BRIDGING THE SKILLS GAP IN PHARMACY EDUCATION: A COMPREHENSIVE REVIEW OF COMPETENCY- BASED REFORMS FOR B. PHARM AND M. PHARM

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ABSTRACT

The current pharmacy curriculum in India is heavily content-oriented, examination-driven, and misaligned with industry and clinical expectations. Competency-Based Education (CBE) emerges as a promising approach that emphasizes measurable outcomes, practical skill development, and professional readiness rather than rote learning. This review examines the need, challenges, and potential strategies for implementing CBE in Pharmacy programs in India. It explores the global context, regulatory frameworks, digital integration, skill mapping, faculty development, and industry-academia collaboration. The paper proposes a multi-tiered approach for holistic curriculum reform, aligning pharmacy education with evolving domains such as clinical pharmacy, regulatory sciences, precision medicine, and digital therapeutics.

KEYWORDS: Competency-Based Education, Pharmacy, Pharmacy Curriculum Reform, Skill-Based Learning, Digital Pharmacy.
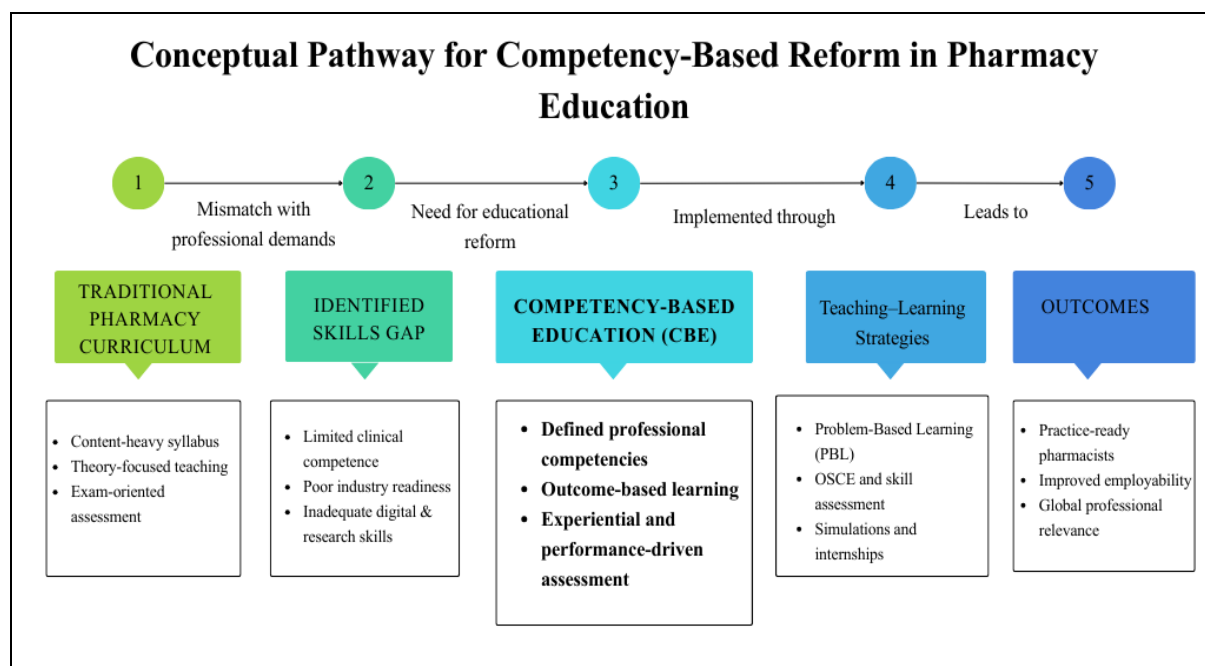
1. INTRODUCTION

Pharmacy education in India is experiencing a period of intense scrutiny and reflection, driven largely by the widening mismatch between what students learn in academic institutions and what the professional world expects from practicing pharmacists. Even though the pharmaceutical sector in India has expanded rapidly—emerging as a major global supplier of generics, vaccines, medical devices, and clinical research services—the pace of curriculum reform has not kept up with the industry's evolving skill demands. Hospitals, regulatory bodies, pharmaceutical companies, and community health systems consistently report gaps in graduates' practical abilities, clinical decision-making skills, research competence, digital literacy, and communication proficiency. This persistent disparity underscores an urgent need to redesign pharmacy education so that it produces professionals who are not only knowledgeable but also capable, adaptable, and

practice-ready (Guru 2020). Traditional pharmacy programs, especially B. Pharm and M. Pharm, are largely structured around content-heavy syllabi, memorization-based assessments, and rigid semester systems. These factors limit students' opportunities for hands-on learning, critical thinking, and independent problem-solving. The emphasis often lies on theoretical understanding rather than applied competence, resulting in graduates who struggle to integrate into diverse professional environments such as clinical pharmacy, hospital practice, regulatory affairs, pharmacovigilance, formulation development, and clinical data management. Numerous reports by academic bodies and employers highlight that insufficient training in patient-centred care, inadequate laboratory skill development, and limited exposure to real-world scenarios remain major barriers to building a competent pharmacy workforce in India (J. Frank et al. 2015).

Competency-Based Education (CBE) is increasingly recognized as a transformative model capable of addressing these gaps. CBE shifts the focus from time-bound teaching and examination patterns to measurable competencies that reflect real-world professional expectations. Instead of merely covering topics, students are expected to demonstrate essential skills such as clinical reasoning, ethical judgment, communication proficiency, data interpretation, critical appraisal, and the ability to apply pharmaceutical knowledge in authentic contexts (Farris *et al.* 2023). Countries like the United States, Canada, Australia, and the United Kingdom have already adopted such frameworks—such as the CAPE Outcomes, CanMEDS Competency Framework, and the General Pharmaceutical Council (GPhC) standards—to ensure that pharmacy graduates are aligned with healthcare needs and global practice expectations (Zodpey and Sharma 2019)

In India, discussions around skill-based reforms have gained momentum following the introduction of Outcome-Based Education (OBE), the National Education Policy (NEP 2020), and accreditation mandates by bodies like the National Board of Accreditation (NBA). While OBE has laid the foundation, a more structured shift toward Competency-Based Education is required to achieve meaningful change. CBE enables personalized learning, encourages interdisciplinary exposure, promotes reflective practice, and integrates continuous formative assessment—components that are vital for healthcare-related disciplines (Deepak Kumar Behera, 2Shehnaz Firdaus, 3Rajlaxmi Upadhyay *et al.* 2024). Moreover, rapid technological advancements in artificial intelligence, digital therapeutics, telepharmacy, virtual simulation labs, and precision medicine demand a pharmacy curriculum that prepares students for contemporary and future roles, not just traditional ones. Therefore, bridging the skills gap in pharmacy education is not merely an academic improvement—it is a strategic national requirement. The global pharmaceutical landscape is becoming more complex, patient-centric, and technology-driven, and India must ensure that its pharmacy graduates can operate confidently in these dynamic environments. This review provides a comprehensive evaluation of the need for Competency-Based Education in B. Pharm and M. Pharm programs in India. It discusses the limitations of traditional curricula, examines global competency frameworks, reviews regulatory challenges, and outlines actionable strategies to establish a future-ready educational system that aligns with India's healthcare and industrial needs (Rhoney *et al.* 2024).

Figure 1: Conceptual Framework for Competency-Based Reform in Pharmacy Education.

2. Global Competency Framework in Pharmacy Education

The practice of pharmacy has changed tremendously over the past few decades, transitioning from a product-oriented profession to one which focuses on patient care, team-based care and evidence-based practice. With changes in pharmacy roles in clinical, community, regulatory, and public health, there is increasing need to create educational programs that produce graduates with the competencies necessary for such new models of healthcare. The international community's professionals and pharmaceutical workforce must respond to this demand and meet the FIP Global Competency Framework (GCF), a common reference that provides guidance on curriculum design, assessment development, workforce training (Deepak *et al.* 2024).

2.1. Historical Development and Rationale

Prior to the GCF, pharmacy education was quite diverse between countries. Inhomogeneity in the length, structure and content of the pharmaceutical education as well as inconsistencies in definitions of professional roles and evaluation systems resulted in varying competences among pharmacy alumni. The globalisation of the world and movements in international workforce and the co-operation in healthcare required harmonised expectations on competences. FIP launched the initial version of the Global Competency Framework (GbCF v1) in 2012, targeting pharmacists at the entry level. It detailed the behavioural competencies that pharmacists should exhibit in their practice, no matter where they are located. Significantly, the framework adhered to the "adopt-and-adapt" principle, allowing different countries or institutions to customize it according to their regulatory, cultural, and practice contexts. Revisions that followed resulted in GbCF v2 (2020), an updated document that encompassed modern roles like immunisation, collaborative prescribing, pharmacogenomics, chronic disease management, and digital health. The development of the GCF demonstrates the evolving role of the pharmacist as a primary healthcare provider involved in patient-focused care and public health initiatives (Riyadi1 et al. 2025).

2.2. Areas and Framework of Expertise for the GCF

The Global Competency Framework in Pharmacy Education is underpinned by four integrated domains that collectively define the scope and expectations of contemporary pharmacy practice. Pharmaceutical Public Health emphasizes the pharmacist's role in improving population health through health promotion, disease prevention, antimicrobial stewardship, medication safety, emergency preparedness, and vaccination advocacy, a contribution that gained heightened visibility and importance during the COVID-19 pandemic. Pharmaceutical Care constitutes the clinical core of the profession, encompassing comprehensive patient assessment, evidence-based therapeutic decision-making, medication therapy management, identification and resolution of drug-related problems, patient counselling, and the promotion of medication adherence, thereby reflecting the transition toward patient-centered, outcome-driven care. Organisation and Management address the managerial and system-level competencies required to ensure safe, efficient, and sustainable pharmacy services, including leadership, human resource management, inventory and supply chain oversight, financial management, quality assurance, and risk management, which are increasingly critical as pharmacy practice expands within multidisciplinary healthcare systems. Professional and Personal Competencies form the foundation across all domains by emphasizing ethical conduct, professionalism, effective communication, cultural competence, interprofessional collaboration, reflective practice, and lifelong learning, ensuring that pharmacists remain accountable, adaptable, and capable of responding to the evolving demands of global healthcare (Muhammad Salahudeen et al. 2015).

2.3. Global Adoption and National Adaptations

While the Global Competency Framework serves as an international reference point, its true value is found in its adaptability, as evidenced by its incorporation into national standards such as the General Pharmaceutical Council's (GPhC's) Standards for Initial Education and Training of Pharmacists in the UK, the AACP's CAPE Outcomes in the United States, the National Competency Standards Framework for Pharmacists in Australia, and tailored competency models implemented across numerous Asian and Middle Eastern nations including Kuwait, Thailand, Lebanon, and Indonesia, highlighting both its worldwide significance and the need for contextual adaptation.

The Global Competency Framework (GCF) plays a pivotal role in guiding curriculum design, assessment, and experiential learning within pharmacy education. Through curriculum mapping, the framework enables educators to systematically align learning objectives, teaching methodologies, and assessment strategies, thereby ensuring curricular coherence, transparency, and the identification of gaps in competency coverage. In terms of assessment, the GCF supports a competency-based, multimodal evaluation approach that incorporates Objective Structured Clinical Examinations (OSCEs), workplace-based assessments (WBAs), entrust able professional activities (EPAs), portfolios, reflective writing, and structured supervisor evaluations. Collectively, these methods facilitate comprehensive assessment of not only cognitive knowledge but also clinical reasoning, communication skills, professional behaviour, and ethical decision-making. Furthermore, the GCF strongly emphasizes experiential learning, advocating for structured and supervised placements in community, hospital, and primary care settings, where students can progressively demonstrate and integrate competencies within authentic practice environments, thereby bridging the gap between theoretical instruction and real-world professional practice (Mandal and Gupta 2019).

Table 1: International Competency Frameworks for Pharmacy Education.

Sl. No	Country/Region	Framework	Key Competencies
1.	USA	CAPE Outcomes	Patient care, professionalism
2.	Canada	CanMEDS	Leadership, collaboration
3.	UK	GPhC Standards	Safe practice, ethics
4.	Global	FIP Framework	Pharmaceutical care, research

2.4. Faculty Development and the Educator Competency Framework

A significant obstacle in adopting competency-based curricula is the insufficient readiness of faculty members. To address this issue, FIP launched the Global Competency Framework for Educators (GCFE) to assist in the professional growth of instructors in aspects such as teaching methods, assessment creation, mentoring, and reflective practice. This supporting framework encourages educator responsibility and guarantees that academic personnel have the essential competencies needed to provide quality pharmacy education in line with the GCF (Udoh *et al.* 2021).

3. Gaps in the current Indian pharmacy education system

Pharmacy education in India has seen significant growth over the last twenty years, marked by a notable rise in the number of institutions providing Diploma in Pharmacy (DPharm), Bachelor of Pharmacy (BPharm), Master of Pharmacy (MPharm), and Doctor of Pharmacy (PharmD) programs. Although this expansion has increased access to pharmaceutical education, it has also led to challenges concerning quality assurance, standardization, and alignment with the current needs of healthcare and the pharmaceutical industry. The regulatory oversight from organizations such as the Pharmacy Council of India (PCI) and the All-India Council for Technical Education (AICTE) has maintained minimum standards; nevertheless, there are still significant deficiencies in curriculum development, practical learning experiences, and the competency outcomes of graduates (Rhoney *et al.* 2024).

3.1. Curriculum Deficiencies and Inconsistency with Modern Practices

One significant drawback of the existing pharmacy curriculum in India is its persistent focus on conventional, content-heavy teaching methods. Numerous programs primarily concentrate on pharmaceutical sciences, with insufficient integration of clinical pharmacy, patient-focused care, pharmacovigilance, pharmacogenomics, regulatory science, and digital health technologies. Consequently, graduates frequently lack familiarity with the evolving responsibilities of pharmacists in healthcare delivery and public health. In many institutions, the curriculum has not adapted to the swift advancements in therapeutics, biotechnology, and personalized medicine, resulting in a

gap between educational outcomes and the actual demands of the profession (Babar 2021).

3.2. Insufficient Practical and Hands-On Training

Experiential learning is fundamental to pharmacy education, yet practical experience in Indian pharmacy programs is often inadequate and applied inconsistently. Laboratory work typically focuses on elementary experiments, while opportunities for clinical exposure in hospitals, community pharmacies, and patient care are quite limited. Where internship programs exist, they commonly lack defined learning objectives, consistent assessment methods, and sufficient oversight. This shortfall obstructs the attainment of critical skills such as patient counselling, therapeutic decision-making, medication safety, and professional communication (Meštrović *et al.* 2022).

3.3. Restricted Collaboration Between Clinical Pharmacy and Patient-Cantered Care

Even with the implementation of PharmD programs, the practice of clinical pharmacy is still not fully realized in numerous institutions. Educational approaches frequently focus on theoretical pharmacotherapy instead of practical clinical reasoning and teamwork across disciplines. There are few chances for students to engage in ward rounds, medication therapy management, and interprofessional healthcare teams. As a result, pharmacy graduates may feel uncertain and unskilled in taking on proactive roles within healthcare systems, which diminishes the potential influence of pharmacists on patient outcomes and medication safety (Balakrishnan *et al.* 2018).

3.4. Challenges Related to Faculty and Gaps in Professional Development

The quality of pharmacy education is significantly linked to the knowledge and skills of the faculty as well as the success of their instructional methods. Many institutions face challenges due to a shortage of seasoned faculty, particularly in areas related to clinical pharmacy and research. There is a lack of opportunities for continuous professional growth for educators, and faculty often have restricted access to current industry practices or clinical environments. This situation leads to outdated teaching techniques and limits the adoption of innovative, competency-based teaching methods in pharmacy programs (Jishnu, Gilhotra, and Mishra 2011).

Table 2: Challenges and Potential Solutions for Implementing CBE in Indian Pharmacy Education.

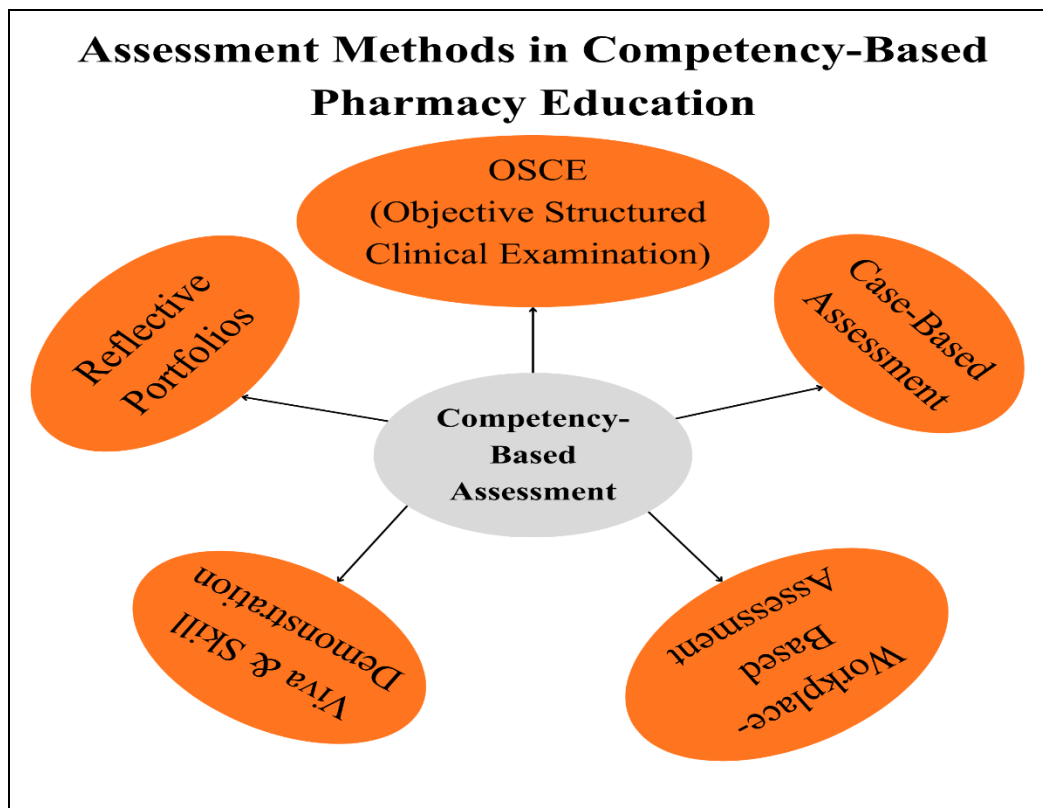| Sl. No	Challenge	Root Cause	Suggested Solution
1.	Faculty readiness	Lack of training	Faculty development programs
2.	Assessment difficulty	Traditional exams	OSCE, rubrics
3.	Infrastructure	Limited labs	Simulation-based learning
4.	Regulatory rigidity	Fixed syllabus	Modular curriculum

3.5. Assessment and Evaluation Shortcomings

In Indian pharmacy education, assessment methods mainly focus on summative written tests that assess

factual knowledge instead of practical skills or professional abilities. There is infrequent use of Objective Structured Clinical Examinations (OSCEs),

assessments based in the workplace, and portfolio reviews. The absence of frameworks for competency-based assessments hampers the evaluation of students'

preparedness for professional practice, potentially enabling graduates to advance without proving essential clinical or practical skills (J. R. Frank *et al.* 2010).

Figure 3: Assessment Methods Used in Competency-Based Pharmacy Education.

3.6. Poor Collaboration Between Industry and Academia

Collaboration between universities and the pharmaceutical sector is still quite limited. Despite India having a robust pharmaceutical manufacturing and research landscape, there is a lack of organized partnerships for internships, collaborative research initiatives, curriculum design, and faculty exchanges. This gap leads to graduates who lack familiarity with contemporary industrial practices, regulatory standards, quality assurance protocols, and professional expectations, which in turn impacts their employability and readiness for the workforce (Palsokar and Tajne 2018).

3.7. Limitations on Research and Innovation

The research training offered at the undergraduate level is frequently insufficient, with few opportunities for students to get involved in significant research endeavours. Factors contributing to this include a lack of proper infrastructure, limited financial resources, and inadequate mentorship. Consequently, students may not develop essential skills in research methodologies, data analysis, scientific writing, and innovation. This deficiency hinders the growth of future researchers, academics, and innovators in the field of pharmaceutical sciences (Deshmukh and Paliwal 2024).

3.8. Disparities in Infrastructure and Resources

There are notable inequalities in infrastructure and educational resources among pharmacy schools throughout India. Although certain institutions have cutting-edge laboratories and educational technologies, numerous others function with obsolete equipment and restricted access to digital tools, simulation resources, and contemporary analytical devices. These disparities lead to differences in graduate skill levels and the overall quality of education across the country.

3.9. Shortcomings in Training for Soft Skills, Ethics, and Professionalism

Soft skills like communication, collaboration, leadership, and ethical decision-making are essential in pharmacy practice, yet many educational programs do not focus on them sufficiently. Training in professional ethics, patient communication, and cultural awareness is frequently insufficient or purely theoretical. The lack of organized skill development in these domains can adversely impact the quality of patient care and the integration of professionals.

3.10. Continuing Professional Development and Lifelong Learning Gaps

Continuing professional development (CPD) programs for pharmacists in India are currently disorganized and poorly enforced. In contrast to several developed nations,

CPD obligations are not consistently tied to license renewal or career advancement. This hinders practicing pharmacists from enhancing their knowledge and skills in alignment with the changing healthcare and pharmaceutical environments (Goyal *et al.* 2014).

3.11.   Regulatory and Accreditation Obstacles

Despite the establishment of minimum educational standards by regulatory bodies, there continues to be inconsistency in how these are implemented and monitored. Accreditation based on outcomes, which emphasizes the skills of graduates and their job prospects, is still developing. The absence of uniform quality benchmarks and a lack of transparency lead to variations in educational standards among different institution (Babar 2021).

3.12.   Tackling the Needs of Public Health and Community Pharmacies

Pharmacy education today does not sufficiently focus on public health, preventive care, and practices in community pharmacies, especially in rural and underserved regions. The training often prioritizes urban settings, which limits graduates' readiness to play a significant role in primary healthcare and public health efforts. Enhancing community-focused education is crucial for increasing the involvement of pharmacists in India's healthcare system (Desale 2013).

4.   Challenges in implementing CBE in pharmacy programs in India

Competency-Based Pharmacy Education (CBPE) represents a progressive shift in pharmacy education, aiming to produce graduates who are competent, practice-ready, and responsive to the evolving needs of the healthcare system. By emphasizing outcome-based learning and practical skill acquisition, CBPE seeks to bridge the gap between theoretical knowledge and real-world professional practice (Voorhees 2001). However, as highlighted in the present discussion, the transition from a traditional, knowledge-oriented curriculum to a competency-based framework is complex and fraught with multiple challenges. One of the foremost challenges in the implementation of CBPE relates to student awareness, availability of resources, and adequacy of time allocation. Students' understanding of the philosophy, structure, and expectations of competency-based education is fundamental to its success (Raja and Khan 2018). Inadequate orientation programs often result in confusion regarding learning objectives, assessment strategies, and the importance of self-directed and experiential learning. When students are not sufficiently sensitized to the principles of CBE, their engagement and alignment with competency requirements are adversely affected, ultimately limiting the effectiveness of the educational process. Equally important is the availability of adequate resources to support competency development. CBPE relies heavily on trained faculty, well-equipped laboratories, simulation facilities, digital learning platforms, and opportunities for hands-on

practice. Resource constraints, particularly in government and newly established institutions, restrict meaningful skill acquisition, limit opportunities for feedback, and compromise the quality of supervision. In addition, insufficient time allocation for repeated practice, reflection, remediation, and formative assessment further hampers the attainment of competencies, placing undue pressure on both students and faculty (Muhammad Salahudeen *et al.* 2015).

Infrastructural inadequacies in newly established medical and pharmacy colleges pose another major barrier. Despite regulatory mandates by bodies such as the National Medical Commission, skill laboratories and simulation facilities often remain underdeveloped or poorly maintained. The lack of essential training tools, shared resources across departments, and inadequately equipped classrooms undermines the implementation of student-centered teaching methods such as case-based learning and team-based learning. These deficiencies directly affect the quality and consistency of competency-based pharmacology and pharmacy education. The regularity and adequacy of supervision also emerge as critical concerns. Although the framework of Competency-Based Medical Education (CBME) emphasizes continuous supervision and formative feedback, supervisory visits are frequently irregular or insufficient. Inadequate supervision limits real-time monitoring of student performance, reduces opportunities for corrective feedback, and leads to variability in teaching standards across departments. As a result, there is often a disconnect between planned curricular objectives and their actual execution at the ground level. Faculty shortage and increased workload further compound these challenges. CBPE demands close supervision, frequent assessments, individualized feedback, and extensive documentation of learner progress. However, faculty members are often burdened with large student numbers, multiple teaching responsibilities, clinical duties, research expectations, and administrative tasks. The additional documentation requirements associated with competency-based assessment increase faculty workload, often resulting in delayed or superficial feedback and a tendency to reduce assessments to checklist-based exercises rather than meaningful formative processes (Katoue and Schwinghammer 2020).

In conclusion, while CBPE holds significant promise for enhancing the quality and relevance of pharmacy education, its effective implementation is constrained by multiple interrelated challenges, including inadequate orientation, limited resources, infrastructural deficiencies, irregular supervision, and faculty shortages. Addressing these issues requires a coordinated and sustained effort at institutional and policy levels. Strengthening faculty capacity, improving infrastructure, ensuring adequate resource allocation, providing structured orientation programs, and optimizing time and supervision are essential steps toward realizing the full

potential of competency-based pharmacy education. By systematically addressing these challenges, CBPE can truly fulfil its goal of producing competent, confident, and practice-ready pharmacy graduates capable of meeting contemporary healthcare demands (Ferede *et al.* 2015).

5. Traditional vs Competency-Based Education

The comparison between traditional education and Competency-Based Education (CBE) reveals a fundamental transformation in the philosophy, delivery, and expected outcomes of professional training, particularly in healthcare and pharmacy education. Traditional educational models primarily emphasize the acquisition of theoretical knowledge through lectures, rote learning, and periodic examinations. Student progression is largely time-based, and assessments are mainly summative, focusing more on memorization than on the application of knowledge (Ordonez 2014). Although this system has been effective in transmitting foundational concepts, it often fails to adequately prepare graduates for real-world professional practice, as practical skills, critical thinking, and decision-making abilities may remain underdeveloped. In contrast, Competency-Based Education focuses on the attainment of clearly defined competencies that integrate knowledge, skills, attitudes, and professional behaviour. This approach is learner-centered and outcome-oriented, emphasizing experiential learning, continuous formative assessment, and timely feedback. Progression is based on demonstrated mastery rather than completion of a fixed academic timeline. Teaching–learning strategies such as case-based discussions, simulation exercises, team-based learning, and workplace-based training are central to CBE, promoting active participation, practical skill development, and readiness for professional roles (Mohamed Ibrahim and Fathelrahman 2018).

Graduates trained under a competency-based curriculum demonstrate comprehensive proficiency across all areas of their discipline, ensuring that no component of the curriculum remains insufficiently mastered. As a result, these graduates are well prepared to meet professional expectations and are considered job ready. This is particularly important in the context of the rapidly evolving labour market influenced by the fourth industrial revolution, where technological advancement demands adaptable, skilled, and practice-ready professionals. CBE equips learners with the ability to apply knowledge effectively and respond to changing professional environments (Taylor, Carr, and Kujan 2024). However, transitioning from traditional education to CBE presents several challenges. Successful implementation requires significant institutional and cultural shifts, including redefining the role of educators from information providers to facilitators, mentors, and evaluators. Adequate infrastructure—such as simulation facilities, digital learning platforms, and clinical or practical training environments—must be established or enhanced. Faculty shortages, increased teaching and assessment workloads, and extensive documentation requirements further complicate adoption. Moreover, students accustomed to passive learning may find it difficult to adjust to the self-directed and performance-oriented nature of CBE, highlighting the need for proper orientation and ongoing academic support. Overall, while traditional education prioritizes knowledge retention and time-bound advancement, CBE emphasizes competency mastery, practical application, and adaptability to professional demands. Graduates of CBE programs are generally better equipped for clinical, industrial, and community-based roles, capable of translating theory into practice and engaging in lifelong learning. By narrowing the gap between knowledge and application, CBE produces professionals who are competent, confident, and prepared for real-world challenges (Raja and Khan 2018). Understanding the fundamental differences between traditional pharmacy education models and competency-based education is essential for evaluating the need for curriculum reform. While conventional approaches emphasize content delivery and time-based progression, competency-based education focuses on measurable skills, professional performance, and real-world applicability. These distinctions are summarized in Table 1.

Table 3: Comparison Between Traditional Pharmacy Education and Competency-Based Education.

Sl.No	Aspect	Traditional Pharmacy Education	Competency-Based Education
1	Educational focus	Knowledge accumulation	Competency and performance
2	Teaching approach	Lecture-centered	Learner-centered and experiential
3	Curriculum structure	Rigid and time-bound	Flexible and mastery-based
4	Assessment method	Written examinations	OSCE, portfolios, workplace-based
5	Skill evaluation	Indirect	Direct and measurable
6	Industry/clinical exposure	Limited or optional	Integrated and mandatory
7	Student role	Passive learner	Active participant
8	Outcome	Degree-oriented	Practice-ready professional

6. The proposed competency framework and curriculum model in India for Pharmacy Education

Over the past few decades, competency-based education (CBE) has gained widespread attention in higher education and professional training. Health-related fields like nursing, pharmacy, hospital administration, and healthcare leadership have increasingly adopted CBE, along with its assessment systems. Public health has also made significant strides in defining and standardizing

core competencies (Zodpey and Sharma 2019). The current pharmacy curriculum covers only a limited range of multidisciplinary subjects. To keep pace with modern science and technology, it's essential to expand course options. Introducing topics like data analytics, robotics, mechatronics, artificial intelligence, and advanced engineering tools can better equip future pharmacists for emerging trends and innovations in drug development (Alowais *et al.* 2024).

In India, medical colleges have traditionally trained public health professionals, but undergraduate public health education remains limited. In 2009, a national consultation by the Ministry of Health and WHO India reviewed workforce development and emphasized the need for a competency-based curriculum. Through literature review and workshops, experts mapped public health functions for MBBS doctors and identified 16 core competencies covering communication, leadership, equity, ethics, problem-solving, systems thinking, and conflict resolution to be integrated into the MBBS syllabus (Pandav *et al.* 2016). Pharmacy education in India is shifting toward a competency-based, industry-aligned, and interdisciplinary approach across all levels of training — from diploma and undergraduate (B Pharm) to postgraduate (M Pharm) and professional doctoral (Pharm D) courses. Regulatory reforms by the Pharmacy Council of India (PCI) — linked to the goals of National Education Policy 2020 (NEP 2020) — aim to make pharmacy graduates better prepared for the evolving needs of healthcare and pharmaceutical sectors (Pandav *et al.* 2016).

These reforms intend to bridge the gap between academic learning and real-world practice by equipping students with not only foundational pharmaceutical knowledge, but also skills, attitudes, and competencies relevant to industry, clinical practice, and research (Goyal *et al.* 2014). A major feature of the revised curriculum is the introduction of elective specialization tracks from the third year of B Pharm and M Pharm programs. These tracks allow students to focus on areas such as industrial pharmacy, clinical pharmacy, pharmacovigilance, regulatory affairs, or research, based on their career interests. This personalized approach encourages deeper engagement, builds domain expertise, and prepares students for specialized roles in industry, clinical practice, and research (Goyal *et al.* 2014). The pharmacy profession has expanded rapidly, spanning healthcare, research, and industry. With advances in AI, machine learning, and data science shaping modern healthcare, pharmacy education must take a multidisciplinary approach. Introducing courses in emerging technologies and diverse specialties will make the curriculum more relevant and prepare students for the future (Aziz *et al.* 2024). A flexible ME-ME framework in pharmacy programs lets students join or leave courses at different stages, creating personalized learning pathways. This approach improves accessibility and adaptability, allowing learners to shape their education

around career goals and personal circumstances (Catherine and Gopalakrishnan 2021). Pharmacy is a technology-driven profession requiring diverse practical skills. Industry-focused students should gain competencies in machine operation, documentation, computational tools, and market knowledge, while those pursuing clinical or hospital pharmacy should develop skills in patient counseling, communication, and medical device handling. Targeted skill-based training ensures graduates are prepared for the specific demands of their chosen careers (ElKhalifa *et al.* 2024). Programs now integrate digital resources like MOOCs, SWAYAM, and NPTEL to complement the core curriculum. These platforms let students explore emerging and interdisciplinary fields, broadening their knowledge and enhancing skills relevant to today's evolving pharmaceutical and healthcare landscape (Krishnan 2009).

The reformed curriculum emphasizes hands-on learning through internships of at least one semester. These experiences let students apply classroom knowledge in real-world settings, building technical skills as well as soft skills like communication, problem-solving, teamwork, and ethical decision-making, preparing graduates for the demands of industry and healthcare (Khanal *et al.* 2023). The curriculum incorporates Industry 4.0 technologies such as AI, robotics, machine learning, and biotechnology across diploma, undergraduate, and postgraduate programs. This equips pharmacy students with practical, future-ready skills, fostering interdisciplinary thinking, adaptability, and global competitiveness, and preparing them for diverse careers in an increasingly digital and automated pharmaceutical industry (Katoue and Schwinghammer 2020). Overall, these reforms mark a shift in pharmacy education in India from a traditional knowledge-focused model to a competency-driven approach that develops well-rounded professionals ready to excel in healthcare, industry, research, and innovation.

7. Implementation Roadmap, Policy Recommendation and Strategic Directions for CBE in Pharmacy Education

Implementing Competency-Based Education (CBE) in Indian pharmacy education requires a phased, structured roadmap to ensure feasibility, regulatory compliance, and long-term sustainability. Early efforts should build national consensus through engagement with policymakers, the Pharmacy Council of India (PCI), AICTE, academic institutions, healthcare providers, industry representatives, and students. A shared vision is crucial to align CBE with national healthcare priorities, patient safety, and the objectives of the National Education Policy (NEP) 2020 (Zodpey and Sharma 2019). At the heart of CBE implementation is a nationally recognized pharmacy competency framework outlining the knowledge, skills, professional behaviors, and values expected of graduates. These competencies should be tailored to India's healthcare needs covering
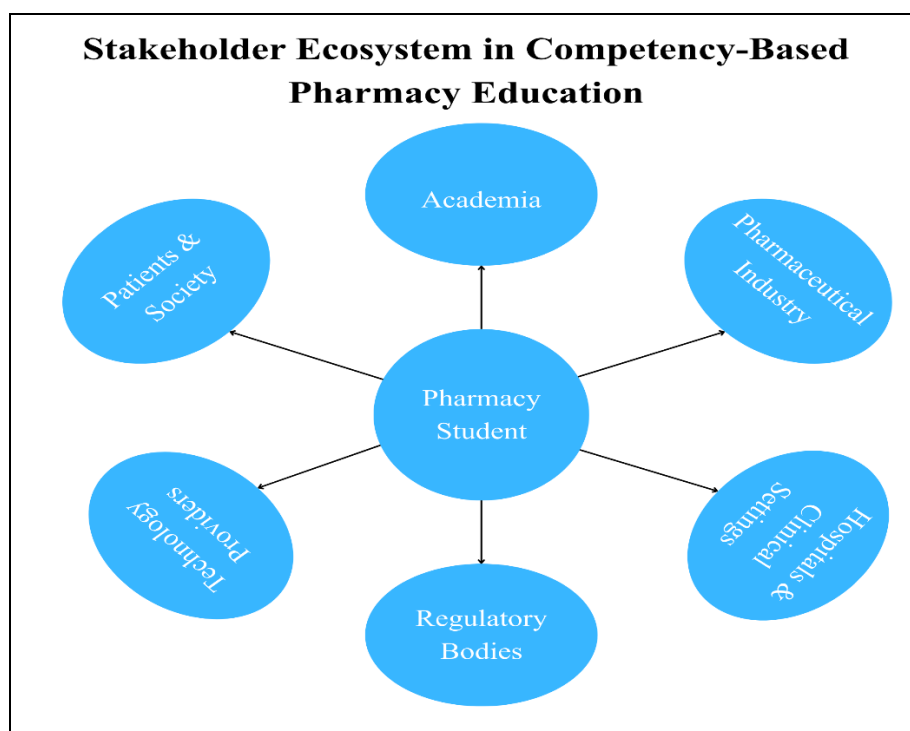
rational medicine use, antimicrobial stewardship, chronic disease management, and public health while aligning with international standards to ensure quality and global mobility (Lok *et al.* 2022). Implementing CBE means replacing traditional subject-based teaching with an outcome-oriented, modular curriculum where teaching, learning and assessment link directly to defined competencies. Emphasis shifts to experiential learning (community/hospital training, simulations, workplace exposure) so student progress based on demonstrated skills, not time spent. Assessment becomes programmatic and continuous using tools such as OSCEs, workplace-based assessments, portfolios, and Entrustable Professional Activities (EPAs) ensuring reliable evaluation and regular feedback (Katoue and Schwinghammer 2020).

Faculty development is key to successful CBE adoption. Structured training, certification, and institutional support are needed to prepare educators in learner-centered teaching, assessment, and mentoring. Equally vital is investment in infrastructure such as simulation labs, digital learning platforms, e-portfolios, and standardized training sites to ensure consistent competency development. Pilot programs in representative institutions can help identify challenges

and guide national implementation (Katoue and Schwinghammer 2020). Strong regulatory and policy support is crucial for embedding CBE in pharmacy education. The PCI should adopt a national competency framework and revise regulations to support outcome-based curricula, flexible credit systems, and competency-driven graduation and licensure. Aligning accreditation standards with measurable competencies, alongside sustained investment in faculty development and infrastructure, will enhance institutional capacity and reduce regional disparities. Involving employers and professional bodies in competency design ensures alignment with workforce needs (Katoue and Schwinghammer 2020).

In the long term, CBE should align with broader education and health reforms under NEP 2020, fostering multidisciplinary learning and expanding pharmacy roles in patient-centered care, public health, and antimicrobial resistance management. Digital tools, micro-credentials, and competency-based continuing professional development will support scalability and lifelong learning. Continuous research and systematic evaluation of outcomes will be essential for ongoing improvement and evidence-based policymaking (Lok *et al.* 2022).

Figure 3: Key stakeholders involved in the implementation of competency-based pharmacy education, highlighting the central role of the pharmacy student within the educational ecosystem.

8. CONCLUSION

In India, the shift to Competency-Based Pharmacy Education (CBPE) is now a professional requirement rather than an academic choice. The conventional "rote-learning" method is leaving Indian graduates unprepared for the challenges of contemporary practice as the global

pharmaceutical landscape changes from a product-centered to a patient-centered and technology-driven one.

The B. Pharm and M. Pharm frameworks must be fundamentally rethought in order to close the skills gap. India can develop pharmacists who are not only degree

holders but also skilled healthcare professionals and industry innovators by implementing the Global Competency Framework (GCF) and coordinating it with the objectives of NEP 2020. But these reforms' effectiveness depends on: Robust Faculty Development: Transforming educators from lecturers into mentors and evaluators. Infrastructure Investment: Establishing simulation labs, digital health tools, and active industry-academia corridors. Assessment Overhaul: Moving away from high-stakes summative exams toward continuous, workplace-based assessments and Entrust able Professional Activities (EPAs).

In the end, a multi-tiered strategy is necessary, combining academic institutions, industry stakeholders, and regulatory organizations like the Pharmacy Council of India (PCI). India can guarantee that its pharmacy workforce continues to be a worldwide leader, prepared to navigate the frontiers of precision medicine, digital therapies, and advanced clinical care, by concentrating on quantifiable outcomes and practical readiness.

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