Viewpoint

Assessment Methods and Competency Mapping in Pharmacy Education: Understanding of Components and Quality Parameters

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Abstract

Centre of advanced pharmaceutical education have developed 15 subsets of competencies required to be competent pharmacist and able to provide optimum care. These competencies were further categorized; Level 1 intermediate, Level 2 efficient, and Level 3 professional. These competencies are cross-mapped to achieve desirable outcomes. Where personal and professional development skills incorporate knowledge, for being a holistic pharmacist. In healthcare education curriculums, active learning tools such as simulation-based patient cases and other innovative learning activities are used to teach clinical skills, patient assessments, and pharmacotherapy concepts. The advance team-based learning technique for the development of stepwise understanding of disease management (simple-complex cases) and students can communicate and collaborate for the critical thinking and decision-making process. Many studies showed the positive impact of the peer teaching on the students; enhanced their academic performance, increase the cognitive congruence, and allows the students to share their own learning struggles to come up with solutions to overcome these challenges. Pharmacy is a healthcare professional required intensive training and professional skills to provide optimum care to patients. The emerging clinical role of pharmacy focused on the patient-centered model, comprehensive assessment, and teaching methods are required to fulfill the professional competencies.

Keywords: *Center of advanced pharmaceutical education, clinical pharmacy, curriculum development, education, pharmacy*

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Introduction

In 1992, the Center of advanced pharmaceutical education (CAPE) was originated by the American Association of Clinical Pharmacy (AACP) to evolve pharmacy education. AACP released many versions after it, current being 2013 CAPE educational outcomes.[1] To become a professional competent pharmacist; one must have these 15 CAPE competencies. Each competency can be built by the integration of knowledge, skills, and attitude. CAPE 2013 document defines each educational outcome in detail under specific domains and further illustrates learning objectives to it.[2] Figure 1 demonstrates stages of development to become a competent pharmacist, from Level 1 being intermediate through Level 2 being efficient to finally being Level 3 which is professional.

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Learner is the core competency, which maps to provider (Population care), promoter (Health promoter), manager (Meds Manager – Medication Use Management), and caregiver (Patient-centered care). The competency as explained in the CAPE is to develop, integrate and apply foundational knowledge to perform duties of a pharmacist.[1] Foundational knowledge domain has become the core of competency without which students won't be able to progress.[3] It has been well integrated into curriculum and linked with pharmacy practice.[4,5] To describe the mapping in Figure 1, For example, let

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us look into the professionalism competency; it has been back mapped to problem solver, health educator, interprofessional collaborator (IPC), culture sensitivity includer, and self-awareness. Now further each of this back mapped competency of Level 2 is back mapped to Level 1 competencies example problem solver is mapped to patient-centered care and health promoter.

These competencies are cross-mapped in this order to achieve desirable outcomes. One of the literature-based proof for this mapping is Ramia *et al.,* where personal and professional development skills (PPD) incorporate knowledge, for being a holistic pharmacist. PPD skills include professionalism, innovator, leader, and self-awareness subdomains.[6] According to the Royal pharmaceutical society article titled "Leadership Competency Framework for Pharmacy Professionals," highlights five domains which are "Demonstrating Personal Qualities, Working with Others, Managing Services, Improving Services, Setting Direction." Each of these domains contains elucidated four subdomains.[7] As per Figure 1, leadership has been mapped to (Level 2) self-awareness, IPC, and patient advocate, which has been clearly demonstrated by the former study. In addition, each of these Level 2 competencies mapped to Level 1 have also been supported in the literature.

Idea/Hypothesis

Assessment methods and proficiency in educational Outcome

Different types of assessment methods will help in the acquisition of certain competencies. However, the teaching method mapping to acquire competency is quite a challenge. There are several key factors play a vital role in the implementation, sustainability, and efficacious outcomes, such as reliability, validity, time needed to apply, and impact on study learning capability.

Table 1 provided list of other methods and relevant application in the education system.

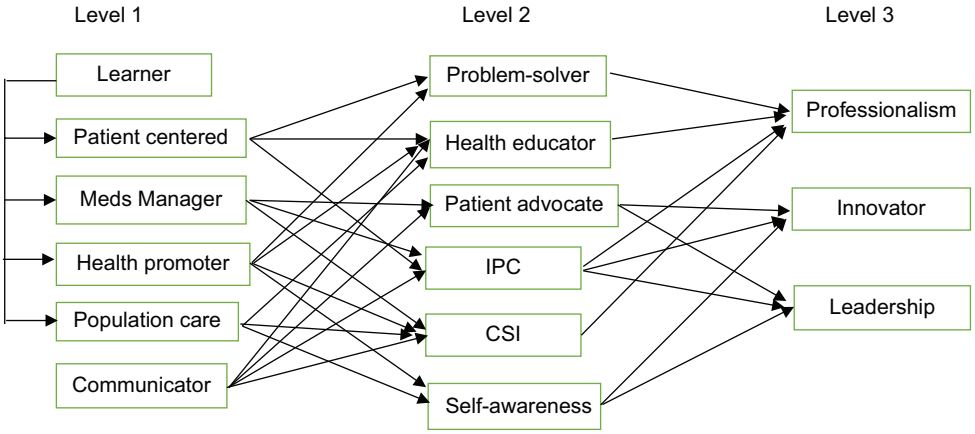

Figure 1: Level of Competency mapping to achieve optimum outcomes. Level 1: intermediate, Level 2: Efficient, Level 3: Professional. IPC: Interprofessional collaborator, CSI: Cultural sensitivity includer

Table 1: Provided list of other methods and relevant application in the education system

Method*	Role	Reliability and validation	Time needed	Impact	Level
MCQs	Knowledge and understanding	↓Internal validity	Low	Short	1
One-min paper	Prior knowledge and analysis	↑Reliability	Low	Moderate	2
Muddiest point	Prior knowledge and analysis	↑Reliability	Low	Moderate	2
Article application	Synthesis and critical thinking skills	↑Validity and reliability	Medium	Long	3
Student-generated questions	Recall and understanding	↓Internal validity	Medium	Short	1
Chain notes	Analysis and understanding	↓Reliability	Low	Moderate	3
Roleplays	Creative thinking and performance skills	↑Validity and reliability	Medium	Long	2
Computer-aided presentations	Synthesis, application, and performance skills	↑Validity↓reliability	High	Moderate	1
Peer-assisted teaching	Knowledge, problem-solving, and application skills	↓Internal validity	High	Short	3
Clinical debate	Creative thinking, synthesis, and problem-solving	↑Reliability	High	Long	3
E-learning	Understanding and problem-solving	↑Validity↓reliability	Low	Moderate	2

*Some material in this report is adapted from: Angelo, T.A. and Cross, K.P. (1993). Classroom assessment techniques: A handbook for College Teachers, second edition, San Francisco: Jossey-Bass publishers. Level 1: Intermediate, Level 2: Efficient, Level 3: Professional. Impact: Short, moderate, and long-term memory. MCQs=Multiple choice questions

Current evidence

Teaching methods and competency mapping

The 1-min questions type of exam can evaluate the prior knowledge and synthesis and analysis. The ability to synthesis and critical thinking skills can be best evaluated using the article application assessment technique.[5,6] Roleplays are type of experiential learning simulation in which learners take on different roles, assume a profile of a character or personality, and interact and participate in diverse and complex learning setting [Supplementary Table 1]. It improves creative thinking and performance skills and has a higher validity and reliability outcomes.[2] The time needed to develop this type of tool is moderate. There is a long impact on the students learning ability.[7]

Developing e-learning is more expensive than preparing classroom material and training the trainers especially if multimedia or highly interactive methods are used. This learning strategy provides a high level of understanding and problem-solving abilities. The validity is very high with this strategy; however, it is associated with poor reliability. The time needed is comparatively low and has a moderate impact on the learning skills. It has a Level 3 of quality learning pyramid.[2-5]

Team/group-based learning and assessment

In healthcare education curriculums, active learning tools such as simulation-based patient cases and other innovative learning activities are used to teach clinical skills, patient assessments, and pharmacotherapy concepts. These learning modems have been shown to enhance students' problem-solving abilities, communication skills, team-based learning skills, and leadership aptitudes.[6,7] A simulation-based exercise implemented for all second-year pharmacy students at Wayne State University in 2006 reported student satisfaction in the enhancement of their teamwork and problem-solving skills inpatient care was more effective with the active learning method using simulation and team-based discussion as compared to the traditional model of classroom teaching.[7]

Advance group-based learning activity

Objective structured clinical examinations (OSCEs) and objective structured practical examinations (OSPEs) are ways of assessing various clinical knowledge and skillsets through active learning strategies. They are widely used as problem-based exercises that enhance students' critical thinking abilities through the integration of knowledge, communication skills, and reflective assessments which impact achievement of core competencies. The Accreditation Council for Pharmacy Education's Standards and Guidelines suggest the implementation of realistic-type active learning assessment tools such as OSCE and OSPE in pharmacy curricula to evaluate critical thinking skills in clinical scenarios.

Student self-awareness evaluation

Multiple definitions of self-awareness have been proposed in different literatures depends on the population involved. In the educational literature, self-awareness is considered as the knowledge and understanding of personal attitude, behaviors, emotions, and needs [Supplementary Table 2].[2,5,7] This tendency of the individual to pay attention to the attitude and skill can be measured using direct methods such as small group learning and indirect methods such as student's self-assessment on patient history skill, for which these approaches help in increasing the student's consideration toward the differences in their performance assessment compared to their faculty assessment.[2] As seen in [Supplementary Figures 1 and 2, one of the methods of student's evaluation on self-awareness can be performed using journal club article appraisal which requires medium efforts from the student side. This method proves to have a good impact on the student's ability to criticize literature and increase the confidence toward making clinical decisions through creating an awareness on the learning and information process.[4,6,7] Other method which requires higher level of effort is students peer-reviewing for which they will exchange their work in pairs and ask for each other's evaluation of that work. Peer teaching is being utilized in medical schools as a new teaching tool to assess students' performance and learning[Supplementary Figures 3].

Recommendation

Pharmacy is a healthcare professional required intensive training and professional skills to provide optimum care to patients. The emerging clinical role of pharmacy focused on the patient-centered model, comprehensive assessment, and teaching methods are required to fulfill the professional competencies. Application of single assessment method (such as multiple-choice questions or short-essay questions) will have its limitation and impact on overall program learning outcomes. Pharmacy professional bodies should have to give emphasis on implementation and monitoring of multi-method assessment techniques.

Authors' Contribution

All the authors have contributed equally to the preparation of this manuscript.

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Conflicts of interest

There are no conflicts of interest.

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Supplemenatry Files

Table 1: Teaching methods and competency mapping

Method	Assessment	Bloom's taxonomy	CAPE
MCQs	Objective marking	Knowledge and understanding	Learner aspects
One-min paper	Subjective review	Prior knowledge and analysis	Communicator, health educator and IPC
Muddiest point	Subjective review	Prior knowledge and analysis	Communicator, problem solver and IPC
Article application	Content rubric	Synthesis and critical thinking skills	Provider, self-awareness, innovation
Student generated questions	Subjective review	Recall and understanding	Communicator and problem-solver
Chain notes	Opinions	Analysis and understanding	Health educator and provider
Role plays	Objective rubric	Creative thinking and performance skills	Self-aware, leadership, professionalism
Computer-aided presentations	Rubric*	Synthesis, application and performance skills	Communicator and IPC
Peer-assisted teaching	Rubric*	Knowledge, problem solving and application skills	Leadership, innovation, CSI
Clinical debate	Objective rubric	Creative thinking, synthesis, problem-solving	Health educator, patient advocacy
E-learning	Content rubric	Understanding and problem-solving	Self-awareness, problem solver

*Both subjective and objective contents. IPC=Interprofessional collaborator, CSI=Cultural sensitivity include, CAPE=Centre of advanced pharmaceutical education, MCQs=Multiple choice questions

Table 2: Teaching methods exploration

Method	Role	Validity	Time needed	Assessment	Impact	Level
OSCE	Problem-solving and critical thinking	↑Validity and reliability	High	Objective rubric	Moderate	3
OSPE	Problem-solving and critical thinking	↑Validity↓reliability	Medium	Content rubric	Short	2
TBL	Analysis, application and performance	↑Validity and reliability	Medium	I-RAT and T-RAT	Long	3
PBL	Prior knowledge, problem-solving and critical thinking	↓Validity and reliability	Low	Case-based rubric	Short	2

Publishers. Level 1: Intermediate, Level 2: Efficient, Level 3: Professional. Impact: Short, moderate and long-term memory. I-RAT and T-RAT: Individual and team readiness assessment test, OSPE: Objective structured practical examinations, OSCE: Objective structured clinical examinations, TBL=Team-based learning, PBL=Problem-based learning

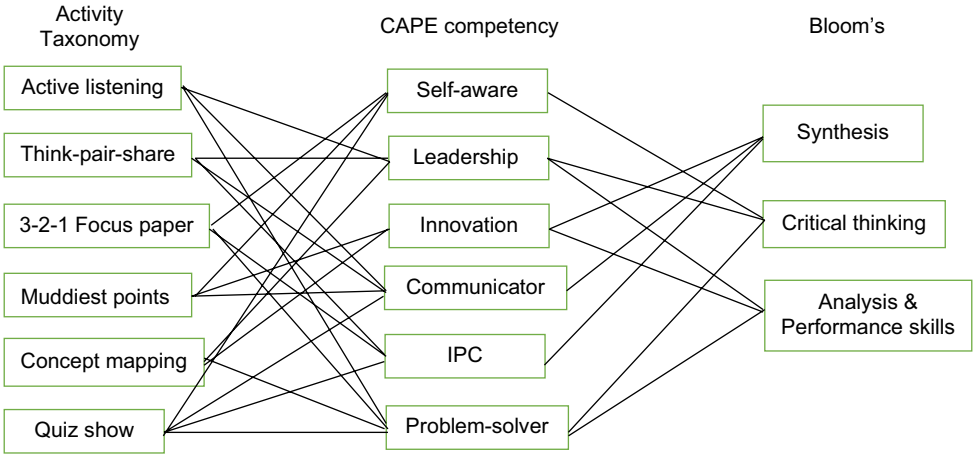

Figure 1: Team base learning activity and competency mapping

Figure 3 is the presentation of advance team-based learning technique for the development of stepwise understanding of disease management (simple-complex cases) and students can communicate and collaborate for the critical thinking and decision-making process.

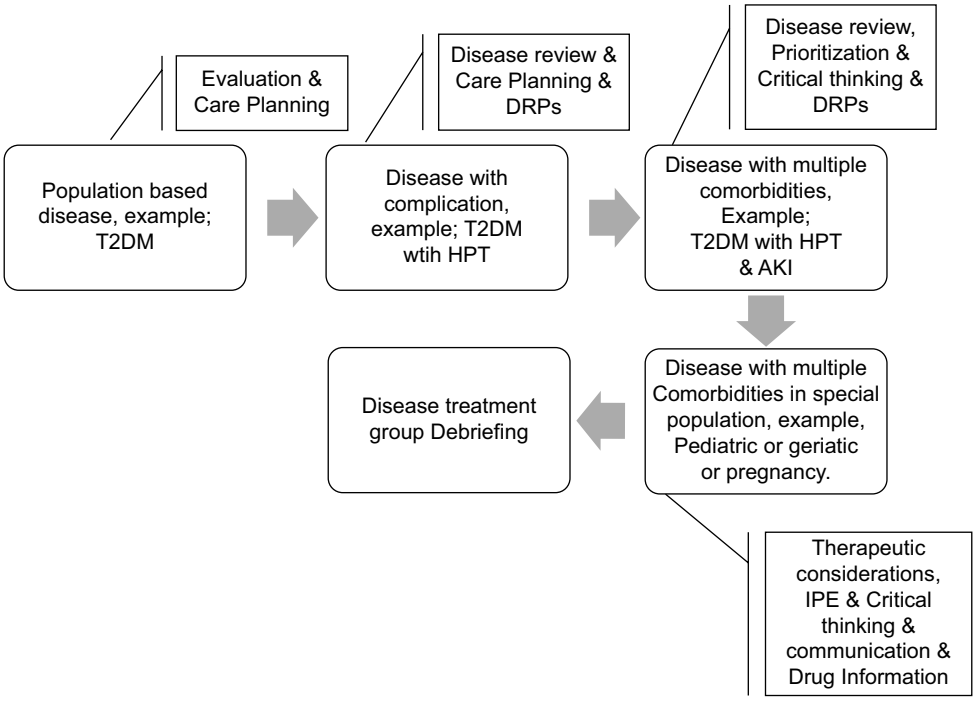

Figure 2: Advance group-based learning model design *T2DM: type 2 diabetes mellitus, HPT: Hypertension, AKI: Acute kidney injury, DRPs: Drug related problems, IPE: interprofessional collaborator outcomes.

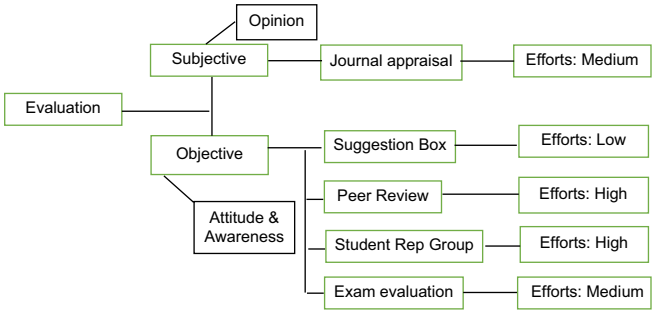

Figure 3: Self-reporting methods and outcomes