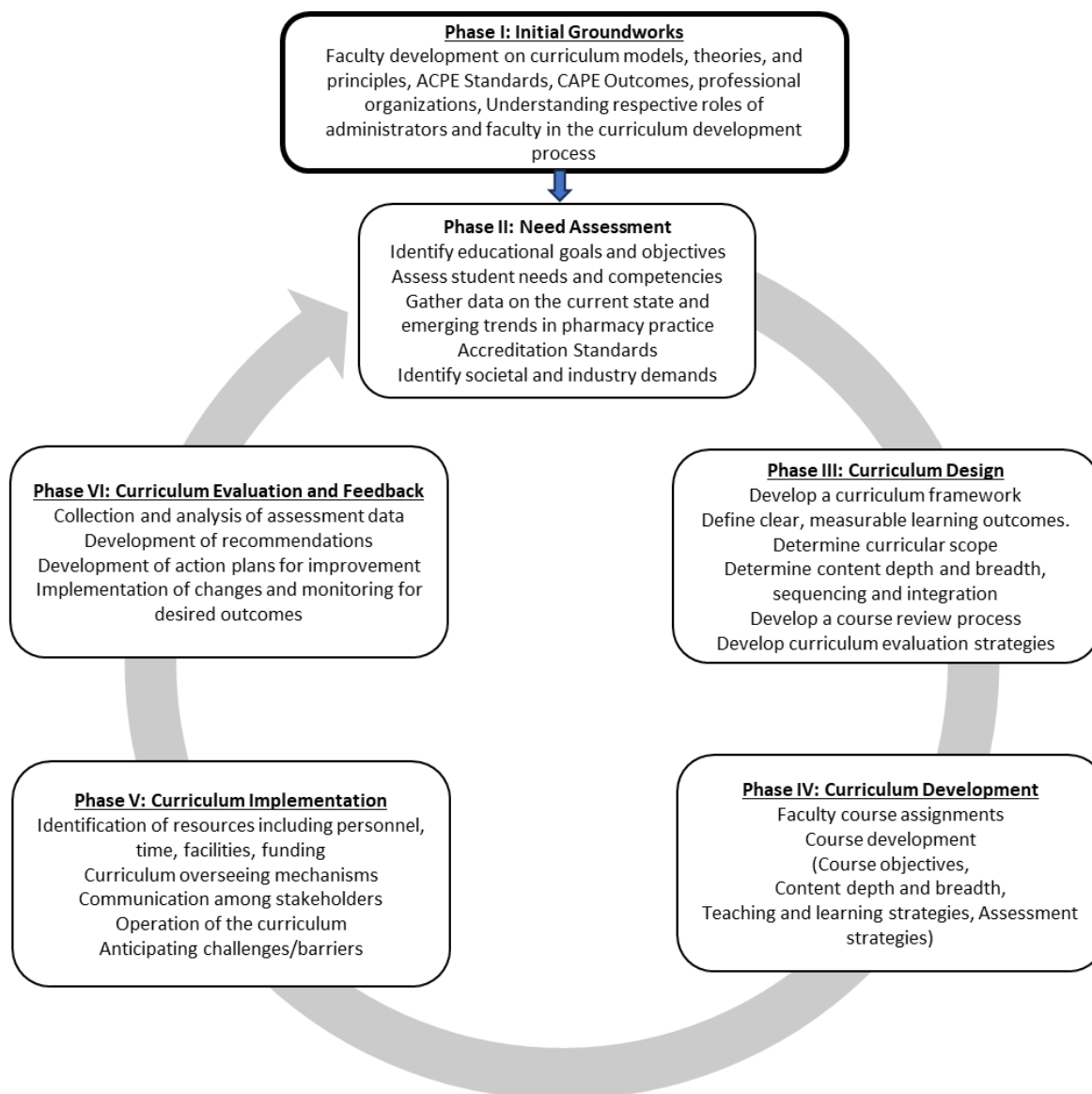hip in developing, implementing, and evaluating a Doctor of Pharmacy (Pharm.D.) curriculum within a three-year accelerated pharmacy programme in the United States.

## Programme description

The School of Pharmacy (SOP) at the American University of Health Sciences (AUHS) introduced its Pharm.D. programme in the summer of 2019. The curriculum was developed and implemented, leading to the graduation of the inaugural Class in May 2022. The SOP undertook a synergistic approach to faculty and leadership collaboration in the curriculum development process. This model combines the insights and directives from leadership with the expertise and input from faculty and subject matter experts. Faculty demonstrate their motivation, collaborative attitude, commitment, and sense of ownership (Figure 1). Given varied SOP faculty experience, collaboration between administrators and faculty became crucial. Effective curriculum development requires knowledge, leadership, and stakeholder collaboration (Iwasiw *et al.*, 2020b; Wiles, 2008). The curriculum leader shapes a clear vision, empowering teams through training and continuous assessment (Calabrese, 2015; Iwasiw *et al.*, 2020b; S.L. Oliver & Hyun, 2011; Wiles, 2008). Figure 2 outlines detailed process of the SOP curriculum design and development.
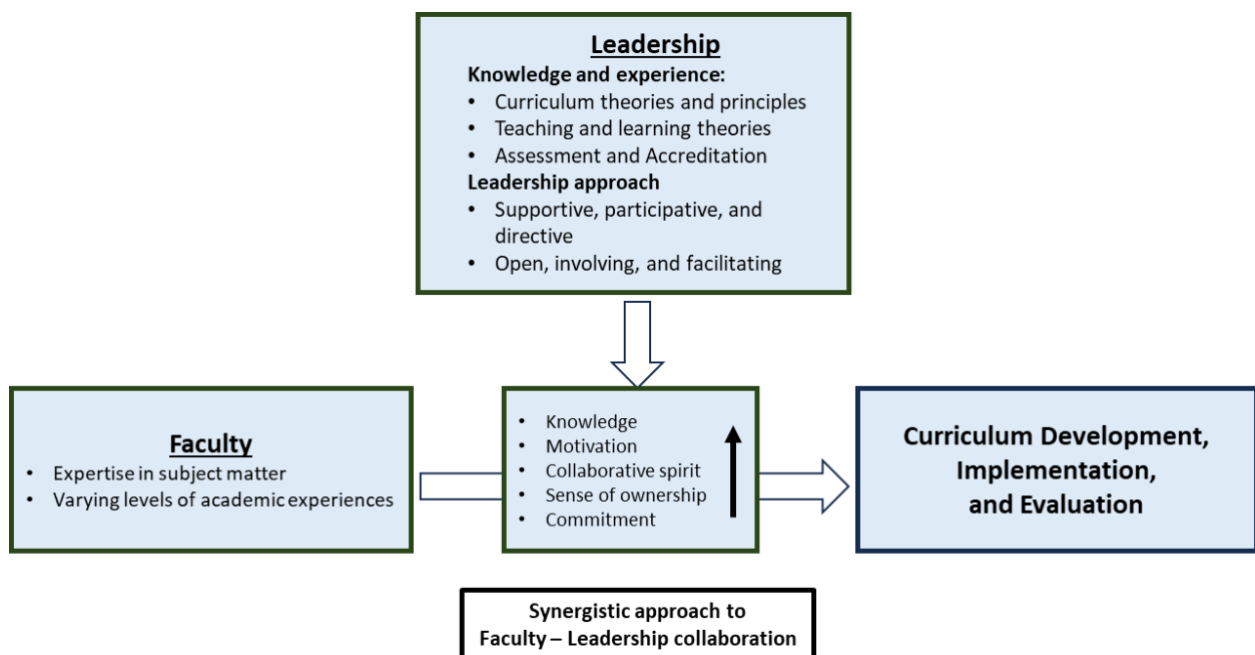


**Figure 1: A synergistic approach to faculty and leadership collaboration in a pharmacy curriculum development process. This method combines the insights and directives from leadership with the expertise and input from faculty. Faculty demonstrate their motivation, collaborative attitude, commitment, and sense of ownership**

**Phase I: Initial Groundworks**
Faculty development on curriculum models, theories, and principles, ACPE Standards, CAPE Outcomes, professional organizations, Understanding respective roles of administrators and faculty in the curriculum development process

**Phase II: Need Assessment**
Identify educational goals and objectives
Assess student needs and competencies
Gather data on the current state and emerging trends in pharmacy practice
Accreditation Standards
Identify societal and industry demands

**Phase VI: Curriculum Evaluation and Feedback**
Collection and analysis of assessment data
Development of recommendations
Development of action plans for improvement
Implementation of changes and monitoring for desired outcomes

**Phase III: Curriculum Design**
Develop a curriculum framework
Define clear, measurable learning outcomes.
Determine curricular scope
Determine content depth and breadth, sequencing and integration
Develop a course review process
Develop curriculum evaluation strategies

**Phase V: Curriculum Implementation**
Identification of resources including personnel, time, facilities, funding
Curriculum overseeing mechanisms
Communication among stakeholders
Operation of the curriculum
Anticipating challenges/barriers

**Phase IV: Curriculum Development**
Faculty course assignments
Course development
(Course objectives,
Content depth and breadth,
Teaching and learning strategies, Assessment strategies)

**Figure 2: Curriculum design and development process**

### Step 1. Initial groundwork

In the initial phase, the authors laid the groundwork for curriculum development. This included assessing faculty expertise, forming a dedicated curriculum team, and defining roles for administrators and faculty (Table I). This ensured the team had the required understanding and skills to proceed effectively. Leadership also fostered a supportive environment for faculty to express concerns and seek guidance. The SOP faculty represented a mix of experienced and novice faculty. The leadership provided guidance and support for faculty navigating the complexities of curriculum development. The leadership ensured curriculum alignment with institutional missions, accreditation standards, and broader educational goals. An organised faculty development approach was undertaken to provide mentoring and professional development to the curriculum team. Two models of faculty development were implemented, as described by Thomas *et al.* (2015). The first model, known as pre-staff development, occurred before curricular changes and involved guiding the process. The second model, termed post-staff development, consisted of sessions held after curriculum design was completed. The SOP leadership and external experts provided professional development opportunities to help the faculty team acquire the necessary skills and knowledge in curriculum development, assessment, and programme evaluation.

**Table I: Respective roles of leadership and faculty in different stages of curriculum development process**

| Stages of curriculum development | Roles of leadership | Roles of faculty (faculty-driven task forces, curriculum committee) |
|---|---|---|
| Foundational step | <ul><li>Provide clear vision and goals</li><li>Build curriculum development team</li><li>Design faculty development activities including SoTL</li><li>Provides faculty training and mentoring</li><li>Share knowledge and best practices</li><li>Clarify working steps in the curriculum process</li><li>Foster a culture of collaboration and open communication</li></ul> | <ul><li>Actively engage in professional development opportunities on curriculum design and development</li><li>Acquire knowledge on curriculum theories, principles, and practices, and SoTL</li><li>Seek mentorship from experienced colleagues or leadership to enhance curriculum knowledge</li><li>Engage in collaborative sessions with colleagues to share ideas</li></ul> |
| Needs assessment | <ul><li>Provide faculty with an overview of the needs and resources</li><li>Lead the faculty teams in discussion on developing curriculum goals and objectives</li><li>Help faculty identify areas to focus (e.g., evolving profession, accreditation, required competency)</li></ul> | <ul><li>Perform their own research to identify needs</li><li>Review documents and resources</li><li>Engage in collaborative discussions and share ideas</li><li>Develop curriculum goals and objectives</li><li>Determines the areas to focus (e.g., evolving profession, accreditation, required competency)</li></ul> |
| Curriculum design | <ul><li>Impart knowledge and experience on:<ul><li>✓ Curriculum theories and principles</li><li>✓ Teaching and learning theories</li><li>✓ Assessment and accreditation</li><li>✓ Best practices in curriculum</li></ul></li><li>Provide team with training, mentorship, and one-on-one guidance</li><li>Define curriculum framework</li><li>Guide faculty in the horizontal and vertical aspects of curriculum integration</li><li>Provide guidance on course credit allocation, course sequencing</li></ul> | <ul><li>Engage in professional development activities</li><li>Engage in open communication with leadership on curriculum design</li><li>Actively participate in curriculum development teams</li><li>Provide input and feedback on curriculum development efforts</li><li>Share insights and best practices with colleagues</li><li>Take the ownership of the work accomplished</li></ul> |
| Curriculum development | <ul><li>Empower the curriculum team</li><li>Provide team with training, mentorship, and one-on-one guidance on teaching and learning strategies</li><li>Provide guidance on developing CLOs and mapping with PLOs</li><li>Ensure PLOs align with institutional goals</li><li>Ensure elements of ACPE Standards 1-4 and CAPE Outcomes 2013 are addressed across the curriculum</li><li>Lead curriculum mapping of planned curriculum</li></ul> | <ul><li>Actively participate in curriculum taskforces</li><li>Provide input and feedback on course design and content</li><li>Develop measurable learning outcomes in the course-levels</li><li>Determine the depth and breadth of content</li><li>Develop course materials</li><li>Develop teaching and assessment strategies</li><li>Share insights and best practices with colleagues</li><li>Apply SoTL in classroom practices</li><li>Participate in regular faculty-administrator meetings to discuss progress</li><li>Perform curriculum mapping of the planned courses</li></ul> |
| Implementation | <ul><li>Allocate resources efficiently</li><li>Monitor implementation of teaching and learning activities</li><li>Assist faculty in planning and implementing OSCEs and IPE events</li></ul> | <ul><li>Implement the curriculum</li><li>Implement teaching and learning strategies</li><li>Conduct formative and summative assessments and collect data</li><li>Create a positive and inclusive learning environment</li><li>Engage in reflective practices to continually improve teaching approaches</li></ul> |
| Evaluation | <ul><li>Provide guidance in developing the Comprehensive Assessment Plan</li><li>Ensures appropriate mapping of CLOs and PLOs</li><li>Lead curriculum retreat, curriculum review, and curriculum mapping</li><li>Assist faculty in interpreting assessment results</li><li>Acknowledge and reward faculty achievements</li></ul> | <ul><li>Implement Comprehensive Assessment Plan</li><li>Collect course level data mapped with CLOs and PLOs</li><li>Analyse assessment results to identify areas of strength and improvement</li><li>Work closely with Assessment Coordinator and Assessment Committee</li><li>Assessment Committee evaluates assessment data and develop recommendations for improvement</li></ul> |
| Improvement | <ul><li>Monitor assessment data and action plans for improvement</li><li>Provide guidance on curriculum improvement decision</li><li>Share assessment report with stakeholders</li><li>Make data-driven decisions on curriculum improvement</li><li>Monitor changes</li></ul> | <ul><li>Provide constructive feedback to colleagues on their curriculum materials and teaching methods</li><li>Use assessment data to inform instructional decisions and curriculum improvements</li><li>Curriculum Committee reviews action plan for recommended changes</li><li>Collaborate with administrators in data-driven decision-making about curriculum</li></ul> |

SoTL: Scholarship of Teaching and Learning; OSCE: Objective Structured Clinical Examination; CLO: Course Learning Outcome; PLO: Program Learning Outcome

The professional development activities were offered focusing on curriculum development for six months before the implementation of the curriculum to the inaugural class in July 2019. The pre-candidate state application prompted weekly sessions led by the Associate Dean of Academic Affairs, involving all administrators and faculty. Faculty actively participated in immersive workshops, retreats, and brainstorming sessions, crafting strategies to align course content with accreditation standards and ensuring courses were well-balanced for student learning. A key feature of the faculty development programme was promoting the Scholarship of Teaching and Learning (SoTL) (Manarin *et al.*, 2021; Miller-Young & Yeo, 2015). The aim was to help faculty incorporate SoTL principles into teaching, course development, and assessment to enhance classroom practices for better educational outcomes.

### Step 2. Needs assessment

Globally, there is a growing consensus advocating for a needs-based approach to pharmacy education. The International Pharmaceutical Federation (FIP) Education (FIPEd) stands as a key proponent of needs-based strategies, emphasising the importance of socially accountable education, evidence-based practice, and competency-driven training for pharmacy practitioners (Anderson & Futter, 2009; FIP, 2017). In the United States, the American Association of Colleges of Pharmacy (AACP), spearheads this mission, aiming to advance pharmacy education, research, scholarship, practice, and service for improved public health (AACP, 2024).

A rigorous scholarly approach was utilised, recognising the utmost importance of aligning the curriculum with the evolving needs of the pharmacy profession. Faculty and administrators engaged in a comprehensive needs assessment to design and develop the Pharm.D. curriculum. The needs assessment covered crucial elements, including defining educational goals, staying current on pharmacy practice trends, meeting accreditation standards, and aligning the curriculum with societal and industry needs. The curriculum team examined accreditation guidelines, published literature, and best practices, drawing from various sources. These included the ACPE standards and guidance, insights from the AACP, the American Pharmacists Association, the American Society of Health-System Pharmacists, and State Boards of Pharmacy, including the California Board of Pharmacy. The California Practice Standards and Jurisprudence Examination (CPJE) Content Outline and the Multistate Pharmacy Jurisprudence Examination (MPJE) Competency Statements from the National Association of Boards of Pharmacy were also reviewed to align the curriculum with relevant state-specific laws and regulations. Table II presents the identified needs and key resources used for the needs assessment.

**Table II: Identified needs and key resources utilised for needs assessment**

| Needs assessment | Key resources |
|---|---|
| • Identify goals and objectives | • ACPE 2016 Standards |
| • Stakeholders' engagement | • ACPE Guidelines and Guidance for Curriculum Development |
| • Professional competencies | • American Association of Colleges of Pharmacy (AACP) Reports |
| • Accreditation Standards | • (CAPE) Educational Outcomes 2013 (USA) |
| • Workforce demands | • The Joint Commission of Pharmacy Practitioners- Practice Standards and Guidelines (e.g., Pharmacists' Patient Care Process) (USA) |
| • Healthcare trends | • Pharmacy Education Journals |
| • Educational innovations | • Healthcare Trends and Reports |
| • Interprofessional education | • Clinical Guidelines and Treatment Guidelines |
| • Experiential education (preceptors and sites) | • Interprofessional Collaboration Resources |
| • Research and scholarships plan | • US Federal and state laws and regulations related to pharmacy practice |
| • Assessment and continuous improvement plan | • Published original reviews/articles on research and Innovation in education |
| • Faculty and staff | • Pharmacy professional organisations (local, regional, and national) (USA) |
| • Classrooms and laboratory facilities | |
| • Library and information resources | |
| • Technology infrastructure | |
| • Pharmacy dispensing facilities | |
| • Resources (students, faculty, preceptors) | |
| • Assessment tools | |
| • Community engagement and outreach | |

ACPE: Accreditation Council for Pharmacy Education; CAPE: Center for the Advancement of Pharmacy Education; USA: United States of America

### Step 3. Design of the curriculum

Pharmacy curriculum must align with societal needs to effectively address healthcare challenges. Pharmacy education in North America, Europe, and Asia exhibits notable differences in program structure, curriculum, and professional focus (Arakawa *et al.*, 2020; Nunes-da-Cunha *et al.*, 2016; Yi *et al.*, 2014). In the United States, pharmacy education follows a Pharm.D. programme, which is a postgraduate degree requiring completion of prerequisite undergraduate coursework. The curriculum emphasises clinical training and patient care, preparing graduates for roles in community pharmacies, hospitals, and other healthcare settings (Knoer *et al.*, 2016). In contrast, European pharmacy education commonly begins with undergraduate studies leading to a Bachelor of Pharmacy (BPharm) or equivalent degree, followed by additional years of study for a Master's of Pharmacy (MPharm) (Atkinson, 2014). European programmes place greater emphasis on pharmaceutical sciences alongside clinical training (Moura *et al.*, 2022). In Asia, pharmacy education varies widely across countries, with some following models similar to Europe while others resembling the American system (Chanakit *et al.*, 2014; Ohtani, 2021). Asian pharmacy education is product-oriented, with an emphasis on pharmaceutical sciences (Islam *et al.*, 2014). Additionally, cultural and regulatory differences influence the focus of pharmacy practice in each region, with variations in the scope of pharmacist roles and responsibilities (Rhoney *et al.*, 2021).

At the SOP, the curriculum team explored various curriculum designs, principles, and theories (Ornstein & Hunkins, 2017). The curriculum design process involved consulting a multitude of documents, including ACPE Standards, Institutional Learning Outcomes, CAPE 2013 Outcomes, Pharmacists' Patient Care Process (PPCP) developed by the Joint Commission of Pharmacy Practitioners (JCPP, 2014), North American Pharmacist Licensure Examination (NAPLEX) Competency Statements (NABP, 2021), as well as drawing insights from peer school curricula and relevant published literature. Moreover, SOP core values (e.g., collaboration, integrity, leadership, compassion, open-mindedness, credibility, excellence, diversity, adaptability, and accountability) formed the moral compass guiding the curriculum design. After extensive discussions and reviews with all faculty members during a curriculum retreat, the team collaboratively designed the curriculum.

The SOP incorporated the four domains of CAPE 2013 as programme learning outcomes (PLOs) for curriculum planning, delivery, and assessment. The PLOs formed the foundational framework of the curriculum. The goal of the Pharm.D. curriculum, established by the faculty, is to develop graduates into proficient practitioners capable of delivering patient-centred care, promoting population health, and becoming dynamic, thoughtful leaders. The three-year Pharm.D. curriculum comprised four core components: 1) pharmaceutical sciences, 2) biomedical sciences, 3) clinical sciences, and 4) social, behavioural and administrative sciences. Using a spiral design approach (Harden & Stamper, 1999), the courses in all four areas were sequenced to introduce and reinforce core concepts so that students could master and apply them in clinical areas. Additionally, the curriculum stands out for its unique features, including the integration of basic and clinical sciences both horizontally and vertically, the inclusion of longitudinal faith-based courses, and the incorporation of medical arts courses into the curriculum.

The first-year pharmacy (PY1) curriculum laid a solid grounding in foundational sciences, offering courses such as Biochemistry, Pharmaceutical Calculations, Pharmaceutics, Immunology & Medical Microbiology, Pathophysiology, Pharmacokinetics, Medicinal Chemistry, and Pharmacology. It also introduced clinical skill-based courses, such as Health and Drug Information, Self-Care Pharmacotherapy, and Physical Assessment, as well as social and administrative sciences courses like Professional Communications, US Healthcare Systems, Professional Ethics, Judeo-Christian Values and Ethics, and Biostatistics & Research Design.

In the second-year pharmacy (PY2) curriculum, Health Informatics and Patient Safety, Public Health and Policy, Pharmacy Law, Practice Management, and Pharmacoeconomics were incorporated. Integrated Pharmacotherapy courses were placed in the curriculum to integrate basic and clinical sciences, fostering clinical problem-solving and patient-centred care skills. Finally, the experiential education curriculum in the third-year pharmacy (PY3) was designed to help students apply their knowledge and skills in diverse patient care settings, developing self-confidence, independent decision-making abilities, and effective patient management skills. Courses were strategically sequenced, credit hours allocated, and a comprehensive curriculum blueprint was developed (Figure 3).

| Summer | Fall | Winter | Spring |
|--------|------|--------|--------|
| **Year 1** • Biochemistry<br>• Health and Drug Information<br>• Pharmaceutical Calculations<br>• Professional Communications<br>• US Healthcare Systems<br>• Judeo-Christian Values in<br>• Old Testament I | • Immunology & Microbiology<br>• Self-Care Pharmacotherapy<br>• Pharmaceutics<br>• Physical Assessment<br>• Medical Illustration I<br>• Old Testament II | • Pathophysiology<br>• Medicinal Chemistry<br>• Medication Use Systems<br>• Natural Products<br>• Medical Illustration II*<br>• Introduction to Pharmacology<br>• Old Testament III | • Sterile and non-sterile Compounding<br>• Basic Pharmacokinetics<br>• Biostatistics<br>• IPPE I – Community<br>• Pharmacogenomics<br>• Old Testament IV |
| **Year 2** • Health Informatics<br>• Fluids, Electrolyte<br>• Cardiology<br>• IPPE II – Hospital<br>• Elective I<br>• New Testament I | • Public Health<br>• Pharmacy Management<br>• Pulmonary & Nephrology<br>• Gastroenterology & Endocrinology<br>• IPPE III – Ambulatory Care<br>• New Testament II | • Pharmacy Law<br>• Neurology & Psychiatry<br>• Infectious Disease<br>• IPPE IV - Transitions of Care<br>• Elective II<br>• New Testament III | • Psychosocial Aspect of Health Care<br>• Oncology & Nutrition<br>• Urology & Reproductive System<br>• Elective III<br>• Pharmacoeconomics<br>• New Testament IV |
| **Year 3** • Dermatology & Rheumatology<br>• Practice Readiness | • APPE-I – Acute Care/ General Medicine<br>• APPE II – Health Systems/ Institution<br>• APPE III – Ambulatory Care<br>• APPE IV – Advanced Community<br>• APPE V – Elective I<br>• APPE VI – Elective II | | |

**Figure 3: Pharm.D. curriculum blueprint**

The Pharm.D. curriculum blends experiential education, enabling students to apply their knowledge, skills, attitudes, and values in serving diverse patient populations in real-world settings. During PY1 and PY2, students complete 320 hours of Introductory Pharmacy Practice Experiences (IPPEs). During PY3, students complete six Advanced Pharmacy Practice Experiences (APPEs) in Community, Hospital, Ambulatory Care, and Transitions of Care settings (1440 hours). These experiences expose them to diverse patient populations, acute and chronic diseases, and wellness-focused patient care services.

Pharmacy students enhance their skills in interprofessional team dynamics via structured IPE activities involving medical, nursing, and physician assistant students. Moreover, during IPPEs and APPEs, students actively participate in collaborative patient care within an interprofessional setting.

### Step 4: Curriculum development

The Pharm.D. The curriculum comprises 48 didactic and ten experiential courses, totalling 183 quarter credits. The curriculum spans three years, with courses developed and implemented sequentially following the matriculation of the first cohort. Faculty members are assigned courses based on expertise. They use a standardised template from the Curriculum Committee for syllabus development, which is then reviewed and approved by the committee to ensure alignment with educational objectives. This process involves assessing course learning outcomes (CLOs) for essential knowledge, skills, and attitudes, checking alignment with PLOs, and confirming using measurable action verbs in the construction of CLOs. The committee follows guidelines for evaluating new courses, including the use of standardised templates, alignment of CLOs with PLOs, adherence to student-centric pedagogy, and an assessment of the appropriateness and quality of course content and assessment strategies.

### Determination of content

The CAPE 2013 Outcomes and the ACPE Standards 1-4 serve as a framework outlining the knowledge, skills, and abilities that pharmacy students should attain to achieve competence as pharmacists. Besides, ACPE Appendix 1, NAPLEX blueprint, PCOA content area, Pharmacotherapy toolkit for disease states, and current therapeutic guidelines were utilised to determine the curricular content.

Standard 1 (Foundational Knowledge) of ACPE 2016 Standards requires graduates to blend diverse scientific knowledge, critically assess scientific literature, elucidate drug action, address therapeutic issues, and contribute to enhancing population health and patient-centred care (ACPE, 2016). Standard 2 prioritises holistic graduate development, imparting crucial skills for patient care, medication management, health promotion, and population health. Standard 3 highlights the development of problem-solving, communication, advocacy, and collaboration skills. Moreover, Standard 4 emphasises personal and professional development, urging graduates to foster self-awareness, leadership, innovation, entrepreneurship, and high professionalism standards.

This holistic approach to pharmacy education aims to produce graduates well-equipped for success in the dynamic healthcare field.

Integrating ACPE Standard 2-4 content across the curriculum required a concerted effort from the faculty and the curriculum team. Faculty participated in a series of immersive workshops tailored to the ACPE Standards. This approach allowed them to thoroughly explore the components of each Standard. As faculty understanding of the Standards deepened, the curriculum team formed three task forces comprising faculty experts who identified instructional content and skill-based activities in precise alignment with Standards 2-4. For example, the task force adopted the student leadership development competencies described by Janke and colleagues (Janke *et al.*, 2013). To ensure a cohesive educational experience, the curriculum team deliberately integrated content or learning activities across the curriculum using a "nesting" approach to curricular integration (Harden, 2000).

### Skill development

Beginning with communication, professionalism, and patient-centred care in their first year, learning activities were strategically integrated throughout the curriculum to enhance students' mastery of these skills progressively. Early emphasis is placed on health and drug information retrieval and ethical decision-making, with ongoing reinforcement. In parallel, practical pharmacy skills like self-care, physical assessment, and immunisations are addressed in several courses. Problem-solving and critical thinking skills are integrated throughout didactic and experiential courses. Leadership development is deliberately woven into the curriculum, culminating in a leadership assignment during clinical rotations. Patient care skill labs were integrated through the Integrated Pharmacotherapy courses and Advanced Pharmacy Practice Experiences (APPEs).

### Step 5. Implementation

Curriculum implementation is crucial to translating educational plans and curriculum designs into practical classroom experiences. The commitment to successful curriculum implementation represents an ongoing, dynamic effort to enhance student engagement, comprehension, and retention. Faculty carefully executed the curriculum framework, covering lesson planning, teaching methods, assessment approaches, and the efficient use of educational resources.

### Teaching and learning strategies

As curriculum developers, the SOP curriculum leaders were mindful of adult learning principles and related issues. Additionally, the leadership demonstrated effective teaching methods through modelling, showcasing how to incorporate the curriculum in an engaging and impactful manner.

The faculty adjusted their teaching strategies, aligning with the overarching educational goals and the diverse needs of students. Faculty used varied instructional methods and active learning strategies in delivering the curriculum, aiming to stimulate higher-order thinking, problem-solving, and clinical reasoning skills. The pedagogical techniques included traditional lectures, discussions, team-based activities, case recitations, laboratory practicum, role plays, Objective Structured Clinical Examinations (OSCEs), simulations, peer teaching, service learning, and self-directed learning and reflection exercises. Students develop and maintain an ePortfolio that serves as a tool for self-evaluation of progress made throughout the curriculum and co-curriculum. Diverse instructional methods are also employed by faculty to instruct within the experiential learning programme.

### Assessment strategies for student learning outcomes

The SOP curriculum prioritises robust assessment and evaluation practices to uphold rigorous educational standards. Faculty employ diverse formative and summative assessment activities to gauge student learning and professional development. Formative assessments utilise audience response systems, quizzes, think-pair-share, reflections, case studies, role-playing, patient counselling, OSCEs, journal club presentations, and simulations. Clinical rotations involve mid-point assessments using rubrics for formative feedback. Summative assessments include knowledge-based tests, research papers, case-based assignments, and OSCEs. Preceptors conduct summative evaluations after experiential rotations. Students maintain electronic portfolios to document achievements and reflections. These portfolios serve as platforms for tracking progress toward individual professional and personal goals throughout the programme.

### Step 6: Quality improvement of curriculum

The SOP has developed a faculty-driven Curriculum Review and Quality Assurance process. The objectives of the review process included assessing the appropriateness of all courses, course sequencing, adequacy of depth and breadth, and identifying gaps or redundancies. The Curriculum Committee utilised a

structured syllabus review process to ensure clear and measurable CLOs, teaching and learning strategies, and assessment tools. Student outcomes are measured by aggregated CLOs and PLOs assessment data and inform evaluations. The course-level assessment report and the quality improvement recommendations were communicated to course coordinators and department chairs. Action plans were created by the course coordinator(s), reviewed by the Curriculum Committee and Assessment Committee, and approved by all faculty for changes.

This above-described incremental course review process was further enhanced by engaging all faculty in an annual comprehensive curriculum review for the first four years since the inception of the programme in 2019. Faculty were introduced to the plan, process, timeline, and expectations at the beginning of the planning phase. The Curriculum Committee Chair formed taskforces with three or more faculty members serving each task force. The data collection and review involved a triangulation of assessment data: student learning outcomes, feedback, course materials, and curriculum mapping data. The task forces used a data collection instrument, including a series of questions focusing on course policies and procedures, content depth and breadth, instructional and assessment strategies, student workload and course outcomes. The task forces completed their reviews within eight weeks and presented their findings to all faculty during curriculum retreats. All faculty, administrators, and

staff participated in open discussions on the findings and recommendations of task forces and the decision-making process. The findings and recommendations were communicated to the respective course coordinators. Based on feedback and recommendations, course faculty created action plans for improvement. The curriculum reviews in 2020 and 2021 identified unintended redundancies and content overload in several courses. Course-level improvements encompassed content/topic adjustments, revisions of CLOs, revised mapping of CLOs with PLOs, and modifications to course sequencing during the subsequent iterations of the courses (Islam & Yang, 2023). Subsequently, in 2022, after the first cycle of three-year Pharm.D. courses, the SOP conducted a comprehensive curriculum review to further strengthen the curriculum. Gaps in several content areas, including pharmaceutical calculations, the Top 300 drugs, and brand-generic drug names were identified. To address these gaps, the curriculum committee undertook content adjustments across the curriculum and introduced three milestone courses. Inadequate course credit hours for the intended depth and breadth of course content in the Pharmacotherapy of Infectious Diseases course were identified. The course has been split into two courses with additional credit hours. Moreover, active learning exercises were integrated into nine therapeutic courses for enhanced knowledge transfer. The Curriculum Committee ensures that the changes are implemented and the impact is monitored.

**Table III: Curricular changes based on assessment data**

| Assessment findings | Curricular modifications | Implementation timelines |
|---|---|---|
| Inadequate coverage of pharmaceutical calculations in the curriculum | The pharmaceutical calculations component has been integrated across the curriculum: | |
| | • PS 715: Pharmaceutical Calculation course (PY1 summer) | Summer 2019 |
| | • PS 722: Pharmaceutics and Biopharmaceutics (PY1 Fall) | Fall 2020 |
| | • PS 735: Extemporaneous & Sterile Compounding with Lab (PY1 Spring) | Spring 2020 |
| | • AS 745: Biostatistics & Research Design (PY1 Spring) | Spring 2020 |
| | • PS 733: Basic Pharmacokinetics (PY1 spring) | Spring 2020 |
| | • CS 748: Practice Readiness I (PY1 Spring) | Spring 2024 |
| | • CS 857: Integrated Pharmacotherapy I: Fluids, Electrolyte & Nutrition | Summer 2022 |
| | • CS 868: Integrated Pharmacotherapy VI: Infectious Disease | Winter 2022 |
| | • CS 886: Practice Readiness II | Spring 2025 |
| | • CS 943: Practice Readiness III | Spring 2026 |
| Lack of reinforcement of brand-generic and Top 300 drugs | Brand-generic and Top 300 drugs were integrated into the PY1 courses in the format of course-embedded quizzes and self-directed learning: | |
| | • CS 712: Patient Care Process: Health and Drug Information | Summer 2020 |
| | • AS 736: Professional Communications | Summer 2020 |
| | • CS 713: Self-Care Pharmacotherapy & Alternative Therapy | Fall 2020 |
| | • CS 734: Physical Assessment and Pharmacy Practice Lab | Fall 2021 |

| Assessment findings | Curricular modifications | Implementation timelines |
|---|---|---|
| | • CS 724: Pharmacy Practice: Medication Use Systems Management | Winter 2021 |
| | • EE 746: IPPE I – Community | Spring 2019 |
| | • All integrated therapeutics courses emphasise on Top 300 drugs and brand-generics practices | Summer 2021 |
| Unintended redundancy and content overload | Balancing of course materials based on credit and contact hour allocation to minimise content overload in the following courses: | |
| | • PS 731: Immunology & Medical Microbiology | Fall 2020 |
| | • PS 741: Pathophysiology | Winter 2020 |
| | • CS 872: Integrated Pharmacotherapy VI: Infectious Disease with Lab | Winter 2020 |
| | • CS 881: Integrated Pharmacotherapy VII: Oncology & Nutrition with Lab | Spring 2020 |
| Content gaps identified (toxicology, pharmacoeconomic principles of drugs) | • Toxicology Elective offered in the curriculum | Winter 2022 |
| | • Pharmacoeconomic principles were integrated into integrated therapeutic courses. | Summer 2021 |
| Lack of reinforcement of prior knowledge and skills for practice readiness | Three practice readiness courses have been incorporated into the curriculum to help students practice readiness. A milestone examination is integrated into each course which mimics NAPLEX examination questions. | |
| | • Practice Readiness I: This course reinforces topics in calculations, communications, patient and drug information, Top 300 drugs, self-care, and compounding. | Spring 2024 |
| | • Practice Readiness II:  This course reinforces topics in calculations, SOAP writing, disease state review, and care plan development. | Summer 2025 |
| | • Practice Readiness III:  This course brings together previous knowledge and skills from both the didactic and experiential curricula. Topics in calculations, compounding, disease state review, and care plan development will be reviewed. | Spring 2026 |
| Inadequate course credit hours for the intended depth and breadth of course content | Based on students' course evaluations and recommendations from comprehensive curriculum review taskforce, CS 872: Integrated Pharmacotherapy VI: Infectious Disease with Lab is split into two courses with each of 4 credit hours for optimal content coverage: | |
| | i. CS 868: Integrated Pharmacotherapy VI: Infectious Disease I | Winter 2023 |
| | ii. CS 876: Integrated Pharmacotherapy VI: Infectious Disease II | Spring 2023 |
| Inadequate coverage of NAPLEX content areas across the curriculum | Conducted curriculum mapping to ensure adequate coverage of six NAPLEX competency areas. Curricular content was adjusted in 15 courses to emphasise NAPLEX competency areas. | Summer 2023 |
| Course delivery lacks active learning strategies | Course delivery improved with increased active learning exercises in class related to patient cases in all integrated therapeutic courses. | Summer 2023 |
| Lack of students' awareness of NAPLEX | The SOP has integrated NAPLEX preparation modules into the curriculum. NAPLEX-type questions are embedded in quizzes, exams, homework, and case studies in each of these modules. | Spring 2023 |
| NAPLEX: North American Pharmacist Licensure Examination | | |

## Evaluation

Triangulation of multiple qualitative evaluations, including students' faculty and course evaluations (FCEs), AACP Curriculum Quality Surveys, and faculty evaluations of the curriculum review process, were employed to evaluate curriculum structure, content, organisation, and outcomes.

The University's Office of Institutional Research and Assessment conducts FCEs twice per quarter – mid-quarter and at the end. The AACP Curriculum Quality Surveys gather insights from graduating students, faculty, preceptors, and alumni to inform data-based enhancements in pharmacy programmes. These surveys were first introduced in 2007 and later refined to adhere to ACPE Standards 2016 (Plaza *et al.*, 2014). Moreover, the SOP Assessment Committee developed and pre-tested a survey for faculty evaluations of the curriculum review process to ensure its validity.

The SOP collects students' feedback to assess the course quality and faculty teaching effectiveness through FCEs. Students evaluate preceptors and practice sites via summative feedback through the end-of-rotation evaluations. The FCEs revealed that 100% of faculty performed at or above the university benchmark (average scores 3.5 or above on a 5-point Likert scale). Students' comments were positive for most of the faculty. Most preceptors in IPPEs and APPEs for the Class of 2022 and 2023 exceeded the ratings of 3 out of 4 in students' evaluations.

In AACP Faculty Surveys (2020-2023), faculty strongly agreed on clarity (100%), instructional alignment (100%), depth supporting concepts (95%), interdisciplinary collaboration (95%-100%), and using assessment data for improvement (95%-100%). Graduating students affirmed their competence in patient-centred care, medication expertise, health needs assessment, and optimising medication use. Students (100%) agree on achieving educational goals in patient education, advocacy, collaboration, social determinants of health consideration, and effective communication, personal and professional growth, shared goals, innovative practice, and pharmacist professional expectations. Preceptors (93%-100%, 2021-2023) and alumni (100%, 2023) similarly agreed on all curriculum elements related to ACPE Standards 1-4.

Faculty (100%) surveyed on the curriculum review process reported response rates of 3 or above on a 4-point Likert scale. Communication about the curriculum review's purpose, process, and organisation received favourable responses. The data collection worksheet significantly improved the organisation of the review process (mean rate, 3.71). The curriculum retreat was valuable for fostering insights through open discussions. Participants noted an enhanced understanding of course interrelatedness, promoting dialogue, reflection, and consensus. These positive ratings suggest the curriculum review process effectively achieved its goals and fostered collaboration among faculty.

## Future plans

Over the preceding four years, the SOP has undergone a meticulous process of developing, implementing, and refining its curriculum. This period was not without its challenges. One significant challenge was faculty resistance to change, as they often require evidence of the value of proposed changes (McCullough & Jones, 2014; Tagg, 2012). Additionally, limited faculty time, driven by competing obligations like research, teaching,

and service, posed another obstacle (Banta & Blaich, 2011). Balancing the curriculum's content and ensuring seamless integration demanded innovative solutions to create a cohesive educational programme. Challenges emerged during integrated course development, including interdepartmental discord, faculty time constraints, content inconsistencies, and compliance issues. Insufficient interaction between basic and clinical science faculty was also noted. These challenges were addressed through one-on-one meetings between instructors and the Associate Dean of Academic Affairs.

These future strategies are heavily drawn upon the experiences and insights gained during this period. Throughout this process, the authors have recognised the importance of faculty development in curriculum development and maintenance. Ongoing professional development helps faculty stay current with the latest teaching best practices (Dillard & Siktberg, 2013). Faculty development is an integral component of the overall curriculum development process (Alsubaie, 2016; Iwasiw *et al.*, 2020a). It entails enhancing faculty skills and knowledge of faculty members to ensure they are well equipped to design, implement, and evaluate an effective curriculum (Iwasiw *et al.*, 2020a; Khan *et al.*, 2020; van Schaik, 2021). Faculty development initiatives in pharmacy education primarily concentrate on teaching, assessment, research, and grant writing (Behar-Horenstein *et al.*, 2018; Desselle & Semsick, 2016; Franks, 2018; Zimmermann & Thomas, 2017). Literature regarding faculty development in the context of pharmacy curriculum design is scarce (Iwasiw *et al.*, 2020a).

Moving forward, it will be crucial to consistently monitor student learning outcomes and conduct a comprehensive curriculum review to ensure the curriculum stays dynamic and relevant. This periodic evaluation will enable adaptation to emerging trends, advancements, and industry changes, ensuring the curriculum remains aligned with the evolving demands of the profession. The authors anticipate that future curriculum evaluation will emphasise greater personalisation to cater to diverse learning styles and individual student needs. Moreover, effective leadership, stakeholder engagement, collaboration, and shared accountability will be crucial for assessing and maintaining the success of the curriculum. Insights gained from this new pharmacy school journey are expected to assist other curriculum planners and faculty in the curriculum development or review process.

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The authors declare no conflict of interest.

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**Appendix A: Curriculum review data collection instrument**

The Curriculum Committee developed a standardised data collection instrument to assess each course in the curriculum. The following table shows the general areas of questioning pursued by the working group. The working group is expected to organize their reviews in order to address all questions, to ensure more meaningful results and consistency of data collection.

**Data collection template used by working group in course review process**

| Areas | Questions |
|---|---|
| Course Policies/Procedures (Syllabus) | Check whether the course syllabus address the following<br>• Course objectives<br>• Course description<br>• Schedule of topics<br>• Grading<br>• Teaching strategies<br>• Assessment strategies |
| Course Contents | Is the depth and breadth of content appropriate and adequate for the course?<br>Does it match with course objectives?<br>Should any topic(s) be added or deleted?<br>How the course is linked or integrated with other courses in the curriculum?<br>Is there any content redundancies/duplication?<br>Is there content reinforcement from a prior course? |
| Instructional Strategies | Does the course employ diverse teaching and learning strategies?<br>What types of learning activities are used?<br>Would additional types of activities enhance student learning?<br>What instructional materials are used? How effectively? |
| Assessment | Does the course utilize a diverse assessment strategy?<br>Are the number of assessments appropriate for the course?<br>Is the amount of assessment excessive, about right, or insufficient? |
| Balance of student workload | Are the course activities balanced for student workload? |
| Student learning outcomes | At the end of the course, what evidence is there that students have achieved the stated objectives? |