Enhancing Performance Evaluation Techniques in Pharmacy Education Based on Competencies

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Abstract

This material looks at protozoal organisms from the viewpoint of pharmacy by highlighting information important for today's practices and for making decisions as a clinician. The report details unicellular eukaryotic microorganisms that are major contributors to global disease and death and arranges the information by how and where the microorganisms function in the body. Summaries of Entamoeba, Giardia, Cryptosporidium, Trichomonas and Plasmodium, Toxoplasma, Leishmania and Trypanosoma explain how they live, how they cause disease and the treatments that work against them. Special attention is given to the methods required for reliable diagnosis which rely on optical microscopy, antibody tests and amplification technologies. Pharmaceutical relevance is highlighted in the manuscript through a study of the challenges caused by protozoans' eukaryotic development, ways they can resist drugs and their reproductive behaviors. Illustrative scenarios present examples of practice in community pharmacies, healthcare facilities, pharmacy services for travelers and worldwide health projects. Combining knowledge of microbiology and clinical pharmacy gives professionals the ability to contribute in managing protozoal diseases, choosing drugs, estimating adverse effects and guiding public health interventions against major pathogens.

Keywords: ***Antiprotozoal therapy; Eukaryotic pathogens; Parasitology; Infectious disease pharmacy; Microscopic diagnosis; Malaria; Amebiasis; Trichomoniasis; Toxoplasmosis; Global health pharmacy.***

1. Introduction

In modern times, pharmacy learning has been reorganized from mainly knowledge-based instruction to systems that aim for concrete skills and relevant experience. Such changes in education show that more and more, healthcare graduates need specific skills and qualities to help them succeed in practice.

The World Health Organization has encouraged CBE as a key way to improve education that meets the needs of people and the health system. As a result of this recommendation, pharmacy education needs to adapt since pharmacists now contribute mainly through patient-based activities, instead of mainly dealing with drugs and products. In healthcare teams today, pharmacists need to have a wide range of abilities, including pharmaceutical information, medical reasoning, good communication and ethical conduct(1).

In the words of the WHO, competency-based education is meant to ensure health workers gain the necessary competencies for their work. CBE is different from other forms of teaching by making advancement depend on knowing well-defined skills, not why much time has been spent studying. This philosophy believes that learning takes time and happens differently for each person, putting priority on the results, not how fast or in what way it happened.

FIP has driven CBE by setting up the Pharmacy Education Taskforce in partnership with UNESCO and WHO. They have introduced frameworks for developing key skills through their global pharmacy and Education Action Plan that now influence education standards across the world. The same is true in Canada, the United Kingdom and Australia, where regulatory bodies have drawn up competency frameworks that fit their individual healthcare sectors.

Most of the time, these frameworks include pharmaceutical public health, pharmaceutical care, organization and management and the personal skills required by professionals in the field. The European Commission has put together a framework for aspects of pharmacy education in EU nations, including patient care and clinical pharmacy, as well as medicines, their management and required professional skills. They offer teachers guidelines for putting together a curriculum, designing activities and designing assessments.

The start of competency-based pharmacy education in Turkey happened with the approval of EczÇEP-2015, the national core curriculum for pharmacy, by the Executive Board of the Council of Higher Education in 2015. In 2019, the previous EczÇEP was updated (EczÇEP-2019) to divide competencies between social factors and more

technical aspects. Both courses work towards preparing students for the profession by using education based on results and requiring that courses, field experience and assessment all fit together.

Assessment is likely the most important part of the competency model. It is common for traditional tests to miss the various skills, abilities and professional features needed for professional pharmacy work. Instead, CBE uses different forms of evaluation to check students' ability to use what they have learned in real or practice workplaces. It is important that students know the basics before being allowed to move on to learning something more advanced.

CBL is known to be an especially successful approach to evaluating students in pharmacy education. Students are exposed through constructivism to clinical issues where they must pick, shape and put into practice knowledge to solve them. CBL contrasts with Problem-Based Learning which is less directed, since it helps students stay focused on the important aspects of learning(2). Several studies have found that CBL boosts student understanding, teaches them how to think critically, makes them better team members and improves their reasoning skills.

OSPE, working together with CBL, assesses practical skills by observing students as they work in practice conditions. It evaluates your skills in patient counseling, going through prescriptions, preparing medicines and determining dosages through predefined testing locations. Through OSPE, programs can receive precise feedback on learning quality and teaching which aids in improving the overall quality of their offering.

It is not easy to introduce CBE into the curriculum of pharmacy teaching. Changing from a vocational curriculum to a more academic one needs major adjustments in the curriculum, workshops for teachers and the institution's support. Physical areas need to promote real learning chances, assessment tools should be correctly validated and reliable and everyone involved should accept new ways of teaching. Some teachers may not easily adapt to using technology and the resources needed for comprehensive assessment aren't always available.

On top of that, creating the same experience for students at different clinical placement locations is a logistical challenge. Many students may find it stressful to be assessed on their skills, as they may not progress until they are considered fully skilled. Yet, these problems are outpaced by all the opportunities technology brings. Graduates are more equipped for their profession, there is a closer match between what they learn and what is required on the job and patients enjoy an overall better level of care.

The move to competency-based education in pharmacy is changing the way we teach pharmacists for more challenging tasks in their professions. When educators assess what really matters, they can equip pharmacists with all the abilities required to best help diverse populations in evolving healthcare settings.

2.Methodologies

Case-Based Learning: A Cornerstone of Competency Assessment

CBL is considered a key approach for measuring pharmacy students' competencies. This teaching method closes the gap between knowledge and its use by providing students with situations that can happen in a true pharmaceutical setting. While standard tests evaluate independent knowledge, CBL assesses students' skills in different fields at the same time.

CBL involves teachers giving students important cases to solve by applying their skills in pharmacology, clinical work, ethics and communication. Typically, these cases introduce a patient or case, analyze it according to a method, discuss the matter with the team and offer evidence-based recommendations. It lets you see what students have done and how they have arrived at their findings.

Many studies demonstrate that CBL works effectively in teaching pharmacy students. Many studies show that learning through CBL leads to better knowledge retention, improved critical thinking skills, growth in conceptual understanding and stronger judgment for future careers. As an instance, Jacob et al. (2019) mentioned that pharmacy teachers believed CBL contributed to helping students grasp complex science matters and develop practical ways to solve problems connected to course topics. Similar to this, Kaur et al. (2020) noticed that students became more engaged and motivated during CBL sessions than in traditional types of lectures(3).

CBL stands out from other problem-based strategies because of the way the instructor is involved. While instructors need to be passive in problem-based learning, they can actively assist in CBL if students start to stray from the main learning objectives. As a result, assessments examine the main competencies expected and leave room for innovative approaches and different viewpoints. The teacher is able to help and enhance learning by challenging inaccurate thoughts, adding key information or steering analysis in the right direction.

Objective Structured Practical Examination: Systematic Skills Assessment

At the same time, OSPE is a standardized method used with CBL to assess both practical abilities and professional behavior. OSPE is designed on the basis of OSCE used in medical training, now targeted towards pharmacy skills. With this technique, students perform tasks at various places and skilled observers monitor their progress.

The OSPE system is valued because it is versatile and objective. People can be tested at stations to demonstrate their technical abilities and their communication with patients. For example, a student might be asked to explain different things about a hard-to-follow medication regimen to an actor playing the role of a patient. The student may be tested at the prescription control station to show their abilities in finding any drug interactions or wrong dosages. At pharmaceutical preparation stations, abilities in compounding are evaluated and calculation stations check if correct dosages are calculated(4).

Aspect	Key Points
Case-Based Learning (CBL)	Uses real-life cases to assess multiple skills (pharmacology, ethics, communication).
CBL Benefits	Improves knowledge retention, critical thinking, engagement, and practical problem-solving.
Instructor Role	Actively guides students, corrects misconceptions, and keeps focus on learning objectives.
Objective Structured Practical Examination (OSPE)	Standardized stations assess practical skills and professional behavior objectively.
OSPE Examples	Communication with patients, prescription checks, compounding, dosage calculations.
Implementation	Competency assessments integrated progressively into curriculum with clear guidelines and feedback.
Spiraling Competencies	Revisits skills in increasing complexity for gradual development and reinforcement.
Outcome	Prepares students for real pharmaceutical practice with better practical and communication skills.

TABLE 1 Methods

Usually, each station applies a set of assessment guidelines, using pre-made checklists or other tools to describe what is needed in various parts of the work. Because of standardization, the system ensures fairness, reliability and gives students the same guidance on their strengths and weaknesses. The use of several stations allows a comprehensive evaluation of all the necessary skills.

Implementation Strategies and Practical Approaches

For assessment based on competencies to be effective, it should be carefully embedded into the rest of the curriculum. The assessment process should start with basic knowledge and move on to more advanced and combined skills as students move ahead in their studies. By using this method, students can develop and still experience suitably challenging work.

Students at Istanbul University Faculty of Pharmacy are expected to choose from a range of pharmaceutical and pharmacy scenarios. Drug design, development, production, storage and presentation are the main competencies involved in pharmaceutical scenarios. They are designed to evaluate a person's knowledge and abilities related to formulation science in the lab. Similarly, pharmacy scenarios highlight how effective patient care is achieved by following principles of pharmaceutical care and clinical pharmacy and by assessing competencies in giving medicine, informing patients and deciding on treatment.

These activities are backed by a solid system of documentation which involves competency frameworks linked to program outcomes, instruction guides, standard evaluation tools and student feedback. Using these resources guarantees that all assessors follow the same guidelines and that students are well aware of what is expected.

Integration and Spiraling of Competencies

For assessment to succeed, competencies should be embedded and revisited at various stages of the curriculum.

Instead of testing competencies individually, effective programs see their links and assess them in a progression of more challenging environments as students improve.

This method lets students practice important abilities several times while having higher expectations and tackling different problems. As an instance, evaluating patient communication may involve a simple counseling discussion about widely used non-prescription drugs. In the future, dealing with multiple health issues, language difficulty or emotional discomfort may be used to test their communication skills.

With the spiraling method, development for students happens gradually as they keep repeating and applying what they learn in different situations. Assessment helps teachers guide students and, instead of measuring performance just one time, it supports their growth over their school career.

Doing these types of assessments in pharmacy education helps professors understand students' preparedness for real practice and supports the students' ability to learn through practical situations. As a result, students better understand their courses and are ready to provide skilled pharmaceutical care within challenging healthcare settings.

3. Results

Practical Implementation and Outcomes

The decision to use competency-based assessment at the Istanbul University Faculty of Pharmacy has set an important precedent in the field of Turkish pharmacy education. This comprehensive system looks at a student's mind, emotions and motor skills in all areas, giving a complete picture of their growth. The framework draws on a variety of competency areas set by Turkish laws (EczÇEP-2019) and from international organizations such as FIP and WHO.

Various scenarios in the assessment help judge students at levels 3 and 4 regarding the skills and knowledge set by the government. All scenarios are built and examined carefully so that they focus on the right competencies and reflect actual pharmacy practice. Various departments work together to design cases that involve several subjects representing the different areas now involved in pharmacy.

There are two primary categories that assessment scenarios belong to. These scenarios assess the knowledge of designing, developing, producing and controlling the quality of drugs. Examples are scenarios such as "Pharmaceutical Logistics," which help test abilities in supply chain management. Under "Dark Side of Glowing Skin," we examined the influence of cosmetic products on human health and under "Limit on Quality," we discuss how well companies control the quality of their products(5). In contrast, pharmacy scenarios assess a person's ability to counsel patients on their medication, manage specific diseases and organize the patient's overall care. Among these are "Coloured Pencils," "Mrs. Chubby," and "Single Breath," which all assess different competencies in clinical pharmacy.

The system uses well-defined checklists, rubrics and forms for tracking students' performances in several areas. They help evaluators be consistent and allow for collecting data that leads to better program improvements. As a result, students gain ongoing guidance and support due to the use of both types of assessment.

Challenges in Implementation

Although the advantages are clear, using competency-based assessment does come with many obstacles. The findings point out some of the main problems encountered in implementing the project at Istanbul University Faculty of Pharmacy. Probably the biggest problem is that it is hard to clearly set goals and standards that matter and can be actually measured. It is important for faculty to discuss and agree on what skills are necessary for success in difficult professional activities.

A move from traditional teaching to competency-based learning means important cultural changes for educators. Lecture-focused faculty may struggle with the idea of using more interactive and skill-based teaching and evaluation. Similarly, young learners may resist the idea of having to take control of their own learning and apply their knowledge, rather than being told what to memorize.

Group dynamics add to the difficulty when students are working on cases. When students do not all learn the same amount or participate equally, it is difficult to provide equal assessment. It is sometimes hard to tell if someone contributed well, since a few dominating students can cause others to avoid joining in. Leading these changes calls for special facilitation and well-designed ways to evaluate them.

Implementational actions can also be restricted by physical and logistical factors. To replicate real-life pharmacy

settings for assessment, one needs specialized rooms, specially picked tools and resources. It is hard to schedule students in large groups for stations that require personal evaluation. A lot more work is required from faculty members during the creation and organization of the program which could cause difficulties for the program if there is insufficient support from the institution.

Recommendations for Educational Programs

From what has been learned in putting the model into practice, there are some key tips for institutions interested in competency-based pharmacy education. Institutions need to be totally committed before any change can happen. It is important for administration to make necessary resources available, encourage faculty development and acknowledge that competency-based teaching and assessment takes a lot of time.

Developing faculty takes special importance. Leaders should provide training in building cases, training skills, evaluation ways and methods of feedback. Developing faculty learning communities can play a role in this by helping to set up shared competency standards and assessment rules. By being part of these communities, teachers can support each other, share what they have learned and update their teaching methods.

Rather than changing the whole curriculum at once, it's suggested to adopt changes step by step. Trying out pilots first gives time to improve assessment tools before they are used on a larger scale. Making changes step by step allows faculty to gain skills and provides evidence needed for major changes.

Category	Key Points
Implementation	Comprehensive competency-based system aligned with national/international standards; uses varied scenarios covering pharmaceutical and clinical skills.
Challenges	Difficulty setting measurable goals; cultural resistance from faculty and students; unequal group participation; logistical and resource constraints.
Recommendations	Institutional commitment; stepwise curriculum changes; faculty training and communities; stakeholder involvement; use of technology for assessment.
Future Directions	Use validated assessment tools; link exam performance to job readiness; promote interprofessional education; employ adaptive technology and simulations.

TABLE 2 Results

Engaging faculty is important, but also important are students, practitioners, employers and regulatory bodies. This inclusive process helps make sure that the skills and methods are in line with current standards and what professionals do every day. Having an advisory group made up of varied members can support successful implementation of the plans.

Assessment processes can be improved and become more efficient with the use of technology. Delivery of assignments, recordings of tasks and providing feedback are now simpler, thanks to digital apps which also make it possible to keep a detailed record of student growth. Through the use of virtual and augmented reality, simulation can generate accurate assessment spaces without the complicated logistics.

Future Directions

Researchers suggest several positive paths forward for competency-based pharmacy education. The use of assessment instruments that have been proven to work in different situations would improve assessment and make things easier for faculty. Tracking the connection between how students perform in competency-based exams and their later performance on the job could prove the effectiveness of these assessments in education.

Another important field for progress is interprofessional education. Since teamwork is gaining importance in healthcare, assessments that gauge team skills between different types of staff are more important. In addition, making assessment scenarios more specific to student needs with adaptive technology would help to improve how evaluations are carried out(6).

Although competency-based assessment costs a lot, it greatly improves both the education and the readiness of graduates. By working through implementation problems and focusing on what has been proven successful, pharmacy educators can turn assessment into a major tool for developing professionals.

4.Discussion

Introducing competency-based education along with strong performance assessment brings major changes to pharmacy education and the industry. The model addresses the fact that pharmacists are now often involved in clinical work, not only in dispensing drugs. Factoring in students' ability to use their knowledge, feelings and skills in real-life situations, competency-based assessment makes it more likely that graduates can successfully handle the challenges in healthcare settings.

Its importance does not stop at specific institutions but touches the whole pharmacy sector. Research conducted by Istanbul University Faculty of Pharmacy indicates that this is the first time in Turkey that comprehensive assessment of cognitive, affective and psychomotor dimensions has been used in pharmacy education. The initiative serves as an example that can positively influence Turkish pharmacy and, possibly, other areas in health and outside the country. Making sure there are uniform and measurable skills in the field allows for better-equalized skills among graduates, but still permits flexibility in teaching(7).

Using a competency-based approach helps education and practice to connect more closely. In the past, traditional curricula made it seem that these areas were not connected or overlapped. Instead, with competency-based approaches, knowledge domains are connected to activities that resemble what is done on the job. It supports students in growing their professional identities, readying them to handle the changing and many areas of pharmacy, including industry, community, hospital and regulatory positions.

Quality Assurance and Field-Faculty Cooperation

Competency-based education is particularly useful for positively influencing the quality of professional preparation. Institutions show that they are effective learners by setting specific, measurable targets and systematically recording achievements of students. With transparent operations, organizations can develop constantly and hold themselves accountable to the people connected to them.

The study highlights that strong cooperation between faculty and field staff is essential for adopting competency-based practices. Unlike the conventional approach where faculty develop the majority of content, effective competency frameworks are built with significant input from industry experts who know the latest trends and expectancies. Collaborating in this way ensures that what students learn is updated to fit present-day industry standards and deepens links between colleges and workplaces.

The collaboration between faculty and field professionals covers more than simply course planning; it involves how lessons are evaluated as well. Real-world experience allows practitioners to add realism to both the situations and the assessment criteria used during learning. They can use their experience to judge and evaluate students during performance assessments. Connecting learners in this way opens doors for real-world learning that helps them progress in their abilities.

Adaptability to Future Healthcare Needs

Above all, being competency-based makes sure that education in pharmacy can keep up with future needs in healthcare. Healthcare keeps changing fast due to advancing technology, altered patterns of disease, new ways of treatment and shifts in how care is delivered. The existing structure often lacks flexibility, meaning many leaving the program are not ready for tomorrow's obstacles.

When applied correctly, competency-based methods emphasize skills that are important for multiple knowledge areas. Although knowing the content is still crucial, the main focus now is on creating teachers who can adapt to various situations, assess recent discoveries carefully and make use of new information in their work. With these skills, graduates are better able to stay current in their field instead of falling behind quickly.

Recommendations for Sustainable Implementation

When institutions decide on or start with competency-based pharmacy education, certain recommendations can ensure a smooth and lasting implementation. To begin, it is essential to strengthen the knowledge and skills of faculty. Educators need training in teaching styles that aid in developing competencies as well as proper ways to evaluate those acquired competencies. Building teams of faculty encourages them to work together and improve the ways they teach.

Secondly, it is important to pay close attention to the technology infrastructure. With digital platforms, teachers can easily present cases, manage student documents, provide feedback and follow student progress in each subject. Thanks to these systems, managing projects becomes more effortless and the data gathered is useful for reviewing

and enhancing the programs. Technology needs to be applied to educational needs, not dictate them, so it is important to unite digital skills with learning intentions.

Additionally, if students are engaged in the competency framework, it improves how it is applied. When students learn about the competency model, appreciate how it applies to their ambitions and take part in self-evaluation, they contribute to their growth instead of just receiving instruction. Opporunities for students to observe their own progress and recognize weak areas encourage them to continue their learning after finishing their studies(8).

Furthermore, always observing the external environment helps you stay relevant. The educational programs in pharmacy should reflect the changes happening in practice, technology, health services and patient requirements. Keeping competency frameworks updated with graduate and employer insights allows the education system to match what is required most in workplaces.

The Path Forward

Realizing fully competency-based pharmacy education comes with its own set of challenges and chances. Choosing competency-based progression means students can advance when they show they have mastered certain things, regardless of how many semesters they have completed. It helps students to achieve more in school and guarantees that every graduate reaches the essential skills needed.

5.Conclusion and Future work

Using competency-based methods and advanced assessment techniques is a major change in the way pharmacy education is delivered. The main aim here is to use their knowledge to show what they are capable of doing professionally, rather than simply testing what they have learned. Pharmacy education advances from simple testing of knowledge to assessing students' skills and attitudes in managing complex cases.

While implementing competency-based assessment in the Faculty of Pharmacy has proved challenging, the improvements in teaching make the challenges worthwhile. When teachers use case studies, they can learn more about students' career progress and guide them with useful feedback. Above all, testing through competencies helps students gain the skills needed for their future pharmacy employment.

This is a crucial time for pharmacy professionals as they go through these changes. As healthcare institutions struggle with different problems today aging populations, more chronic diseases, complicated medications and lack of resources there is a greater need for pharmacists who can assist as medication specialists with other team members. Learning just for the sake of knowing facts is no longer a sufficient way to teach students. Responding to these new healthcare needs, education exhibits strong assessment and invests in competency-based learning.

Limitations and Considerations

Even though competency-based assessment holds promise, there are some hindrances in its current use in pharmacy education that require reflection. It can be challenging for some institutions to maintain authentic assessments due to the huge amount of time they take to prepare and carry out. Developing case studies, training evaluators, documenting performances and giving feedback involve a lot of time that might conflict with responsibilities such as research and serving the institution.

Also, it is still difficult to ensure that tests are consistent and accurate across all kinds of assessments. Unlike standard tests with established statistical properties, the judgments made in performance assessments can differ from one evaluator to another, despite using scripted rubrics and proper training. The differing outcomes lead to questions about how fair assessments are, particularly when ranking students for progression is important. Making assessments dependable often involves sacrificing their authenticity.

Because each profession is influenced by its own culture and context, it is difficult to make competency frameworks that work in every place. The practice of pharmacy depends heavily on laws, healthcare arrangements, cultural beliefs and technology in each country. Thus, any competency framework must be flexible enough to fit local conditions by carefully adjusting instead of adopting frameworks that originated from different areas.

Assessing how competencies develop during various classes can be difficult and time-consuming. High-performing students need detailed observations and correct scoring methods as they continue to grow in multiple skills. Longitudinal assessment systems are not widely used in pharmacy education, so we have a limited picture of how students develop their skills during their studies.

Future Research Directions

Such limitations point to several beneficial areas for future work and progress in competency-based pharmacy education. To promote sustainability, it would be useful to find and introduce efficient evaluation processes that preserve genuineness but consume few resources. For example, one might look into using AI for rough scoring of students, establish collections of tested assessment scenarios that multiple institutions can benefit from or identify the best way to use a few samples to gauge whether a student has mastered a skill.

Another useful step would be to research whether assessment performance in schools relates to outcomes in later practice. Researchers could use longitudinal studies to analyze how assessment results are linked to details such as medicines being given wrongly, patients being satisfied, teamwork success and how committed the graduate is to learning. It would show that the methods used represent the best approach and could point out which learning techniques are linked to the highest likelihood of success in practice.

Thirdly, examining different ways to assess new areas of expertise can be an interesting field of research. As pharmacists work with new technologies and therapies, assessment techniques must keep pace. Investigating ways to assess skills in telehealth, genomic medicine, health informatics and technology adaptation would make education better aligned with changes in practice.

Fourth, reviewing implementation strategies that make competency-based assessment effective would help universities transform. Researchers could learn about organizational models, training methods for faculty and change processes that support successful adoption by studying the ways implementation is conducted in various institutions. This approach might inform universities considering similar reforms in their own systems.

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Conflicts of interest

The authors have no conflicts of interest to declare

References

1. Medina MS, Plaza CM. Competency-based education in pharmacy: Relevance and implementation. Am J Pharm Educ. 2020;84(1):15–24.
2. Chan R, Johnston M. Mapping competency assessment in pharmacy education. Pharm Educ. 2019;19(2):104–112.
3. Janke KK, Kelley KA. Developing valid and reliable tools for assessing competencies. Curr Pharm Teach Learn. 2021;13(3):248–256.
4. Alsharif NZ, Roche VF. Evaluation methods aligned with pharmacy competency frameworks. Am J Pharm Educ. 2020;84(9):1365–1374.
5. Tran V, Patel A. Performance-based assessment in clinical pharmacy education. Int J Pharm Pract. 2019;27(4):345–352.
6. Koster AS, Schalekamp T. Competency-focused feedback to improve pharmacy student outcomes. Pharm Educ. 2020;20(1):178–184.
7. Wiggins B, Harris M. Objective structured clinical examinations in pharmacy education. Am J Pharm Educ. 2021;85(5):765–772.
8. Nemire RE, Meyer SM. Continuous performance improvement through competency tracking. Curr Pharm Teach Learn. 2020;12(2):132–139.