DEVELOPMENT OF COMPETENCY STANDARDS AND EVALUATION OF PHARMACY CURRICULUM IN MYANMAR TOWARDS THE PROPOSED STANDARDS

By
Ms. Mi Mi SAW

A Thesis Submitted in Partial Fulfillment of the Requirements
for Doctor of Philosophy SOCIAL AND ADMINISTRATIVE PHARMACY
Silpakorn University
Academic Year 2024

การพัฒนาเกณฑ์มาตรฐานสมรรถนะและการประเมินหลักสูตรเภสัชศาสตร์ของประเทศเมียนมาร์ต่อเกณฑ์มาตรฐานที่พัฒนา

โดย
Ms.Mi Mi Saw

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรเภสัชศาสตรดุษฎีบัณฑิต
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Title	Development of competency standards and evaluation of pharmacy curriculum in Myanmar towards the proposed standards
By	Ms. Mi Mi SAW
Field of Study	SOCIAL AND ADMINISTRATIVE PHARMACY
Advisor	Assistant Professor Nattiya Kapol, Ph.D.
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Ms. Mi Mi SAW : Development of competency standards and evaluation of pharmacy curriculum in Myanmar towards the proposed standards Thesis advisor : Assistant Professor Nattiya Kapol, Ph.D.

Competency standards play a crucial role in the development of pharmacy education, helping institutions enhance students' knowledge, skills, and ability to address real-world challenges. The objectives of this study were to 1) develop competency standards for pharmacy graduates in Myanmar, and 2) evaluate the current Myanmar pharmacy curriculum using these competency standards.

The study was conducted in two phases. In phase one, a mixed-method modified Delphi technique with three rounds was used to develop the competency standards. Forty-eight stakeholders, including policymakers, academic staff, employers/owners, pharmacists, pharmaceutical scientists, healthcare professionals, and patients, were included. They were interviewed regarding their opinions on the competencies needed for pharmacy graduates in Myanmar during the first round. In the second and third rounds, a questionnaire summarizing the previous round's findings was sent to all stakeholders, allowing them to adjust their responses. In phase two, the developed competency standards were compared to the current curricula of the University of Pharmacy (Yangon) and the University of Pharmacy (Mandalay) in Myanmar. All subjects taught in the curricula of both universities were collected by reviewing documents and administering self-administered questionnaires to 80 academic staff members from both universities.

The study found that the developed competency standards for pharmacy graduates included seven domains: 1) basic biomedical sciences; 2) pharmaceutical public health; 3) health systems, policy, and outcomes; 4) pharmaceutical care; 5) pharmaceutical sciences; 6) organization and management; and 7) professional and personal competencies. The final version of the competency standards comprised 25 competencies and 70 sub-competencies. However, the curricula of both universities did not fully meet the competencies outlined in the standards. Domains 2, 3, and 4 were the most lacking. Therefore, the universities should revise their curricula to fulfill the competency standards. It is necessary to include more content on pharmaceutical public health, health systems, policies, and pharmaceutical care to meet the societal needs of pharmacy graduates.

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CHAPTER 1
INTROUCTION

1.1.Background

Pharmacy education is essential for the development of human resources which should be produced according to job market needs (1) where pharmacy students have opportunities to choose a speciality, including pharmaceutical analytics, community pharmacy, hospital and clinical pharmacy, industrial pharmacy, herbal remedies, phytochemistry and phytotherapy processing, pharmacoeconomiscs, biotechnology in health protection, ecotoxicology and health promotion, cosmetology, designing medicinal substances, or food and drug toxicology (2). Pharmacy education is facing remarkable changes following new scientific discoveries, evolving patient needs and the requirements for advanced pharmacy competency for current and future practices (1).

Globally, pharmacy educators face challenges in producing pharmacy graduates who meet stakeholder requirements for each country's specific job market (3). Pharmacy education is a priority area for the International Pharmaceutical Federation (FIP), the global federation representing pharmacists and pharmaceutical scientists worldwide that is spearheading the Global Pharmacy Education Taskforce (4).

The World Health Organization (WHO), the United Nations Educational Scientific and Cultural Organisation (UNESCO) and the International Pharmaceutical Federation Education Development Team (FIPEd) all aim to improve global pharmacy education (5, 6).

In global pharmacy and pharmaceutical education, the call for curricular reform has been raised. However, the requests for educational reform vary within different settings worldwide. In developed countries, academic staff pursue curricula to prepare students for future specialized fields in pharmacy. On the other hand, in developing countries, patient-centred curricula and public health pharmacy are focused on tackling ever-changing health environments. The outcomes of professional pharmacy and pharmaceutical education depend on two main factors: effective quality assurance of pharmacy and pharmaceutical education, and the production of

competent pharmacy graduates (7).

In the 1960s, since the concept of competency was introduced, competencies have been receiving growing attention in healthcare professional development. The importance and usefulness of competencies has expanded globally in the pharmacy profession (8, 9).

The terms of competency, competencies, competence and competences are frequently used in the healthcare literature; these terms imply the ability to perform specific tasks, actions or functions successfully.

The use of these terms also aligns with educational achievement by students, essentially a capacity or skill that is developed by the student. Competence is an outcome and, from the perspective of providing a program of study for students, sits within an outcome-oriented degree framework which refers to specific statements that describe what a student will be able to do in a measurable way (10).

Competencies are often used as an alternative to outcomes assessments in healthcare education, referring to a student's or practitioner's ability to perform actions in a real-life setting (11, 12). Competencies are important for students to accomplish before they graduate, and for practitioners to maintain their ability in their professional practice. Competencies are not only used to control and maintain the quality of professional skills, but are also used as criteria to hire someone for a job (12, 13).

In Europe, and elsewhere in the world, the shift from content-based to competence-based education (CBE) and practice increased. In the healthcare sciences, this process started in medicine and is now developing in pharmacy. This change can have many advantages. Competences for practice are better understood by society at large, and thus provide a clearer public statement of the role of the healthcare practitioner (14).

In a competence-based curriculum, the defined learning outcomes describe what the students are expected to know, understand and/or be able to do after completing a degree or in order to attain a passing grade on a course (15, 16).

The curriculum for the professional degree programme should support the preparation of graduates with the competencies needed to enter pharmacy practice in any setting, to be leaders and agents of change, and to contribute to the profession of

pharmacy throughout their career. FIP has focused particular attention on an initiative to foster and support the evaluation and development of competencies in pharmacy, and to develop educational models that would serve that. The competencies should be used to guide the development of student learning outcome expectations for the curriculum (17).

1.2.Significant of the problems

To achieve a high-quality global infrastructure for pharmacy, the educational system should be mapped to the required competencies of pharmacists to provide the relevant pharmaceutical services for meeting the health needs in any given country's context (18). Therefore, some countries are introducing or undertaking major transformations in pharmacy education.

Across the globe, the profession's competency standards (CS) have been utilised to design, develop and review pharmacy curricula. CS has played an increasingly significant role in the initial and ongoing registration of practicing health professionals. The use of CS to inform outcome-based education (OBE) in pharmacy programmes provides a quality assurance mechanism and may enhance the accountability and flexibility of the profession for its public (19).

In many countries, national governments and/or pharmacy professional organizations have developed competency standards or guidelines which pharmacy students must meet before entering professional practice (20).

The current population of the Republic of the Union of Myanmar is 54,787,300 on 27th April 2025, which is equivalent to 0.67 % of the total world population (21).There are two universities currently offering undergraduate and post-graduate pharmacy programs in Myanmar (22, 23). The curriculum of the Bachelor of Pharmacy (B. Pharm.) includes foundation and professional courses. There are 14 subjects on foundation courses, such as English, Mathematics, Botany, Zoology, Chemistry, Myanmar, Behavioral Science, Anatomy, Physiology, Pathology, Microbiology (Pharmaceutical and medical) and Biochemistry, Pharmacology. The professional courses are only 4 subjects, such as Pharmaceutics I and II, Pharmacognosy, Pharmaceutical Chemistry (22, 23). Moreover, it is a content-based pharmacy education system. In comparison to Competency Based Education (CBE),

which is a replacement of the systems, structures, and pedagogies of the traditional system. It is driven by the equity-seeking need to transform our educational system, so all students can and will learn through full engagement and support and through authentic, rigorous learning experiences inside and outside the classroom (24).

The school should clearly identify and publish the educational competencies that graduates must achieve to address current and future national health-related needs using a needs-based educational model (25). CBE is increasing in popularity in undergraduate educational programs and their role in pharmacy education in the United States (US). In CBE, students demonstrate mastery of explicit and measurable knowledge, skill, and attitude outcomes (competencies) and receive individualized support that is tailored to their specific developmental needs (26).

In Myanmar, pharmacy students who have graduated from two Universities of Pharmacy work in the area of hospitals, pharmaceutical industries, regulation, traditional medicines, academia, research, pharmaceutical companies, drug stores, Non-Governmental Organization (NGO) or International Non-Governmental Organization (INGO) and others. Their careers are especially in the product-oriented area. They are expected to focus on patient care in hospitals, community and pharmaceutical public health, which have very limited roles in Myanmar. Currently, the Myanmar pharmacy undergraduate curriculum is exposed to a 4-year of (B. Pharm.) programme and the professional subjects focused more on the product-oriented curriculum.

In addition, the traditional-based education system should be changed to competency-based education in Myanmar because the current pharmacy education system is not an applied competency-based education system. According to Aye LN, 2020, the identification of the numerical, distribution, and skill pharmacist shortages has occurred in Myanmar (27). The United Kingdom (UK) defines a skill shortage as an expressed difficulty in recruiting individuals from the external labor market under current market conditions with a particular skill set due a low number of applicants caused by at least one of the following reasons: lack of required skills; lack of work experience a company demands; or lack of qualifications a company demands (28). Moreover, skills are abilities to perform specific tasks and skill domains are clusters of skills linked to task domains, and competences that allow the worker to do well in a

given task domain, or in a job (29).

According to Krauss SM, 2017, CBE could meet the urgent need to improve the quality and outcomes of developmental education by shifting the focus away from content and toward competencies (29). Therefore, it is surely necessary to change pharmacy education, especially the pharmacy curriculum in Myanmar. However, competency standards for pharmacy students towards graduates have not been developed yet in Myanmar. The evaluation of Myanmar's pharmacy curriculum by using competency standards to produce skillful and competent pharmacy graduates and pharmacists is definitely necessary in Myanmar. Therefore, evaluation of the curriculum by comparing the pharmacy graduate curriculum with the proposed competency standards should be carried out in Myanmar. This evaluation could assist with the transformation and reform of the pharmacy curriculum. Moreover, pharmacy competency standards are a pivotal guideline for the university to produce required competent pharmacy graduates and development of a new curriculum.

Pharmacy students who graduate according to the competency standards are expected not only to work professionally in the Myanmar healthcare system but may also restate to clearly assist in the ongoing curriculum development by giving feedback/requirements that make the revised curriculum more relevant to the industry in the schools of pharmacy in Myanmar ((30).

1.3.Objectives

1. To develop competency standards for pharmacy graduates in Myanmar
2. To evaluate the current Myanmar pharmacy curriculum by using competency standards for Myanmar pharmacy graduates.

1.4. Research questions

1. What are the needs of competencies for pharmacy graduates?
2. What are the competency standards for pharmacy graduates?
3. What are the gaps of the curriculum of pharmacy students towards competent pharmacy graduates in Myanmar?

1.5. Scope of the study

The study focuses on the need assessment towards pharmacy graduates' competencies fby pharmacy-related stakeholders in Myanmar in order to propose a competency standard for pharmacy graduates. The developed competency standards will be used as a guideline to evaluate the pharmacy curriculum in the Universities of Pharmacy in Myanmar.

1.6. Expected outcomes and utilization

The development of competency standards will be used for the development and implementation and setting up an advanced pharmacy curriculum to become competent pharmacists is essential for the development of Myanmar's healthcare system. Moreover, it is provided to identify workforce and collaboration opportunities, and the evidence-based information needed for policy, which is essential to providing registered, qualified pharmacists in Myanmar.

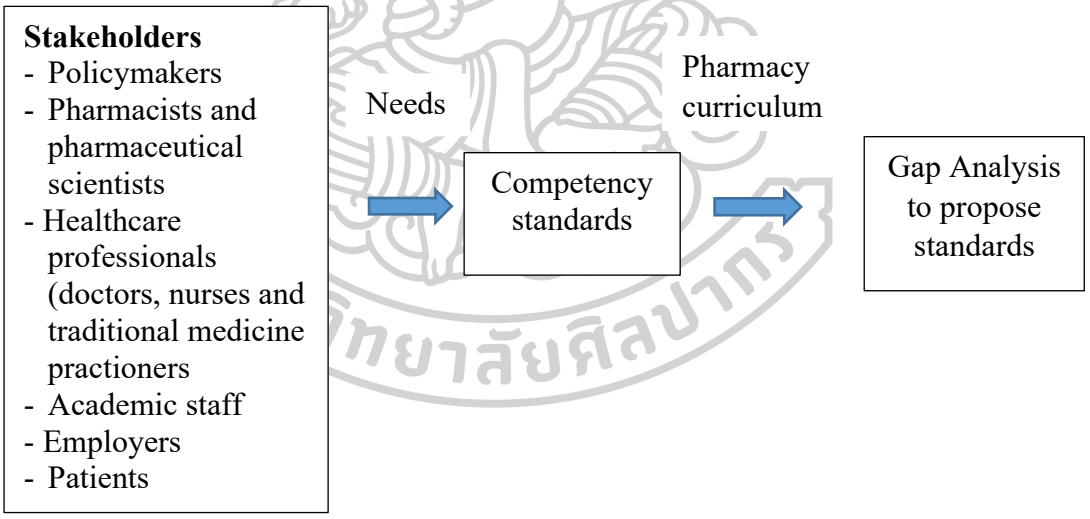

Figure 1.Conceptual framework

1.7.Definition of the terms

A. Competency (ies) mean(s) the knowledge, skills, attitudes and behaviours or performances that an individual develops through education, training and experiences.

B. Competency standards mean the guidelines include the knowledge, skills, attitudes and behaviours or performance needed to perform in a specific workplace.
C. Knowledge means understanding or information about a subject that the learners get by experience or study, either known by one person or by people generally.
D. Skill means the abilities of the learners acquire through learning and practice to do specific tasks.
E. Attitude means the opinion, view and judgement of the learners towards learning, teaching, and the educational environment.
F. Behaviour means the way that learners behave in the learning process and the job.
G. Performance means the ability of the learners based on their training and experience.
H. Performance level means a level of accomplishment that reflects the expertise of the learners based on their training and experience.
I. The curriculum means the development of the knowledge, attitudes, skills, behaviours or performances of the learners, which prepares for the specific workforce through the integration of the contents of the courses into the programme, using teaching/learning methods, assessment and work experiences to meet the expected educational outcomes and competencies.
J. Curriculum evaluation means the process of measuring and judging the gaps in the curriculum in which the planned courses, programme, learning activities and opportunities actually produce the expected results, which can assist in making decisions about the improvements and future progress.

CHAPTER 2
LITERATURE REVIEW

2.1. Pharmacy education

This refers to the educational design and capacity to develop the workforce for a diversity of settings (e.g. community pharmacy, hospital, research and development, regulatory affairs, industry and academia) across varying levels of service provision and competence (e.g. technical support staff, pharmacists and pharmaceutical scientists) and scope of education (e.g. undergraduate, postgraduate, life-long learning) (31).

2.1.1. Global Pharmacy Education

Pharmacists' duties and responsibilities have shifted from product-focused to patient-focused service and public-focused service offerings. A solid foundation of professional education and training is essential for health care practitioners to acquire the ability to improve therapeutic outcomes, improve patients' quality of life, and assist individuals in staying healthy while also furthering science and practice. Contemporary forms of initial education and training are vital for the pharmacy profession to meet the increasingly complex health care demands of populations in any country**.** Pharmacy and pharmaceutical education has to be designed so it can deliver the skills needed by students to work in different pharmaceutical settings once qualified. There are many gaps to be filled in pharmacy and pharmaceutical education worldwide and, in order to mitigate these issues, a joint collaboration between the International Pharmaceutical Federation (FIP), WHO and the United Nations Educational, Scientific and Cultural Organization (UNESCO) was established and the Pharmacy Education Taskforce created (17).

2.1.2. The basic information for pharmacy education

The basic information for pharmacy education and training in 15 countries is shown in Table 1, in which (1) Number of pharmacy schools/institutions (2) Pharmacy graduates per year (3) Number of licensed pharmacists (per 10,000 of population) (4) Years that transition to an all Pharm .D programme has been started (5) Practice training (6) Academic programme, length (years) (7) The programmes

that bridge the academic gap between the 4-, 5- and 6-year pharmacy programmes and (8) National Licensing exam included or not are put into this table (22, 23, 32-40).

Educational pathways to becoming a pharmacist in the five selected countries such as (USA, Japan, South Korea, Pakistan and Thailand). The pharmacy educational systems are similar in course length. Most are approximately 6 years of pre-entry standards and internships are included in Table 2**.** All countries have a similar education system to cater for those who wish to become a pharmacist: the students come from secondary school except for the United States (U.S.) and South Korea, where school-leaving qualifications are lower and entry is after a minimum of 2 years at university, followed by a 4- year pharmacy course with one year training experience and then a licensure examination. All countries require registration assessment of new pharmacists or their national licensure examination (33).

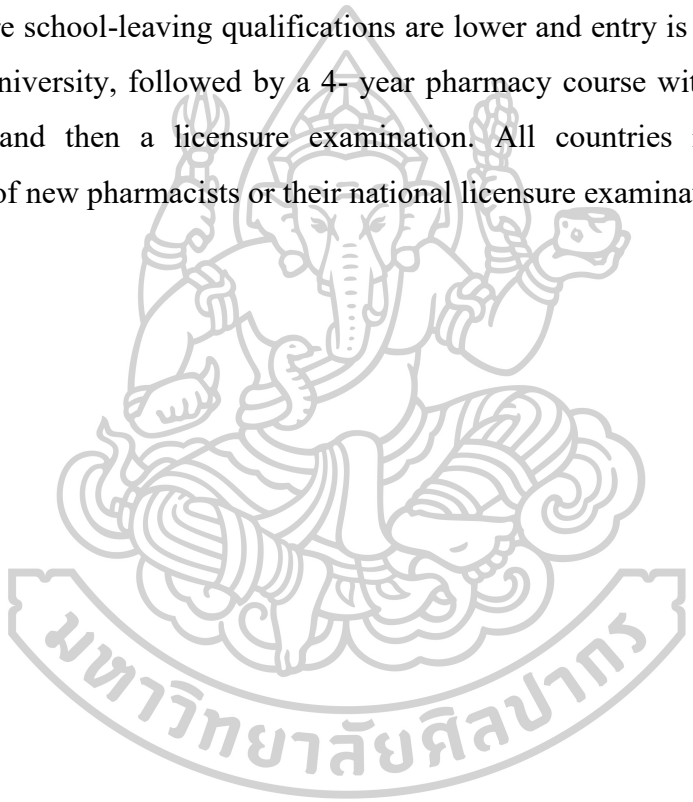

Table 1. Basic information about pharmacy education among countries

No	Countries	No. of pharmacy schools	Pharmacy graduate per year	Number of licensed pharmacists (per 10,000 of population)	Year that transition to an all-PharmD programme has been started	Practice Training	Academic programme, length (years)	Programme that bridge the academic gap	National Licensing exam	References
1	USA	129	12,719	249,642 (9)	2000	C, H, O (1,000-1,800 practice hours)	Pharm.D, 6, 4	Non-traditional PharmD programme	Required	(33)
2	Japan	74	9,912	276,517 (21)	2006	C, H (6 months)	Bachelor, 6	The new curriculum support training	Required	(33)
3	South Korea	35	1,372	53,492 (6.5)	2009	N/A	N/A	Master degree programme in clinical pharmacy	Required	(33)
4	Pakistan	43	40	12,000 (0.7)	2004	C, H	PharmD, 5	N//A	Required	(33)
5	Thailand	19	1,680	28,272 (4.2)	2010	C, H, I, O (2,000 practice hours)	PharmD, 6	Master degree programme in clinical pharmacy, Residency training Programme	Required	(33)
6	Canada	10 accredited pharmacy in 2008 schools	About 1,400	-	2007	The length of this internship varies across the country, but is generally 3-4 months in duration.	BSc Pharm D	a 2-year post-baccalaureate PharmD degree a part-time post-baccalaureate PharmDprograms	Required	(34)

No	Countries	No. of pharmacy schools	Pharmacy graduate per year	Number of licensed pharmacists (per 10,000 of population)	Year that transition to an all-PharmD programme has been started	Practice Training	Academic programme, length (years)	Programme that bridge the academic gap	National Licensing exam	References
						In addition to this inservice training period, candidates for licensure are required to complete a series of provincial and national examinations				
7	Taiwan	Nine in 2017	1,446 in 2016	31,036 in 2016	-	-	4-6 years	-	N/A	(35)
8	China	218 in 2011	Approx. 7,000 in 2005	408,431 in 2017	-	-	4-5 years (BS/BPharm) 3 years (MS after BS) 5 years (PhD after BS)	N/A	N/A	(35)
9	India	1113 in 2007	more than 52,000 students to the BPharm in 2007 PharmD 1410 students.	N/A	2008	Intensive training 1 year	Pharm D, 6 B.Pharm, 4	BPharm degree holders can join the PharmD program in the fourth year	Not required	(36)

No	Countries	No. of pharmacy schools	Pharmacy graduate per year	Number of licensed pharmacists (per 10,000 of population)	Year that transition to an all-PharmD programme has been started	Practice Training	Academic programme, length (years)	Programme that bridge the academic gap	National Licensing exam	References
10	UK	22 in 2008	3000 per year	N/A	No	1-year workplace Training	B.Pharm. 4 M.Pharm.4	N/A	Required	(37)
11	Singapore	6	-	3,201 in 2018	No	12 month training	BS(Pharmay)	N/A	Required	(32)
12	Malaysia	21 in 2017	1,200	1:2000 by 2020	No	complete a one-year internship	4 years B.Pharm	N/A	Required	(35)
13	Philippines	83 in 2017	23,400	N/A	No	600 hours of practicum/internshi (200) hours each for C,H, I.	4 years BS 5-year BS Pharmacy program Pharm D	Baccalaureate degree of PharmD	Required	(35)
14	Vietnam	7 in 2013	1,300 per year	1.2 pharmacistper 10,000 people in 2006 to 2 to 2.5 in 2020)	No	Placement of 140 and 280 hours in generalize pharmacy setting.	4 years B.Pharm	N/A	Required	(40)
15	Myanmar	2	about 200	N/A	No	1 months H one week industries	4 years B.Pharm	N/A	It has not provided	(22) (23)

Table 2. Educational pathways to becoming a pharmacist in the five selected countries that transition from the (B.Pharm) to PharmD programme

Approximated age of learner	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
Approximated grade	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**							
US (6-year PharmD)	Primary school						Secondary school						2-year prerequisites or obtaining a transferable bachelors' degree pharmacy		4-year School of Pharmacy, including clerkship 1,000-1,800 practice hours -IPPEa 300 hours during first 3 years of course - APPEb 36 weeks in the fourth year				State Board exam
Japan (6-year BPharm)	Primary school						Junior high school			High school			6-year BPharm, including 6 months internship (Prior to start outside practice: students have to take common exam at school (CBTc +OSCEd) in the fourth year)						National Board exam
Korea (2+4 Pharmacy programme)	Primary school						Junior high school			High school			2-year Pre-pharmacy + PEET		4-year School of Pharmacy, including clerkship in the final year; -IPPEa 2 credits (70 hours);APPEb 1 years (33 weeks/1330 hours for 28 credits)				National Board exam
Pakistan (5-year PharmD)	Primary school					Secondary school (lower level G6-8)			Secondary school (upper level G9-12)				5-year PharmD (There is no clarity regarding pharmacy practice experience)					**N/A**	

Approximated age of learner	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
Approximated grade	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**							
Thailand (6-year PharmD)	Primary school (6-11 years old: Prathom)						High school (12-18 years old: Mattayom)						6-year PharmD, including 2,000 practice hours -IPPEa 400 hours during the fourth year -APPEb 1,600 hours during the fifth and the sixth year						National Licensure exam
IPPE=Introductory Pharmacy Practice Experience; b APPE=Advanced Pharmacy Practice Experience; c CBT=Computer based testing-for knowledge; d OSCE=(Objective Structured Clinical ability Examination)-for professional skills; e PEET=Pharmacy Education Eligibility Test																			

2.1.3. Identifying national, societal, and population needs

Pharmacists, as professionals, serve the requirements of the society in which they practice, both on an individual patient level and in the larger population. Just as political, health care, and regulatory systems differ from country to country, so do health care needs and other priorities, including economic, educational, cultural and social priorities, differ. Several factors account for or contribute to this diversity. The nature of national, societal and population needs, policies, and priorities, will determine the services that must be provided by the pharmacy workforce to meet these needs. In turn, these services will determine what competencies must be developed by members of the pharmacy workforce in order to deliver the services. The educational programme must be designed and delivered (curricular content, teaching and learning methodologies, educational outcomes, etc.) to ensure that these competencies are achieved by all graduates. This is the needs-based education model embraced by FIPEd's Global Quality Assurance Framework (17). It was shown in Figure 2.

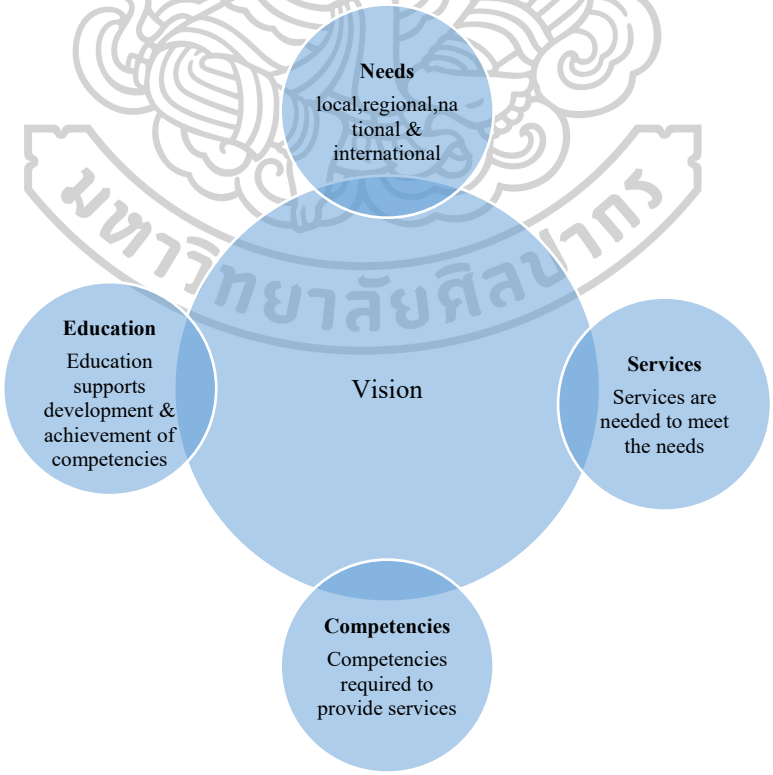

Figure 2. Need based education model

2.2. Competency

2.2.1. Definition of Competency

Competency can be defined as follows.

1. The Council on Credentialing in Pharmacy (CCP) defines competency as: A distinct knowledge, skill, attitude or value that is essential to the practice of a profession (41).
2. The Ministry of Health,Singapore defines competency as: A distinct composite of knowledge, skill, attitude and value that is essential to the practice of the profession (42).
3. The South Africa Pharmacy Council defines a competency as: A quality or characteristic of a person related to effective or superior performance. Competency consists of aspects such as attitudes, motives, traits and skills (43).

2.2.2. FIP competency framework and standard

In recent years, FIP has focused particular attention on an initiative to foster and support the evaluation and development of competencies in pharmacy, and to develop educational models that would serve that purpose. FIP's Global Competency Framework (GbCF) for articulating and evaluating competencies has been finalised, and after testing by several countries, it has been adapted and adopted to become an official model for competencies in pharmacy. The Global Competency Framework describes 20 competencies in four areas (pharmaceutical care, pharmaceutical public health, organization and management, professional and personal), with numerous accompanying specific indicators (behavioural statements). In the standards established by the quality assurance agency, educational outcomes and competencies can be stated in a number of ways, either at a high level (e.g., a few broad competency areas, as above) or at a more detailed level specifying multiple, more specific competencies. In developing and adopting its own educational outcome and competency statements, the school must ensure that it addresses all the outcomes and competencies addressed in the standards (17).

2.2.3. The development of standards or frameworks containing competencies or educational outcomes for pharmacy students among countries and their level

As shown in Table 3, Thailand, Lebanon, Europe, and Malaysia, established

the competency standard for pharmacy students. In addition, the USA, Great Britain, Australia, Canada and Singapore also set the framework or standard of educational or learning outcomes for pharmacy students.

Development of competency standards for pharmacy students

1. Thailand, 2012

The pharmacy competency standard in Thailand was established by the Thai Pharmacy Council in 2002. It was developed by a group of Thai pharmacy experts and included an evaluation of standards used by other countries. There are 8 domains, 40 competencies, and 71 sub-competencies into it, and it is used for their pharmacy licensure examination for 5-year pharmacy program (20). In 2011, Thai Pharmacy Council agreed to the curriculum structure of 6-year pharmacy program. Then, the revision of Thai pharmacy competency standards was announced in 2012 for 6-year pharmacy program. It contains seven domains and 27 competency statements.

2. Great Britain, 2011

The General pharmaceutical Council (GPhC) published standards for the initial education and training of pharmacists to provide schools of pharmacy in May 2011. In this document. The outcomes in Standard 10 refer to outcome levels for an (M. Pharm.) degree and outcome levels for pre-registration training. Standard 10 contains learning outcomes with 2 statements and 5 sub-statements and 58 specific outcomes, which represent (M. Pharm.) degree and outcome levels for pre-registration training level included. It is applicable to current pharmacy students and pre-registration pharmacist trainees. Those involved in the initial education and training of pharmacists, pharmacy professionals and members of the public could also be interested in this document (44).

3. USA, 2016

Accreditation Standards and key elements for the professional program in pharmacy leading to a Doctor of Pharmacy Degree have been published by The Accreditation Council for Pharmacy Education (ACPE). These Standards document includes the 25 standards, required (key) elements, assessment elements, and required documentation for each individual standard. They focus on the educational outcomes required of PharmD programs and the assessment of those outcomes. In this document, Standards 1-4 describe where programs can experiment and innovate

within the didactic and experiential components of their curricula to meet the required educational outcomes. This guidance provides to support faculties or schools for the improvement of the quality of their (Pharm D) programs and includes suggested strategies, additional examples, evidence of compliance, and other important information to meet standards. To achieve and maintain ACPE accreditation, professional Doctor of Pharmacy (Pharm D) degree programs must meet the standards contained in this document. ACPE standards are minimum requirements. It is expected that programs will exceed these required standards through initiatives designed to ensure continuous quality improvement (45).

4. Australia, 2015

Stupans I, et*al*, had published the development of learning outcomes and exemplar standards in Australia for all entry-level pharmacy graduates in the International Journal of Pharmacy Practice in 2015. They were developed through a participatory action research framework and involving an iterative process of dissemination and seeking feedback. The stakeholders are academic staff representatives from pharmacy schools in Australia, pharmacy student representatives, and the Australian Pharmacy Council. In this article, 8 pharmacy learning outcomes and 32 exemplar standards (PhLOS) are included. They are a collaborative reconceptualisation of the Australian pharmacy curriculum for all students graduating from entry-level pharmacy programmes. It is likely to accrue benefits to all stakeholders such as students, academics, employers and professional bodies (46).

5. Europe, 2016

This paper presented the results of the second PHAR-QA Delphi round in the European pharmacy community. A revised version of the PHAR-QA questionnaire was produced following the analysis of the results of the first round. The framework is for a European 5-year pharmacy degree. The expert academic panel (the authors) based their revision of the first European Delphi questionnaire on the ranking of, and comments on, the competences proposed. In most cases, the subject matter of the competences was unaltered in the second round survey compared to that of the first round. The process of evaluation and validation of ranking of competences by the pharmacy profession is now complete, and the PHAR-QA consortium will now put

forward a definitive PHAR-QA framework of competences for pharmacy practice. It is included in the framework of 13 clusters in two major domains with a total of 50 competences (47).

6. Canada, 2017

The Association of Faculties of Pharmacy of Canada (AFPC) Task Force on Educational Outcomes was hit by the AFPC Council of Faculties in mid-2016 to revise the 2010 version in 2016 for all entry-to-practice pharmacy programs in Canada and their work was completed in 2017. They developed it through focus group discussions with representatives from the faculties of pharmacy in Canada and literature from pharmacy and the other health professions. This document consists of 7 roles, 20 key competencies and 71 enabling competencies, and it focuses on what graduates are able to do at the end of a Baccalaureate or Doctorate program or at the end of their first professional degree in pharmacy, i.e. entry-to-practice pharmacy degree programs. It is a framework used for curriculum design without being overly enforced (48).

7. Malaysia, 2018

Pharmacy Board Malaysia (PBM), Ministry of Health Malaysia, published standard on approval and recognition of pharmacy programmes in 2018. It was included in the recognition process is the evaluation of a detailed submission of the various components of the pharmacy programme and visits by a panel of evaluators. The programme will last over a minimum of 4 calendar years and provides a Bachelor of Pharmacy, Bachelor of Science (Pharmacy), Bachelor of Pharmacy (Honours) degree.

It provides information on completing the pharmacy programme and professional competencies for graduates. Three knowledge domains, 1 attitude domain, 9 professional competencies and a curriculum are included in this document. It should be used by Higher Education Providers in order to deliver quality education by producing competent pharmacists (49).

8. Singapore, 2018

The Standards for Undergraduate Pharmacy Education and Training in Singapore weres developed by the Pharmacy Programme Review Committee (PPRC) in 2015 and published by the Singapore Pharmacy Council (SPC) in 2018. It is

produced by the reviewing the global pharmacy education standards and formulating a set of standards that are relevant and applicable to the practice of pharmacy in Singapore. It was established to provide guidance to education providers so that their graduates meet the minimum standards for knowledge, skills, attitude and values at the point of registration with the SPC. In this document, the indicative Syllabus and Learning Outcomes cover five topics demonstrated (Appendix 2). It is also mentioned that 21 competency requirements related to these topics for pharmacy students. The descriptions of the topics and learning outcomes are provided by the education provider to design suitable courses for pharmacy undergraduate students.These must be achieved to become competent graduates from a professional pharmacy educational programme. Therefore, it will ensure that high-quality pharmacy undergraduate programmes offered in Singapore are maintained. It also provides guidance to programme providers about establishing and improving their programme. The standards will also be used as a benchmark to evaluate programmes offered outside of Singapore (32).

9. Lebanon 2021

A cross-sectional study and evaluation by survey was carried out to for the perception of Pharmacy-Related Competencies based on the Lebanese Pharmacy Core Competencies Framework developed in 2020, and it was published in the pharmacy practice journal in 2021. The population is pharmacy graduates. It includes 7 domains and 35 competencies. It is developed to the suggested Lebanese Pharmacy Competency Framework. It is essential to emphasize fundamental knowledge, medicine supply, and public health competencies in undergraduate curricula and improve continuing professional education (50).

Table 3. Standard and framework competencies or learning outcomes for pharmacy students among countries

No	Countries and Year of Publication	Nomenclature		Name of organization	Stakeholders/population	Structure	Statements number of contents	Degree programe
1	Thailand,2012	Pharmacy competency standards		Thai Pharmacy Council	Pharmacy experts	Competency Domains 1. Professionalism, ethics, and morality 2. Teamwork and system management 3. Information technology, communication, and knowledge dissemination 4. Pharmaceutical products, herbal medicines, chemical substances, and quality control 5. Drug procurement and preparation for extemporaneous patients 6. Basic pharmaceutical care and herbal usage 7. Public health and health systems	7 domains, 27 competencies	6 years (Pharm D programe)
2	Great Britain,2011	Standards for the initial education and training of pharmacists		General Pharmaceutical Council	Not identified	**Outcomes for the initial education and training of pharmacists** 1.1.Expectations of a pharmacy professional 1.2.The skills required in practice 1.2.1 Implementing health policy 1.2.2 Validating therapeutic approaches and supplying prescribed and over-the-counter medicines 1.2.3 Ensuring that safe and effective systems are in place to manage the risk inherent in the practice of pharmacy and the delivery of pharmaceutical services 1.2.4 Working with patients and the public 1.2.5 Maintaining and improving professional performance	Outcomes for the initial education and training of pharmacists =2 and Sub outcomes=5 Specific outcomes =58	M..Pharm and preregistration

No	Countries and Year of Publication	Nomenclature		Name of organization	Stakeholders/population	Structure	Statements number of contents	Degree programe
3	USA,2016	Accreditation Standards and key elements for the professional program in pharmacy leading to Doctor of Pharmacy Degree		Accreditation Council for Pharmacy Education	1. Stakeholders (pharmacy colleges and schools, professional pharmacy organizations, student pharmacist organizations, and other accrediting bodies) 2. All the college or school of pharmacy deans 3. ACPE stakeholders 4. An advisory group from various sections of the academic and practice communities	Standard 1 – Foundational Knowledge Standard 2 – Essentials for Practice and Care Standard 3 - Approach to Practice and Care Standard 4 – Personal and Professional Development	Standards =25 educational outcomes = Standards 1–4	Doctor of Pharmacy (PharmD) degree programs
4	Australia,2015	Learning outcomes and exemplar standards		International Journal of Pharmacy Practice	Academic staff representatives from pharmacy schools in Australia, pharmacy student representatives, and the Australian Pharmacy Council	**Pharmacy learning outcomes** -Demonstrate professional behaviour and accountability in the commitment to care for and about people. -Retrieve, critically evaluate and apply evidence in professional practice. -Demonstrate team and leadership skills to deliver safe and effective practice. -Make, act on, and take social responsibility for clinically, ethically and scientifically sound decisions -Communicate in lay and professional language, choosing strategies appropriate for the context and diverse audiences. -Reflect on current skills, knowledge, attitudes and practice; planning and implementing for ongoing personal and professional development -Apply pharmaceutical, medication and health knowledge and skills. -Formulate, prepare, and also supply medications and therapeutic products	Pharmacy learning outcomes = 8 and Exemplar Standards = 32	an entry-level pharmacy degree

No	Countries and Year of Publication	Nomenclature		Name of organization	Stakeholders/population	Structure	Statements number of contents	Degree programe
5	Europe,2016	The Second Round of the PHAR-QA Survey of Competences for Pharmacy Practice		Pharmacy	Academic students the populations of the professional groups (community, hospital and industrial pharmacists, pharmacists in other occupations and academics)	**Personal competences** (1) Learning and knowledge. (2) Values. (3) Communication and organizational skills. (4) Knowledge of different areas of the science of medicines. (5) Understanding of industrial pharmacy. **Patient care competences** (6) Patient consultation and assessment. (7) Need for drug treatment. (8) Drug interactions. (9) Provision of drug product. (10)Patient education. (11)Provision of information and service. (12)Monitoring of drug therapy. (13)Evaluation of outcomes.	13 clusters 50 competences	5-year pharmacy degree,not postgraduate specialisation
6	Canada,2017	AFPC Educational Outcomes for First Professional Degree Programs in Pharmacy		The Association of Faculties of Pharmacy of Canada (AFPC)	-Representatives from faculties of pharmacy in Canada -National and provincial pharmacy organizations -External stakeholders	**Roles** 1. Care provider 2. Communicator 3. Collaborator 4. Leader-Manager 5. Health Advocate 6. Scholar 7. Processional	Roles = 7 Key competencies= 20 enabling competencies =71	At the end of a Baccalaureate or Doctorate program or entry-to-practice pharmacy degree programs or the first professional degree in pharmacy
7	Malaysia,2018	Standards on approval and recognition of pharmacy program		Ministry of Health Malaysia	A panel of evaluators Pharmacy Board Malaysia	-Knowledge domain -Attitude domain -Professional competencies	-Knowledge domain =4 Attitude domain=1 professional competencies= 9	Bachelor of Pharmacy, Bachelor of Science (Pharmacy), Bachelor of Pharmacy (Honours), over a minimum of 4 calendar years.
8	Singapore,2018	Standards for Undergraduate Pharmacy Education and Training Singapore		Singapore Pharmacy Council	Pharmacy Programme Review Committee	**Syllabus and learning outcomes** 1. Patient or Consumer 2. Health and disease 3. Medicinal Substance 4. Health Product 5. Regulatory Framework & Health System	Related topics =5 Competency requirements=21	Undergraduate programmes

No	Countries and Year of Publication	Nomenclature		Name of organization	Stakeholders/population	Structure	Statements number of contents	Degree programe
9	Labanon, 2021	Descriptive Assessment of Graduates' Perceptions of Pharmacy-Related Competencies Based on the Lebanese Pharmacy Core Competencies Framework		Pharmacy practice	Pharmacists who graduated from Lebanese universities	**Domains** 1.Fundamental knowledge: 2.Professional practice: 3.Personal skills 4.Medicines supply 5. Safe and Rational Use of Medicines 6. Pharmaceutical Public Health 7. Organization and Management	7 domains 35 competencies	Pharmacy graduates last 5 years and lead to a Bachelor of Science (BS) degree, while an additional year to obtain a Doctor of Pharmacy (PharmD) degree is optional except in one of the francophone universities where PharmD is mandatory

มหาวิทยาลัยศิลปากร

2.3. Curriculum

2.3.1. Definition of curriculum

According to Prideaux D, 2003, if the curriculum is defined more broadly than a syllabus or course of study, then it needs to contain more than mere statements of content to be studied. A curriculum has at least four important elements: content; teaching and learning strategies; assessment processes; and evaluation processes (51). A curriculum has at least four important elements: content; teaching and learning strategies; assessment processes; and evaluation processes.

There are many definitions of what a curriculum is, but in general, the term refers to the set of experiences and objectives to be achieved by students during their educational process. The curriculum aims to provide students with the knowledge, skills, behaviors, and attitudes that prepare them for professional practice, all of which play an important role in professional identity formation (52).

The curriculum must define the expected educational outcomes and competencies and be developed with attention to sequencing, reinforcement, integration and application of content, cognitive and behavioral learning, and the selection of appropriate teaching and learning methods and assessments (17).

The definition of the term curriculum includes the development of abilities through coursework, other formal educational activities (traditionally called co-curricular activities), and other life experiences or informal educational activities (traditionally called extracurricular activities). The term abilities is defined in 3 domains: cognitive domain, psychomotor domain, and affective domain (53).

A professional pharmacy curriculum must be designed to meet the registered university school of pharmacy's educational outcomes through the integration of the biological, pharmaceutical, social/behavior/administrative pharmacy, and clinical sciences using a teaching methodology that is student-centered, emphasizing higher-order learning (54).

It is concluded that the definition of the curriculum for pharmacy graduates is the development of the knowledge, attitudes, skills, behaviors or performances of the learners, which prepares for the specific workforce through the integration of the contents of the courses in the programme using teaching/learning methods,

assessment and work experiences to meet the expected educational outcomes and competencies.

2.3.2. Curricular development and improvement

The school's academic staff should collectively be responsible for the development, organization, delivery, review, and improvement of the curriculum. Instruction should be coordinated across school organizational/departmental lines and academic staff disciplines to ensure appropriate coverage of all curricular areas and avoid unnecessary redundancy and overlap. The curriculum should include didactic coursework, opportunities for small group work to foster problem-based learning, laboratories, practice simulations, and supervised educational experiences in pharmacy practice settings. All courses and elements of the curriculum should be "mapped" (cross-referenced) to the expected competencies and educational outcomes.

The curriculum should incorporate both required and elective courses and pharmacy practice experience. The standard should specify the minimum number of academic years/ semesters, as well as hours or credits for the professional degree programme. Ongoing development, review and continuous improvement of the curriculum should be guided by assessment data and be responsive to the changing state of knowledge in healthcare, new technologies, and the needs and demands emerging from health systems, including consumers' expectations. Curricular revision (in particular the addition of new content without an associated increase in curricular length and/or removal of redundant content) needs to ensure the overall integrity of the curriculum. Curricular overload, dilution of focus and insufficient depth of coverage for essential components of the curriculum should be avoided (17).

The following didactic content areas and associated learning expectations are viewed as central to contemporary, high-quality pharmacy education and are incorporated at an appropriate breadth and depth into the required didactic Doctor of Pharmacy curriculum (45).

(A) Biomedical Sciences (may be addressed in the pre-professional curriculum)

- Biochemistry
- Biostatistics
- Human Anatomy

- Human Physiology
- Immunology
- Medical Microbiology
- Pathology/Pathophysiology

(B) Pharmaceutical Sciences

- Clinical Chemistry
- Extemporaneous Compounding
- Medicinal Chemistry
- Pharmaceutical Calculations
- Pharmaceutics/Biopharmaceutics
- Pharmacogenomics/genetics
- Pharmacokinetics
- Pharmacology
- Toxicology

(C) Social/Administrative/Behavioral Sciences

- Cultural Awareness
- Ethics
- Healthcare Systems
- History of Pharmacy
- Pharmacoeconomics
- Pharmacoepidemiology
- Pharmacy Law and Regulatory Affairs
- Practice Management
- Professional Communication
- Professional Development/Social and Behavioral Aspects of Practice
- Research Design

(D) Clinical Sciences

- Clinical Pharmacokinetics
- Health Informatics
- Health Information Retrieval and Evaluation
- Medication Dispensing, Distribution and Administration

- Natural Products and Alternative and Complementary TherapiesNatural Products and Alternative and Complementary Therapies
- Patient Assessment
- Patient Safety
- Pharmacotherapy
- Public Health
- Self-Care Pharmacotherapy

2.3.3. Evaluation of curriculum

In order for pharmacy schools to ensure their graduates possess the necessary skills to practice and to meet new competency standards, it is important for schools to have ongoing educational curriculum evaluations to investigate their educational processes and outcomes, focus attention on meeting more global societal needs for services by pharmacists, and provide feedback for their instructional processes. In addition, the results of curriculum evaluations will hopefully guide schools to more appropriately upgrade their curricula (20).

Curriculum evaluation may also be external or commissioned review processes. These may be research-based investigations into the state and effectiveness of various components of the curriculum and its implementation, or they may be conducted on a regular basis by special committees or task forces on the curriculum. These processes might examine, for example, the effectiveness of curriculum content, existing pedagogies and instructional approaches, teacher training and textbooks and instructional materials (55).

2.3.4. Designing the Curriculum

Designing the Curriculum by Nunes-da-Cunha I, 2017

According to UNESCO, a curriculum is a systematic and intended packaging of competencies that learners should acquire through organized learning experiences in both formal and non-formal settings. Curriculum development must meet society's needs; in this sense, the university should be able to identify the educational objectives and competencies that a graduate must acquire to practice his or her chosen profession. In the case of pharmacy, the curriculum should prepare students to enter a pharmacy practice with the necessary competencies that enable them to respond to

health-related needs. These needs are constantly changing, making the design of a curriculum a process that is always in progress. Koster et al. offer suggestions for designing a pharmacy curriculum: use a competency framework; consult stakeholders ("consultation of the outside world is necessary to align the competencies of recent graduates to the local professional and healthcare needs"); think ahead; integrate content and skills; appoint curriculum coordinators; avoid over burdening; use authentic learning activities and assessment tasks; adopt frameworks for cognitive and skill development; use curriculum mapping for internal quality enhancement; ensure management continuity; develop educational expertise and specialization; and develop scholarship in teaching and learning. The curriculum should be expressed in comprehensive and user-friendly documents, such as curriculum frameworks; subject curricula/syllabuses, and in relevant and helpful learning materials, such as textbooks, teacher guides and assessment guides. A course syllabus is the principal outcome of curriculum development. A syllabus is a document that includes descriptions and course plans. This instrument enhances student learning, assists faculty teaching, increases communication between faculty members about courses, and improves curricular quality. A syllabus should be created as a manual and a type of contract between the professor and the student. A learning-centred syllabus should be designed to ensure that students, when reading this document, understand what is required to achieve the course's educational objectives. There are several components that a course syllabus must include:

- General course information (course title and course code; term/quarter/semester; location and time of class; credits/units/time and student workload required; pre-requisites/co-requisites; course description)

- Course instructional team (instructor names; office hours and contact information; additional information)

- Course goals (general aims for the course/course purpose) - Course objectives (skills, knowledge and attitudes that students need to acquire). Specific learning outcomes (competencies)

- Course content (description of course content including the sequence of topics/readings; learning activities/assignments)

- Time schedule/course plan (schedule/course plan; lecture and lab topics; landmark events, assessments, due dates; daily assignments linked to the calendar)

- The learning environment (learning and teaching methods; a list of required and recommended texts; course materials and attire)

- Student assessment and grading (grading procedure; grading scale and method; missed assessments; grade posting; the consequences of a failing grade; additional grading information)

- Technical, classroom, and academic policy information (syllabus changes; last course revision date; students with disabilities and special needs; rights and responsibilities of the student and faculty)

- Expectations of professionalism (ethics and professional conduct; behaviour; work habits)

- Additional information (e.g., charts, study suggestions, information on how to access the course website, advice for preparing for assessments/exams, appendices).

The syllabus can be used as an instrument to demonstrate that a course prepares the student for the objectives established in the curriculum. To do so, the syllabus should also include a summary of how the course content relates to the competencies, which means an alignment between the learning outcomes, learning activities/assignments and assessment. The learning activities are used to develop each outcome, and the assessment tasks are used to assess each outcome. Curriculum mapping is used for the evaluation and the continuous quality improvement of undergraduate pharmacy programmes .Curricular mapping allows for the identification of “courses that need content revision and renewed alignment with program outcomes”. Curriculum review and mapping is a process that “increases communication and collaborative efforts regarding instructional strategies, course content, assessment methods, and expected program outcomes among faculty members and other stakeholders. However, this process ensures that the curriculum reflects the goals not only of the academic institution but also of the profession, making the endpoints of the professional program visible to all involved. Articles on mapping pharmacy curricula around the world have emerged in the literature.

The curriculum and course content taught in the pharmacy programme vary from country to country. Some studies have compared pharmacy curricula across

European countries and grouped courses for pharmacy degrees into different subject areas. In an attempt to achieve an appropriate balance between educational content from various areas and following the ACPE standards, some US schools of pharmacy have adopted an integration of the curricular content. In these schools, the courses are linked to each other, and the content taught in one course is related to the information provided in another. Curricular integration can occur with content from courses that are taught at the same time in the programme (horizontal integration) or that are taught in different stages of the curriculum (vertical integration). The curriculum integration consists of the integration of contents from the basic sciences with clinical sciences and the integration of theory and practice. Pharmacy curricula with complete integration of biomedical, pharmaceutical, social/behavioural/administrative, and clinical sciences are also being developed (52).

Designing the Curriculum by FIP, 2014

The curriculum should provide a thorough foundation (knowledge base) in the biomedical, pharmaceutical, social, behavioural, administrative, and clinical sciences, and a range of pharmacy practice experiences that integrate, apply, reinforce, and advance the knowledge, skills, attitudes, behaviours and values developed through the other components of the curriculum. The curriculum should develop quantitative reasoning skills and the ability in graduates to integrate and apply learning to the present and future practice of pharmacy. Graduates should have developed the skills and attitudes to self-direct their lifelong learning and professional development. The professional degree programme should satisfy the educational requirements for licensure (or registration) or, where it is required, for examination for licensure as a pharmacist, and meet the requirements of the university and applicable education authorities for the degree (or other credential) awarded. The structure and duration of the programme, including the number of academic credits awarded and the mix of required and elective courses, should be appropriate to the educational outcomes and competencies to be achieved by graduates.

Practice experiences should be undertaken at approved practice sites under the supervision of appropriately qualified, experienced and trained preceptors, who serve as practitioner educators. The majority of preceptors should be trained pharmacists, and the majority of students' time in experiential education should be spent with

trained pharmacists. Other healthcare professionals can also serve as preceptors, provided that the competencies developed by students during the practice experience are appropriate for pharmacists. Criteria for the selection, review and retention of preceptors and practice sites should be established and implemented in collaboration with the regulators of pharmacy practice. The competency-based objectives for each pharmacy practice experience and the responsibilities of the student, preceptor, and practice site should be clearly defined and mutually agreed. The relationship between the school and its preceptors should be clearly defined and articulated, e.g., through a written agreement and/or appointment as a member of the academic staff of the school. At a level appropriate to the education and experience of the student and in accordance with pharmacy practice regulations, practice experiences should include direct interaction with diverse patient populations in a variety of practice settings and provide opportunities for communication and collaboration with other healthcare professionals (17).

2.3.5. Design process and model of curriculum development

The design of a competency-based curriculum

The design of a competency-based curriculum ideally follows a specific sequence, from competencies to learning outcomes, to assessments, to teaching-learning activities. This process can be described in six steps (56). It was shown in Figure 3**.**

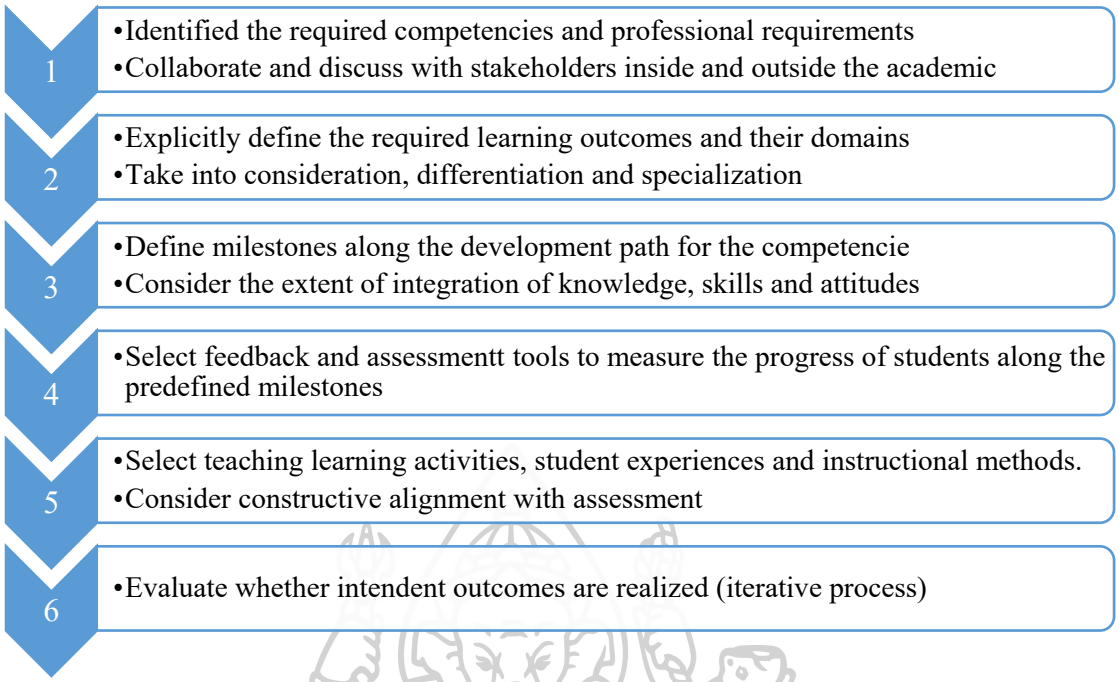

Figure 3. The curriculum design process (56)

Outcomes-based curriculum planning model (Theoretical framework)

The aspects of pharmacy curriculum planning was presented in Figure 4, which shows how they relate and influence one another. The study will first consider the mission-vision of the institution, also known as institutional intended learning outcomes (IILO) or competencies of an ideal graduate, which will lead to specification of Department of Pharmacy goals or program intended learning outcomes (PILO). The PILO will then be formulated under the following main areas or competencies: academic excellence, leadership and teamwork, critical thinking and problem-solving skills, productivity and accountability, social and ethical responsibilities, communication and relational skills, and global engagement (57).

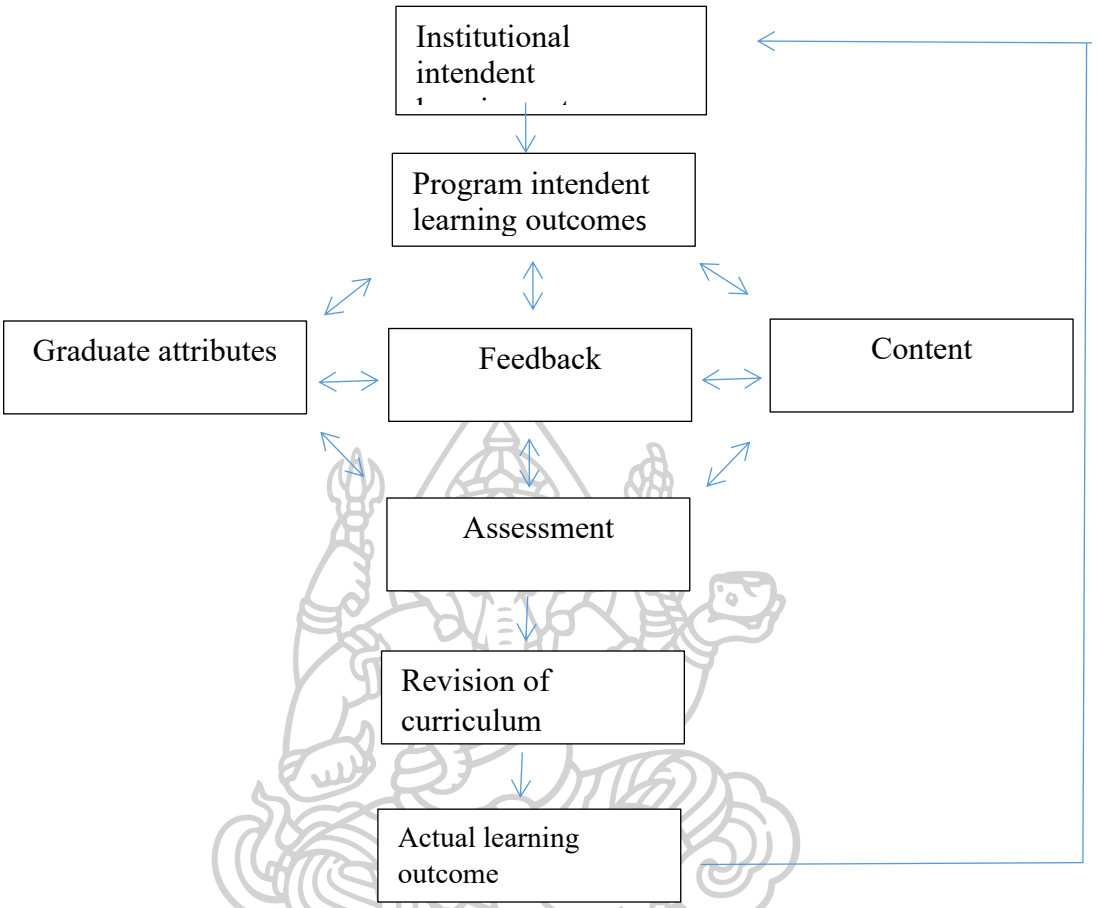

Figure 4. Curriculum planning model illustrating an outcomes-based approach to pharmacy curriculum development (57)

2.3.6. Competency-based curriculum development for Myanmar

As shown in Figure 5, a competency-based curriculum development model for Myanmar has been developed. In this model, first, competency level will be identified. The learning outcome will also be determined. The decision about what courses/modules will be added to the curriculum is made. The objective of each course will be written. The content, teaching learning strategies and assessment method will be described.

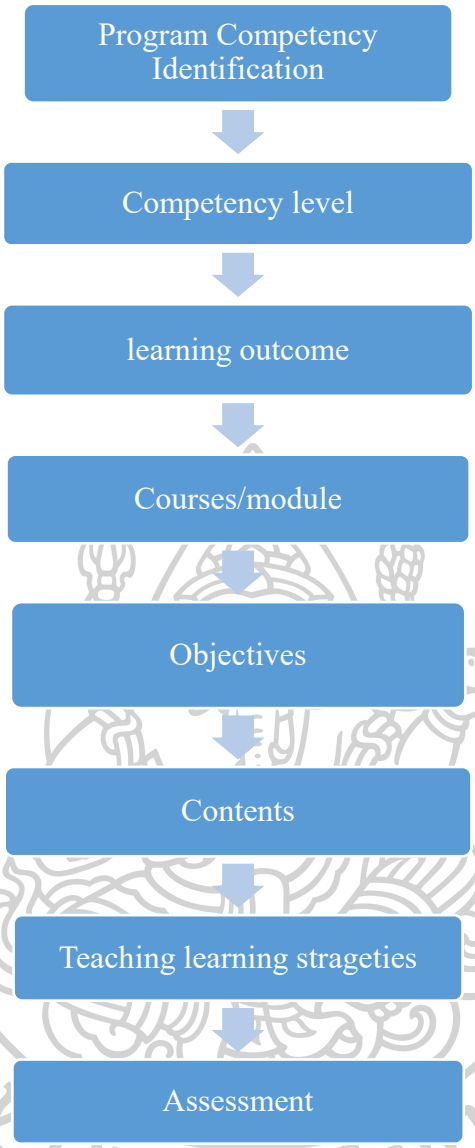

Figure 5. Competency based curriculum development model for Myanmar

2.3.7. Calculation of hours to credit hours

In pharmacy education in the United Kingdom (37), 1 credit hour is 10 hours of study. According to the pharmacy contents of curriculum in Thailand **(20),** the formula of 1 credit hour being equivalent to 15 hours of lecture or 45 hours of laboratory was used for the conversion.

According to the Pharmacy Council of India, credits in theory and laboratory for a course are dependent on the number of hours of instruction per week on that course, and are obtained by using a multiplier of one (1) for lecture and tutorial hours, and a multiplier of half (1/2) for practical (laboratory) hours. Thus, for example, a

theory course having three lectures and one tutorial per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout the semester carries a credit of 2 (58).

2.4. Roles of Pharmacists

The 'seven-star pharmacist' was a landmark concept in terms of setting benchmarks for pharmacists to provide very high quality pharmaceutical care to patients. An addendum to the seven-star pharmacist concept has resulted in the inclusion of two new criteria, thereby giving rise to the 'Nine-star pharmacist'. In addition to the seven roles, the inclusion of pharmacist as a researcher and an entrepreneur is quite significant. The terms of the roles of pharmacists described in Malaysia, Canada, WHO and USA were shown in Table 4**.**

Table 4. Roles of Pharmacists

(WHO,1993) (59)	**Malaysia Faculty of Pharmacy, AIMST University,2015 (60)**	**(Canada, AFPC,2017) (48)**	**(USA, AACP, 2013) (61)**
Care-giver Decisionmaker Communicator Manager Life-long-learner Teacher Leader	Care-giver Decisionmaker Communicator Manager Life-long-learner Teacher Leader Researcher Entrepreneur	Care Providers Communicators Collaborators Leaders and Managers Health Advocates Scholars Professionals	Learner Caregiver Manager Promoter Provider Problem Solver Educator Advocate Includer Communicator Self-aware Leader Innovator Professional

2.5. Pharmacy Education in Myanmar

Myanmar, a developing country, is one of the ASEAN countries located in the South-East Asia region, with an area of 680,000 km^2 surrounded by Thailand, Lao PDR, China, India, and Bangladesh (62). For pharmacy education, there are two

universities currently offering undergraduate and post-graduate pharmacy programs, under the Ministry of Health, in Myanmar (22, 23). Currently, in Myanmar, the pharmacy education system is content-based education and career opportunities for pharmacists are especially in the product-oriented area. Therefore, this traditional-based education system should be changed to a competency-based education and outcome-based education system in Myanmar. There is no pharmacy council in Myanmar and the Myanmar Pharmaceutical Association was set up in 2013 and there is no publication and development of the standards for pharmacy competency and curriculum by the association or the Ministry of Health or the Ministry of Education in Myanmar. A Pharmacy Council is essential for creating a robust regulatory framework that supports the profession and ensures the ongoing development of pharmacy education and practice. One of the Council's primary functions would be to establish a pharmacy licensure exam system. This exam would serve as a quality control measure, ensuring that pharmacy graduates meet the necessary standards before entering professional practice. Beyond the licensure exam, the Pharmacy Council would also be responsible for developing policies, guidelines, and laws related to pharmacy education, including the creation of competency standards for graduates. These measures would help align pharmacy education with international standards and ensure that pharmacists in Myanmar are well-prepared to contribute to patient care and public health.

THE OVERVIEW OF PHARMACY EDUCATION

Degree and programs

Historically, a two-year diploma course, Diploma in Paramedical sciences, (D.P.M.S.) was initially established as pharmacy training in 1964 in the compound of Yangon General Hospitals. This training started with the Department of Pharmacy, organized by the Institute of Paramedical Sciences. However, Pharmacy was separated from the Institute of Paramedical Sciences into the Institute of Pharmacy where a Bachelor of Pharmacy (B. Pharm.) (Bridge course), a 2-year program, started for the one who had finished a 2- year Diploma in Paramedical Sciences course at Tahton Road campus (Former BOC College of Engineering and Mining) in Yangon, in 1992. It was only selected for three batches through the entrance exams and ended in 1998. Then, it was upgraded to a 4-year program, Bachelor of Pharmacy (B. Pharm.) (Regular course), in

1993. The present place of the Institute of Pharmacy Yangon is at Waibargi Myothit in North Okkalapa Township and the name was officially changed from the Institute of Pharmacy to the University of Pharmacy, Yangon in 2005 (23). Another University of Pharmacy was set up on 22nd May 2000 with the name of the Institute of Pharmacy, at Ba Htoo hostel on the campus of the Institute of Medicine Mandalay. The institute was moved to the former Mental Hospital on 35th Street between 65th and 66th streets on 25th June 2000. On 4th May 2004, it finally came to its present place, on the Htone Bo-Myitnge two-way road near Taw-twin village, Amarapura Township, Mandalay Division. Myanmar. The name was officially changed to the University of Pharmacy, Mandalay in 2006 (22).

In the past, there were about 50 students graduating from each university per year. Currently, the average class size at each university is approximately 130 students per year. Female students are normally more than males at every admission. In Myanmar, two pharmacy universities produce about 200–260 pharmacists annually. The data from the two Universities of Pharmacy showed that the cumulative pharmacy graduates is about 4,222 pharmacy graduates till July 2023 (63). In both universities, a Master of Pharmacy (M. Pharm.), a 2-year program, was initiated in 2003 and the selected students per year were about 15-20 students in each school, so the total number of students is around 165 (64). A 3-year Doctor of Philosophy (Ph.D.) program was started in 2014 and the selected students were about 5-7 students per year. For both schools, the total number of students is around 21(64). The continuum of pharmacy education programs in Myanmar can be seen in Figure 6**.**

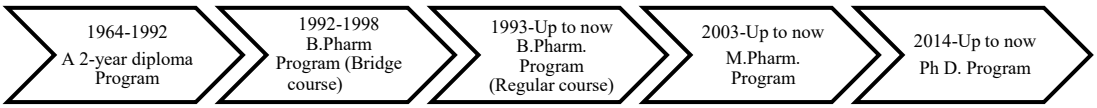

Figure 6. Continuum of pharmacy programs in Myanmar

Admission requirements

A 2-year Diploma in Paramedical Sciences degree is obtained if a person had a Bachelor of Sciences (B.Sc.) and has passed the entrance examination. The admission requirements for a 2-year Bachelor of Pharmacy (Bridge course) were that the one who had a Diploma in Paramedical Sciences passed the entrance examination to attend this course. However, pharmacy students for a 4-year Bachelor of Pharmacy (Regular course) are the ones who must pass the tenth standard of enrollment examination and are selected by a merit system in both universities, but the first and foremost batch of 163 students was selected through a matriculated entrance examination in Mandalay. Phamacy graduates with 1 or 2 year (s) of working experience (s) in the governmental sector can attend a Master of Pharmacy course, but they must also pass the entrance examination and oral examination. The one who has a Master of Pharmacy degree and passes the entrance examination and oral examination of his/her registered subjects can be admitted to a Doctor of Philosophy course.

Curriculum

Currently, in both universities, the subjects of the curriculum are the same. The subjects of the curriculum of the Bachelor of Pharmacy include foundation and professional courses. As shown in Table 5, in the first year, English, Mathematics, Botany, Zoology, Chemistry, Myanmar, Behavioral Science, Anatomy and Biochemistry are taught as foundation subjects as well as Physiology subjects which can be learned in the second year. Other foundation subjects, like Pathology and Microbiology (Pharmaceutical and Medical microbiology) subjects are taught in the third year. However, the foundation subject, Pharmacology, is taught in the second, third and fourth years. There are only professional subjects like Pharmaceutics I and II, Pharmacognosy and Pharmaceutical Chemistry in the second, third and fourth years. The Total Personal and Professional Development (TPPD) Program is also put into the Bachelor of Pharmacy curriculum, where traditional ceremonies, cultural and social activities and special talks are included (65). In the second year, they have an opportunity to learn together with other healthcare professions to obtain professional development.

A four-year undergraduate program in Myanmar consists of field trip training to the pharmaceutical industries, traditional medicine and public hospitals for about three to six weeks in the third year and the final year. The Clinical Pharmacy subject and the Social and Administrative Pharmacy subject are not included in this program.

Reviewing and revision of the undergraduate pharmacy curriculum was done in 2011-2012 and microbiology (combined medical microbiology and pharmaceutical microbiology) was added to the third-year course. They became separate subjects, medical microbiology subject and pharmaceutical microbiology subject, in 2016. Reviewing and revision were also conducted to be a specialized master's program. The course for a Master of Pharmacy first started with a general course and in the first year of the Master of Pharmacy program, Pharmaceutics, Pharmacognosy, Pharmaceutical Chemistry and Pharmacology are taught. Thesis will be submitted in the second year of the Master of Pharmacy program. Later, it was changed into specialized subject areas like Pharmaceutics, Pharmacognosy, Pharmaceutical Chemistry, and Clinical Pharmacy for the Master of Pharmacy program in 2018. There are research degree courses in the Doctor of Philosophy program and specialized subjects like Pharmaceutics, Pharmacognosy, Pharmaceutical Chemistry, and Clinical Pharmacy can be chosen in this program (66, 67). There are no specialized subjects for Master of Pharmacy and Doctor of Pharmacy in Social and Administrative Pharmacy.

The study sites of Pharmaceutics, Pharmaognosy and Pharmaceutical Chemistry subjects for field visit training of Master of Pharmacy students are Central Research Center of Pharmaceuticals and Food, Food and Drug Administrations (FDA), Department of Medical Research, Myanmar Pharmaceutical Factories (MPF), Fame Pharmaceutical Industries and Pharmaceutical Factory, Pyin Oo Lwin and Sagaing. The study sites of clinical pharmacy for field visit training of Master of Pharmacy students are the Department of Medical Research, National Poison Control Center, hospitals and central drug stores.

The study sites for Pharmacognosy, Pharmaceutics and Pharmaceutical Chemistry subjects for the Doctor of Philosophy students conducting research are the Pharmaceutical Industry, Department of Medical Research, Food and Drug Administrations (FDA) and Central Research Center for Pharmaceuticals and Food.

Those for the Clinical Pharmacy are the Department of Medical Research, National Poison Control Center, hospitals and central drug stores.

The research areas of the (Ph.D.) program for Pharmacognosy are phytochemistry of medicinal plants and herbal medicine. Those for Pharmaceutics are cosmeticology, self-medication in the community, pharmaceutical technologies, and formulation of natural and pharmaceutical products. Those for Pharmaceutical Chemistry are physicochemical properties. Those for Clinical Pharmacy are pharmaceutical care, pharmacological and toxicological studies and clinical pharmacokinetics and Bio pharmaceutics (65-67).

Table 5. Subjects in each program of pharmacy schools in Myanmar

Degree	**Years**	**Course title**	**Teaching hours**
Bachelor of Pharmacy (B.Pharm.)	First year	English, Mathematics, Botany, Zoology, Chemistry, Myanmar, Behavioral Science, Anatomy, Biochemistry	160 56 126 126 234 90 44 96 147
	Second year	Physiology Pharmaceutics, Pharmacognosy, Pharmaceutical Chemistry, Pharmacology	132 276 166 151 120
	Third year	Pharmaceutics, Pharmaceutical microbiology, Pharmacognosy, Pharmaceutical Chemistry, Pharmacology, Medical microbiology, Pathology	180 76 169 212 200 100 136
	Fourth year	Pharmaceutics (I), Pharmaceutics (II), Pharmacognosy, Pharmaceutical Chemistry, Pharmacology	220 220 190 287 200
M.Pharm.(Pharmaceutics)	2 years	Master of Pharmacy in Pharmaceutics	
M.Pharm.(Pharmacognosy)	2 years	Master of Pharmacy in Pharmacognosy	

Degree	Years	Course title	Teaching hours
M.Pharm.(Pharmaceutical Chemistry)	2 years	Master of Pharmacy in Pharmaceutical Chemistry	
M.Pharm.(Clinical Pharmacy)	2 or 3 years	Master of Pharmacy in Clinical Pharmacy	
Ph.D.(Pharmaceutics)	3 years	Doctor of Philosophy in Pharmaceutics	
Ph.D.(Pharmacognosy)	3 years	Doctor of Philosophy in Pharmacognosy	
Ph.D.(Pharmaceutical Chemistry)	3 years	Doctor of Philosophy in Pharmaceutical Chemistry	
Ph.D.(Clinical Pharmacy)	3 years	Doctor of Philosophy in Clinical Pharmacy	

The field visit areas for pharmacy students and research areas for post-graduate students are Food and Drug Administrations (FDA), Myanmar Pharmaceutical Factories (MPF), Department of Medical Research, National Poison Control Center, Central Research Center of Pharmaceuticals and Food, Fame Pharmaceutical Industries, Pharmaceutical Factory, Pyin Oo Lwin and Sagaing. The affiliated hospitals are North Okkalapa General, Insein General Hospital, Thingangyun General Hospital and Health Contents in North Okkalapa for practicing patient-centered pharmaceutical care and 300-bedded teaching hospital and central drug stores. The research areas they conduct in Myanmar are phytochemistry of medicinal plants, formulation of natural and pharmaceutical products, physicochemical properties, pharmaceutical care, cosmeticology, pharmacological and toxicological studies, self-medication in the community, pharmaceutical technologies and clinical pharmacokinetics and Bio pharmaceutics (65, 68, 69).

The Union Minister, the Ministry of Health, attended a meeting to coordinate the course schedule and curriculum for those who passed the university entrance examination under the new education system, KG+ 12 (KG+, a 4-year-primary school, a 4-year middle school and a 4-year-high school) at medical universities and medical related universities including Universities of Pharmacy on 28th May 2024. The old education system was KG+ 10 (KG+, a 4-year primary school, a 4-year middle school and a 2-year high school). The Union Minister, the Ministry of Health instructed the duration of the course and the curriculum to be taught that needs to be

in line with what is being taught in ASEAN countries and international standards. The training period is set based on the needs of the country. Focusing on ensuring the quality of human resources is for the needs of the Ministry of Health. It is necessary to consider not burdening the parents. Reviewing and revising the curriculum for all universities under the Ministry of Health will continue to be set up in time (70).

System of Pharmacy Schools in Myanmar

Pharmacy schools in Myanmar are currently regulated by the Ministry of Health (62). The key institutions offering pharmacy programs include the University of Yangon and the University of Mandalay. Both universities are publicly funded. Moreover, the accreditation of pharmacy schools is one of the requirements in Myanmar.

A few prospective pharmacists have an opportunity to go overseas and pursue a post-graduate, Master of Pharmacy degree or Doctor of Philosophy in Pharmacy degree through government permission of a scholarship program as well as their own budgets. Pharmacists who are working in the public sector (governmental sector) have an opportunity to attend post-graduate programs. However, pharmacists in the private sector do not have an opportunity to attend post-graduate programs. Currently, the Myanmar pharmacy undergraduate curriculum is exposed to the 4-year (B.Pharm.) program. The professional subjects are more focused on product-oriented curriculum. There is also a content-based education system in Myanmar and career opportunities for pharmacists are especially in the product-oriented area (27). Currently, the Ministry of Health permits us to conduct research development of competency standards and new curriculum and has already accepted an ethical approval letter and the reference number is UPH-IRB (2022/Research/10). The Naypyitaw State Academy (NSA) project is being implemented in Naypyidaw, Myanmar. The government hoped that not only the Naypyitaw but Yangon and Mandalay Universities should be top of the nation as well as involved in the list of the world's best universities. The currently selected subjects to be opened are arts and sciences, economics, law, social, sports and medical subjects (71). However, it is needed to open a pharmacy school according to this (NSA) project, because of shortages of pharmacists in the working areas.

Career opportunities and workforce of pharmacy graduates

In Myanmar, pharmacy students who graduated from two Universities of Pharmacy work in the area of hospitals, pharmaceutical industries, Food and Drug Administration, traditional medicine, academics, research, pharmaceutical companies, drug stores, Non-Government Organization, International Non-Government Organization (INGO) and others. There were 605 pharmacists working in public settings according to the government database in 2020. They are employed not only in the governmental sector but also in the private sector. Most pharmacy graduates serve under the Ministry of Health, followed by the Ministry of Industries (27). Currently, there are six departments in the Ministry of Health, and they are the Department of Public Health; Department of Medical Services; Department of Human Resources for Health; Department of Medical Research; Department of Traditional Medicines and Department of Food and Drug Administration (62). The salaries of pharmacists, pharmaceutical scientists, and pharmacy and pharmaceutical technicians assigned to the public sector are less than those in the private sector. The estimated Myanmar pharmacist density is 0.51– 0.73 pharmacists per 10,000 population(27). The limited numbers admitted and selected to postgraduate pharmacy programs (68, 69). Moreover, the number of pharmacists in the workforce, like other healthcare professionals, has surely been reduced because of the political crisis between 2021 and 2022 and some of them took part in the Civil Disobedient Movement (CDM).

2.6. Delphi method

The Delphi technique, mainly developed by Dalkey and Helmer (1963) at the Rand Corporation in the 1950s, is a widely used and accepted method for achieving convergence of opinion concerning real-world knowledge solicited from experts within certain topic areas (72). Delphi studies have been helpful in developing guidelines and standards for educational settings, and in predicting trends. Judd (1972) lists five main applications of Delphi methods in higher education: (a) cost-effectiveness, (b) cost-benefit analysis, (c) curriculum and campus planning, (d) university-wide basic goals and objectives and (e) generalized futuristic educational goals and objectives. The Delphi Technique can be useful in developing curricula and learning experiences to help students prepare for their future careers (73). Delphi

technology has been and will continue to be an important data collection method with a wide range of applications and uses for those who wish to collect information from those immersed in a subject of interest and can provide real-time and real-world knowledge (72).

CHAPTER 3
METHODOLOGY

This study was conducted in two phases. In Phase one, it aimed to develop a competency standard for pharmacy graduates in Myanmar. In Phase two, there was an evaluation of the current pharmacy curricula towards the competency standards of pharmacy graduates obtained from Phase one. The findings from Phase two were to propose the revisions of pharmacy curricula in Myanmar. The process of the study was shown in Figure 7. Methodology, objectives and types of stakeholders for two phases were shown in Figure 8**.** The details of each phase were presented as follows.

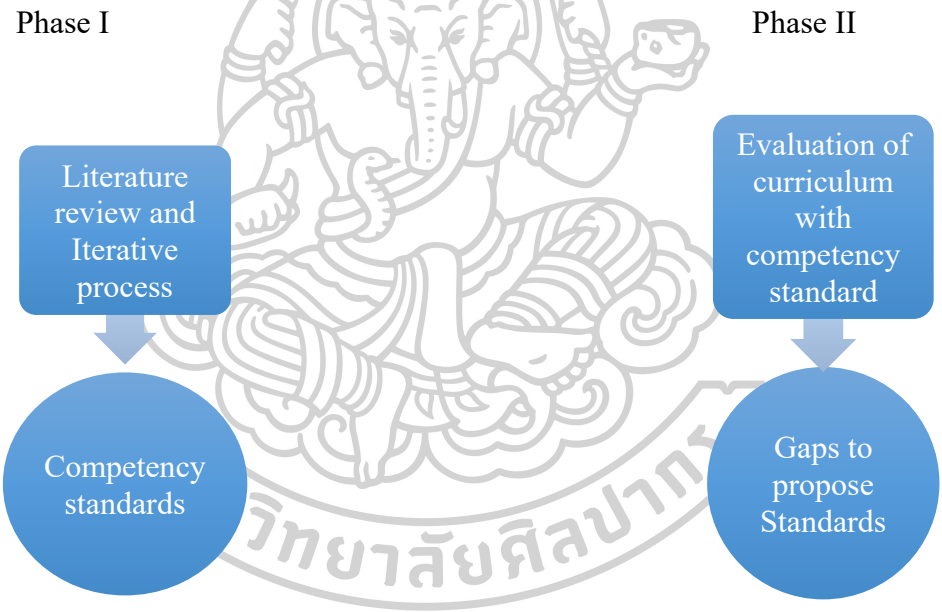

Figure 7. Process of the study

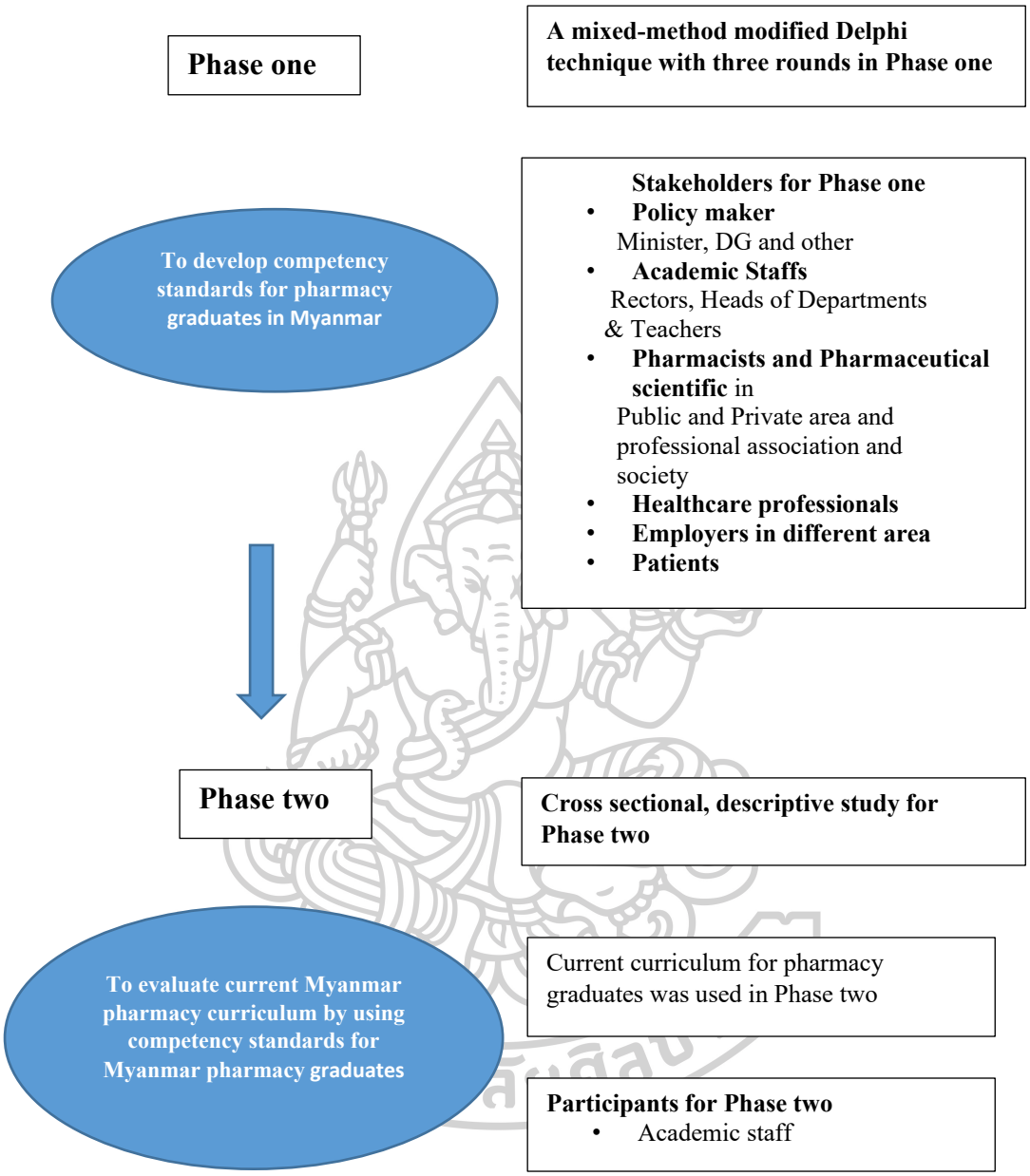

Figure 8. Methodology, objectives and types of stakeholders for Phase one and Phase two

3.1. Phase one: Development of competency standards for pharmacy graduates in Myanmar

3.1.1. Study design

A mixed-method modified Delphi technique approach with three rounds (74-76) was conducted in which stakeholders reached a structured consensus on the development of competency standards for pharmacy graduates in Myanmar. Moreover, the competency statements from the literature were applied. A mixed method was used in this Delphi technique because the qualitative method was done to analyse data in the first round and both quantitative and qualitative data analysis were used in the second round and the third round.

3.1.2. Study Areas

Study areas were described as follows. All stakeholders who were working in the following areas were selected. They were chosen because pharmacists and pharmaceutical scientists are working. Moreover, in these places, other stakeholders were related or incorporated with them into their work.

(I) Government sectors (public areas)

(a) Department of Public Health under the Ministry of Health
(b) Department of Medical Services under the Ministry of Health
(c) Department of Human Resources for Health under the Ministry of Health
(d) Department of Medical Research under the Ministry of Health
(e) Department of Traditional Medicines under the Ministry of Health
(f) Department of Food and Drug Administration under the Ministry of Health
(g) University of Pharmacy Yangon under the Department of Human Resources for Health
(h) University of Pharmacy Mandalay under the Department of Human Resources for Health
(i) Public hospitals under Department of Medical Services
(j) Central medical drug stores Department of Medical Services
(k) Pharmaceutical Industries under Ministry of Industries

(II) Non-government sectors (private areas)

(a) Private hospitals

(b) Pharmaceutical Industries

(c) Natural product factories

(d) Pharmaceutical companies

(e) Drug shops/drug stores in rural and urban areas

(f) International government and non-government organization

(g) Myanmar Pharmaceutical Association

(h) Society of Myanmar Pharmacists

3.1.3. Study period

The study period for Phase one was January 2023 to December 2023.

3.1.4. Population

The population of this phase was stakeholders in both public and private organizations and areas. Stakeholders were classified according to their roles, including policymakers, academic staff, pharmacists and pharmaceutical scientists, employers, healthcare professionals and patients. It was also described the reason why these stakeholders were selected as follows.

(1) Policymakers were in the Ministry of Health, who had, or still have roles, in the development of pharmacy education, and standard guidelines in the Ministry of Health. They were selected because they are leaders and policymakers, and they have a role in launching and implementing the standards.

(2) Academic staff from the Universities of Pharmacy Yangon and the Universities of Pharmacy Mandalay, who have a current role in pharmacy education development, were invited. Academic members have responsibilities in terms of the quality of education and the value of investment in higher education for students and families. They could apply guidelines or standards endorsed by the government and also be responsible for taking part in and participating in the development of educational guidelines or standards so they could be delivered to competent

pharmacists to provide services meeting the needs of final users and customers.

(3) Advanced and/or expert-level pharmacists and pharmaceutical scientists working in different areas of the public were invited. They are alumni and work in the governmental sectors for the public and learning outcomes of pharmacy schools. They provide services to meet the needs of the public, patients and other healthcare providers.

(4) Advanced and/or expert-level pharmacists and Pharmaceutical Scientists working in the different private areas were invited from their working area. They are alumni and work in the non-government sectors (private areas) and learning outcomes of pharmacy schools. They provide services to meet the needs of the public, patients and other healthcare providers.

(5) Representatives of the Society of Myanmar pharmacists and the Myanmar Pharmaceutical association were asked. The members of the organization have to participate in the development of pharmacists and pharmaceutical scientists and professional development by providing continuing pharmacy and pharmaceutical education, a pharmacy conference and forum, which will assist with the registration of pharmacists and licensure examination. Moreover, they can determine the needs of pharmaceutical scientists, pharmacists and their services.

(6) Healthcare professionals who relate to and cooperate with the pharmacy profession. They collaborate with pharmacists and pharmaceutical scientists and are able to determine the competencies required to deliver services that meet the needs of patients, the public as well as what they want from pharmacy graduates.

(7) Owner/employer in public and private areas. They are the users of human resources who graduated from the Universities of Pharmacy. They can determine the required competencies to

deliver services that meet the needs of patients, public and healthcare providers, as well as what they want from pharmacy graduates.

(8) Patients who have experienced visiting (hospitals or to drug stores in urban and rural areas where pharmacists provide services) were asked. They are customers and are able to determine what is required to deliver services that meet their needs.

3.1.5. Selection Criteria

Inclusion criteria

The inclusion criteria of stakeholders are currently advanced or expert level in their working area. However, the inclusion criteria for patients are (a) An .adult (age ≥18 years old) who has experienced visiting a hospital (private and public hospital) or (b) who buys drugs at a drug store or shop in a rural or urban area.

Exclusion criteria

1. Stakeholders who reject participating in the study,
2 Patients who are suffering paralysis, unconscious and mental disorders and who are in the Intensive Care Unit.
3 Patients who are illiterate.

3.1.6. Sample Size and Sampling method

3.1.6.1. Sample sizes

Samples in this phase were 48 stakeholders (60, 62). The key informants of stakeholders were categorized according to practice settings. The stakeholder groups were three policymakers; eight academic staff members; 18 from pharmacists and pharmaceutical scientists working in the public areas; in the private areas, the Myanmar Pharmaceutical Association and the Society of Myanmar Pharmacists; four other healthcare professionals; eleven owners/employees working in the public and private areas and four of patients from (private and public hospitals and clinic in rural area and/ or urban area). The number and characteristics of stakeholder groups were described and it was shown in Table 6.

Table 6. Characteristic of selected stakeholders groups (policymakers, academic staff, pharmacist and pharmaceutical scientists, owners/employers/healthcare professionals and patients

Characteristic of stakeholders	**Policymakers**	**Academic staff**	**Pharmacists and pharmaceutical scientists**	**Owners/ employers**	**Healthcare professionals**	**Patients**
Number of stakeholders	**3**	**8**	**18**	**11**	**4**	**4**
Selected areas of stakeholders	1- Department of Human Resources for Health, Ministry of Health; 1- Department of Traditional Medicines, Ministry of Health; 1- Department of Medical Sciences, Ministry of Health.	4- University of Pharmacy, Yangon, 1- Head of the Pharmaceutics Department; 1- Representative of the rector, (pro-rector); 1- Head of the Pharmaceutical Chemistry Department; 1- Head of the Pharmacognoy Department. 4- University of Pharmacy, Mandalay, 1- Rector; 1- Head of Pharmaceutics	7- Government sector (public areas), 1- FDA department; 1- Department of Traditional Medicines; 1- Research Department; 1- Pharmaceutical Industry; 1- Central Medical Drug Stores; 1- Myanmar Pharmaceutical Factory in Kyaukse; 1- Yangon General Hospital (2000-bedded hospital) 1- Children's Hospital in Mandalay (500-	1-FDA Department; 1- Department of Human Resources for Health; 1- Department of Traditional Medicines 1- Central Medical Drug Stores; 1- Myanmar Pharmaceutical Factory(Insein); 1- Nay Pyi Taw General Hospital (1000 -bedded	1-Children's Hospital in Mandalay (500-bedded hospital). 1- Clinic in Mawlamyine, 1-The Yangon Eye, Ear, Nose and Throad Hospital 1- Department of Traditional Medicines	1- Private hospital in Mandalay, 1-Clinic in the rural area (in Kyaukkyi), 1-Private hospital in Yangon, 1-Drug shop in Nay Pyi Daw.

Characteristic of stakeholders	Policymakers	Academic staff	Pharmacists and pharmaceutical scientists	Owners/ employers	Healthcare professionals	Patients
		Department; 1- Academic staff in SAP area; 1- Academic staff in clinical area	bedded hospital). 11- non-government sectors (private area) 1-Pharmaceutical Factory Yangon); 1-Fame Pharmaceutical Factory (Herbal and Natural Plant Products; 1-INGO in Sittwe; 1-50-bedded hospital in Yangon; 1-Pharmaceutical Company in Mandalay; 1-Clinic in Yangon 1-Drug shop in Mandalay. 2-The Myanmar Pharmaceutical Association 2- The Society of Myanmar Pharmacists	hospital). 1- Pharmaceutical Factory (Pyin Oo Lwin; 1-Fame Pharmaceutical Factory (Herbal and Natural Plant Products; 1. INGO in Yangon; 1- Private hospital in Yangon 1-Chain Pharmacy, Mandalay.		

Characteristic of stakeholders	Policymakers	Academic staff	Pharmacists and pharmaceutical scientists	Owners/ employers	Healthcare professionals	Patients
Age group (Mean = 44.35, SD= 11.07, Range =22- 69) Young people (20-39) Mid-adult (40-59) Older Adult (60-75)	Min: 54 Max: 60 Mean± SD: 56.67±3.055 2-Mid-adult (40-59) 1-Older adult (60–75)	Min: 38 Max: 61 Mean± SD: 48.75 ±8.137 1-Young people (20-39) 5-Mid-adult (40-59) 2-Older adult (60–75)	Min: 26 Max: 69 Mean± SD: 37.5±9.925 respectively. 12-Young people (20-39) 5- Mid-adult (40-59) 1-Older adult (60–75)	Min: 34 Max: 62 Mean± SD: 50.27±8.765 1-Young people (20-39) 9- Mid-adult (40-59) 1-Older adult (60–75)	Min: 35 Max: 56 Mean± SD: 43.7±9.142 2-Young people (20-39) 2- Mid-adult (40-59)	Min: 22 Max: 57 Mean± SD: 41.5±15.416 2-Young people (20-39) 2- Mid-adult (40-59)
Gender Male Female	2-Male 1-Female	1-Male 7-Female	3-Male 15-Female	5-Male 6-Female	2-Male 2-Female	1-Male 3-Female
Education High school Graduate Master PhD	2-Master 1-PhD	8-PhD	4-Graduate 10-Master 4-PhD	2-Graduate 7-Master 2-PhD	1-Graduate 3-Master	1-High school 2-Graduate 1-Master
Position No level Low management level Mid management level High management level	3-High management Level	4-Mid-management level 4-High management level.	13-Low managing level 4-Mid-management level 1-High management level.	3.Mid-management level 8-High management level	1-Low managing Level 2-Mid management level 1-High management level.	2-No Level 1-Low management level 1-Mid management level

Characteristic of stakeholders	Policymakers	Academic staff	Pharmacists and pharmaceutical scientists	Owners/ employers	Healthcare professionals	Patients
Working places Private Public	3-Public	8-Public	11-Private 7-Public	5-Private 6-Public	2-Private 2-Public	2-Private 2-Public
Working areas Hospitals/Clinic Community/INGO/NGO Regulations Industry/company Government Academic Research Other	3-Government	8-Academic	4-Hospitals/Clinic 6-Community/INGO/ NGO 3-Regulations 3-Pharmaceutical Industry/company 1-Research 1-Other(editor)	4-Hospitals/Clinic 1-Community /INGO/ NGO 1-Regulations 2-Pharmaceutical Industry/ Company 2-Government 1-Research	3-Hospitals/Clinic 1-Research	1-Government 1- Academic 2-Other (house wife and student)
Working Experiences group (Mean =18.71, SD=9.5, Range= 0-36) (1-4) Years (5-10) Years (11-15) Years (16-20) Years (21-25) Years More than 25 Years	Min: 27 Max: 34 Mean± SD: 30±3.606 3-More than 25 years	Min: 13 Max: 36 Mean± SD: 23.5±8.071 3-(16-20) years 3-(21-25) years 2-More than 25 Years	Min: 5 Max: 35 Mean± SD: 13.33±7.654 8-(6-10) years 4-(11-15) years 5-(16-20) years 1-(21-25) years	Min: 11 Max: 32 Mean± SD: 23±6.841 1-(11-15) years 1-(16-20)years 5-(21-25)years 4- more than 25 years	Min: 11 Max: 27 Mean± SD: 18.25±6.89 2-(11-15)years, 1-(16-20)years 1-more than 25 years	Min: 0 Max: 34 Mean± SD: 13.5 ±16.60 2-(0) year 1-(16-20) years 1-more than 25-years

Characteristic of stakeholders	Policymakers	Academic staff	Pharmacists and pharmaceutical scientists	Owners/ employers	Healthcare professionals	Patients
Competency of stakeholders No Level General level Advanced level one Advanced level two Expert/consultant	2-Advanced level one 1-Expert level	8-Expert level	1-General level 7-Advanced level one; 6-Advanced level two 4-Expert level	2-Advanced level one 2-Advanced level Two 7-Expert level	1-Advanced level one 3-Advanced level two	2-no competency level 1-Advanced level one 1-Advanced level two.

3.1.6.2. Sampling methods

The sampling method for policymakers, owners/employers, pharmacists and pharmaceutical scientists, academic staff members (rectors and heads of departments, teachers), and healthcare professionals was purposive sampling and patients were selected by convenience sampling.

In the first round, each of the stakeholders from all key informants was invited and asked individually according to the appointment dates. In the second and third round, a self-administered questionnaire was directly sent to each key informant.

3.1.7. Procedure, Data collection and Analysis

All stakeholders were invited via email or messenger or mobile phone at least two weeks or one month prior to the interview dates and next round survey. We met in a convenient, comfortable, silent place or the place they prefer or via online for their participation. On the other hand, the patients (at hospitals or in the urban and rural areas) where pharmacists were providing services were asked for their participation in the actual interview dates and next round of surveys.

The stakeholder's decision to participate in the study was entirely voluntary. They must not be coerced or influenced in any way before the informed consent process can begin. The potential participant must be deemed capable of his or her actions and making a reasonable decision. A person voluntarily agrees to participate in a research study after being fully informed about it via verbal discussion with the principal investigator, followed by documentation in a written, signed, and dated informed consent form. A participant's consent was continually sought during the course of the study, and the participant was notified of any changes to the study, along with any other pertinent information that may influence their decision to remain in the study. The informed consent form for Phase one was attached in Appendix 1**.**

(i) The first round

The first round was to obtain the stakeholders' opinions on the needs of competency of pharmacy graduates. The needs obtained from stakeholders were combined with the literature reviews. Then, validation of the obtained competency statements constructed a first version of competency standards.

Data collection tool and validation:

The questionnaire was composed of 2 parts; demographic data and a semi-structured questionnaire with open-ended questions. Background information like demographic data of stakeholders were included, which were age, gender, education, public or private, working areas, position, and working experience. A semi-structured questionnaire with open-ended questions was used as a data collection tool to survey stakeholders' opinion on the needed (the roles, functions and activities) and competencies of pharmacy graduates. There were five main questions to ask stakeholders' opinion.

The open-ended questions in the questionnaire for pharmacists and pharmaceutical scientists are described as follows.

1. What are (the roles, functions and activities) of pharmacy graduates needed in your practice setting?
2. What are the important knowledges that pharmacy graduates should have to work in your setting?
3. What are the important skills that pharmacy graduates should have to work in your setting?
4. What are the important attitudes that pharmacy graduates should have to work in your setting?
5. What are the important performance/behaviours that pharmacy graduates should have to work in your setting?

For academic staff, the phrase "in your setting" was changed to "when they graduate" in all questions. For health care professionals, policymakers, employers and patients, the phrase "in your setting" or "when they graduate" was changed to "in their working area" in all questions.

The content validity of the semi-structure questionnaire was conducted by five experts. An Item-Objective Congruence Index (IOC) test was performed. The IOC points out calculations provided by three scales of rating for consistency and congruencies of the items. Experts have to choose only one answer as the given mark from these three alternatives of choices:

+1 = Congruent with clear understanding,

0 = Uncertain or not sure whether item is related to the study,

-1 = Not Understand or not congruent or related to this study.

The questionnaire was sent to seven experts to provide three scales of rating for consistency and congruencies of the item. The suggestions and comments were asked by those experts. The results of questions over 0.5 were used and, according to the suggestions and comments of experts, the questionnaire was revised. The results of questions below 0.5 were rejected. The questionnaire for the first round (Phase one) was in Appendix 2.

Data collection method

For the first round, 48 stakeholders were invited to participate in this study. The developed semi-structured questionnaire including open-ended questions was used as a guide for the researcher. The interview guide was attached to Appendix 3. Stakeholders were asked individually by a face-to-face interview method. However, if a stakeholder would like to answer online, an online interview method was used. The informed consent form was provided before interviewing. The interview lasted between 45–60 minutes. Demographic and data of stakeholders' opinions were collected during the interview. All interviews were audio recorded, transcribed non-verbatim and translated into English. The opinions of stakeholders were interviewed in order to deeply understand the competency needed for pharmacy graduates who assisted in the development of competency standards.

Data analysis

Thematic analysis was used to conclude the competencies of pharmacy graduates (64, 65). A draft competency standards was constructed from a combination of stakeholders' opinions and literature review. After that, the validation of statements in competency standards of the draft version was conducted and the first version was obtained.

Data triangulation

For the data triangulation, a methodological triangulation method was used in this study where the same or similar statements were obtained from the finding of interview data and a literature review were drawn. Then validation was carried out asking the opinion of internal and external experts (77).

The literature review used in the data triangulation for the needs of roles, functions and activities was WHO 1993 (59), Faculty of Pharmacy, AIMST University in Malaysia 2015 (60), AFPC in Canada 2017 (48)and AACP in the USA 2013 (61).

The literature review used in data triangulation for the importance of competencies (knowledge, skills, attitude and performance) was the standard containing competencies for pharmacy students in Thailand 2002 & 2008 (12, 20), Lebanon 2020 & 2021 (50, 78), Europe, 2015 & 2016 (47, 79) and Malaysia, 2018 (49). In addition, the framework or standard of educational or learning outcomes for pharmacy students of the USA, 2013 & 2016 (45, 61) , Great Britain 2011(44), Australia, 2015 (46), Canada 2017 (48) and Singapore 2018 (32) were included.

(ii) The second round

In this round, ranking the agreement or disagreement data and comments and suggestions on the first version competency standard were asked from the same stakeholders. After receiving their responses, the second version was obtained.

Data collection tool and validation:

A questionnaire for the second round was developed according to the first version of competency standards. The questionnaire is composed of 2 parts; demographic data and rating of competency statements (a five-point Likert scale). Demographic data of stakeholders was included, which are age, gender, education, working areas, position, and working experience. The other part was competency statements, which can be rated agreement or disagreement on a five- point Likert scale (66). There is a 5-linkert scale as follows.

1. represents “strongly disagree”
2. represents “disagree”
3. represents “neutral”
4. represents “agree”
5. represents “strongly agree”

In addition, the questionnaires were validated. The content validity was done by five experts where the Item-Objective Congruence Index (IOC) test was performed. The IOC points out calculations provided by three scales of rating for consistency and

congruencies of the items. Each expert has to choose only one answer as the given mark from these three alternatives of choices:

+1 = Congruent with clear understanding,

0 = Uncertain or not sure whether the item is related to the study,

-1 = Not Understand or not congruent or related to this study.

The questionnaire was sent to seven experts to provide three scales of rating for consistency and congruencies of the item. The suggestions and comments were asked by those experts. The results of questions over 0.5 were used and, according to the suggestions and comments of experts, the questionnaire was revised. The results of questions below 0.5 were rejected. The questionnaire for the second round (Phase one) was shown in Appendix 2.

Data collection method

Stakeholders in the second round were contacted by mobile phone or letter or via email. Moreover, the researcher met directly some stakeholders to invite their participation. They were informed of the aim of the study and the procedures for the second round. The self-administered questionnaire was used as a data collection tool and the data collection method a questionnaire survey. This questionnaire was sent to each of the stakeholders via email or messenger. In addition, the principal investigator sent it directly to each of some stakeholders by herself. The inform consent form was provided. Stakeholders were asked to rate the agreement of each competency statement on a 5-point Likert scale and provide suggestions and comments or feedback for each competency statement. It took about 45 minutes to one hour. The results of rating data and comments and suggestions were gathered from stakeholders. Variables and operational definitions and scales of measurements of the second round are shown in Appendix 4**.**

Data analysis and statistics

The results of rating data and comments and suggestions were analysed. Descriptive statistics were calculated to present the mean score, standard deviation and percentage of each competency statement. The competency statements which were rated as “agree” (4) or “strongly agree” (5) at least 70%, were included in the revision version of the competency standard (66). In addition, based on the feedback,

suggestions and comments, the revision of competency statements was conducted. The second version of competency standards was developed for the next round.

(iii) The third round

Revision of the judgment on the second version of competency statements with stakeholders was done in this round. It leads to the production of the final competency standards.

Data collection tool and validation:

Delphi panelists received a self-administered questionnaire that included the items and ratings summarized by the investigators in the second round and were asked to revise their judgments. A self-administered questionnaire was developed according to the second version of competency standards. This questionnaire is composed of 2 parts; demographic data and asking judgement, suggestion and comments on competency statements obtained from data summarized by the investigators in the second round. Demographic data of stakeholders was included, which are age, gender, education, working areas, position, and working experience. The other part was asked to revise summarized competency statements obtained from the second round and to provide suggestions and comments on each statement. In addition, the questionnaires were validated. The content validity was done by five experts where the Item-Objective Congruence Index (IOC) test was performed. The IOC points out calculations provided by three scales of rating for consistency and congruencies of the items. Experts had to choose only one answer as the given mark from these three alternatives of choices:

+1 = Congruent with clear understanding,

0 = Uncertain or not sure whether the item is related to the study,

-1 = Not Understand or not congruent or related to this study.

The questionarie was sent to seven experts to provide three scales of rating for consistency and congruencies of the item. The suggestions and comments were asked from those experts. The results of questions over 0.5 were used and, according to the suggestions and comments of experts, the questionnaire was revised. The results of questions below 0.5 were rejected. The questionnaire for the third round (Phase one) was shown in Appendix 2**.**

Data collection method

Stakeholders in the second round were contacted by mobile phone or letter or via email. Moreover, the principal investigator met directly with some stakeholders to invite their participation. They were informed of the aim of the study and the procedures for the third round. The self-administered questionnaire was used as a data collection tool and the data collection method was a questionnaire survey. This questionnaire was sent to each of the stakeholders via email or messenger. In addition, the principal investigator sent it directly to each of some stakeholders by herself. The informed consent form was provided. Stakeholders were asked to edit or reword each statement they felt needed revision and to provide additional information as appropriate. Stakeholders were asked to provide comments or feedback and suggestions for each competency statement. It also took about 45 minutes to one hour. The results of revision, suggestions and comments from the stakeholders were collected. Variables and operational definitions and scales of measurement of the third round are shown in Appendix 5.

Data analysis

Based on the feedback, suggestions and comments, the revision of competency statements was conducted. Then agreements of stakeholders was also asked by the stakeholders in Myanmar. The data gathered from stakeholders was analysed. The final version of competency standards was developed.

3.2. Phase two: Evaluation of current curriculum towards the proposed standards of pharmacy graduates

3.2.1. Study design

Phase two was a descriptive and cross-sectional study. The current curriculum of the University of Pharmacy in Myanmar was determined by comparing it with competency standards obtained from Phase one. A self-administered questionnaire was provided to the academic staff (teachers, heads of all departments and rectors) from the University of Pharmacy, Yangon and University of Pharmacy, Mandalay.

3.2.2. Scope of the study

This phase scoped the study areas were two Universities of Pharmacy in Myanmar, which are:

1. University of Pharmacy, Yangon

2. University of Pharmacy, Mandalay.

3.2.3. Study period

The study period for Phase two was January 2024 to December 2024.

3.2.4. Population

The population in this phase was curriculum at the University of Pharmacy in Yangon and University of Pharmacy Mandalay. However, all subjects taught on the curriculum of the universities were collected by reviewing documents and asking from the academic staff (heads of departments for required courses and teachers) at the University of Pharmacy (Yangon) and University of Pharmacy (Mandalay).

The reason why heads of departments were selected is that not only do they know the curriculum of their subjects, but they also teach their subjects in the curriculum. Teaching staff were selected because they teach their subjects in the curriculum.

3.2.5. Sampling and sample size

Curriculum of pharmacy graduates was asked officially at the University of Pharmacy (Yangon) and the University of Pharmacy (Mandalay). All academic staff who teach the subjects in the curriculum of the University of Pharmacy Yangon and Mandalay were asked to participate in this study. All the Head of Departments and all teachers of all subject at the University of Pharmacy Yangon and in the University of Pharmacy Mandalay were selected. There were eighty academic staff, including heads of departments and teachers of all subjects, who participated in this study.

3.2.6. Procedure

Questionnaire development

The questionnaire was developed as a tool for this phase. The questionnaire is composed of a cover letter and instructions. It was developed to collect data from each subject. It included the name of department, subject and total credit / hours. The participants from different departments were asked whether they accomplished competency statements for each subject. They were asked about teaching methods, teaching hours and assessment methods on the competency statements.

The competencies statements in the questionnaire were obtained from Phase one. Four questions were asked about each competency statement. The four questions were as follows.

1. Do you teach this competency statement in your class? (Yes/No). If yes, please continue to question B to C to D. If no, please skip to ask the next competency statement.
2. How do you teach/learn this competency statement to your students? Please check all teaching methods in your class. (Lecture, Laboratory, Assignment and Others (Please specify).
3. Please specify how long this competency statement has been taught? (min /hours)
4. What assessment method do you use to complete a competency statement for your students? (Please specify) e.g. MCQ/MSQ/viva/ others.

The suggestions and comments on the current curriculum will also be asked.

The questionnaire was tested for the content validity by five experts where the Item-Objective Congruence Index (IOC) test was performed. The IOC points out calculations provided by three scales of rating for consistency and congruencies of the items. Each expert had to choose only one answer as the given mark from these three alternatives of choices:

+1 = Congruent with clear understanding,

0 = Uncertain or not sure whether the item is related to the study,

-1 = Not Understand or not congruent or related to this study.

The questionnaire was sent to seven experts to provide three scales of rating for consistency and congruencies of the item. The suggestions and comments were asked from those experts. The results of questions over 0.5 were used and, according to the suggestions and comments of experts, the questionnaire was revised. The results of questions below 0.5 were rejected. The characteristics of five experts for the IOC test are described as follows. One expert has a degree in the specialized area of Pharmaceutical Sciences, another expert has a degree in the specialized area of Clinical Pharmacy Sciences and one expert has a degree in the specialized area of Social, Administrative and Economic Pharmacy Sciences. Moreover, they have experience in curriculum development. Another one is a health care professional who is a PhD degree holder, and also has national or international experience in curriculum development. The last one is an external expert from another country who has experienced this research topic area. These experts also have 7-10 years or more than 10 years experience in their specialized area.

The pilot study was performed for usability. Ten teachers were used as respondents in the pilot study, where five teachers from the University of Pharmacy, Yangon and five teachers from the University of Pharmacy, Mandalay. The pilot test assesses the clarity of words and content of the cover letter, instructions and questions. The questionnaire was modified based on the feedback from the pilot testing. Variables and operational definitions and scales of measurement for Phase two were attached to Appendix 6**.**

3.2.7. Data collection

The self-administered questionnaire was used as a data collection tool and the data collection method was a questionnaire survey. Academic staff in the two pharmacy schools were officially contacted and requested to participate in the study. In addition, each school and the Department of Human Resources for Health were requested to provide their current curriculum documents. Ten respondents were purposively selected from 80 academic staff, and they were contacted via email or messenger or mobile phone to participate in the pilot study.

Eighty academic staff members were contacted via email, messenger or mobile phone to participate in this study. Eighty academic staff members who teach subjects participated in this study. It included teachers in the pilot study because they were asked in the pilot study for usability. The informed consent and questionnaire were provided to eighty academic staff. It took about 45 minutes to one hour. The informed consent form for Phase two was attached in Appendix 7. There was also attached the questionnaire in Appendix 8. Two to four weeks after the questionnaire was distributed to participants in each school, the researcher visited each school to collect the questionnaire. The researcher reviewed the course content from each course syllabus with teaching hours in the curriculum to determine which competency was met with the competencies of standard and also compared these data to the questionnaire received from the participants. If it was needed, discussion with the heads of departments was done to clarify their responses. The same questionnaire was provided to non-respondents during the site visit. Two weeks later after visiting, the non-respondents were contacted by phone or via mail. A Microsoft Excel was used to summarize the data collected from participants of each course at pharmacy schools.

Data entry was checked by the second person, who is another researcher, for data entry accuracy.

3.2.8. Data analysis and statistics

The collected data was analyzed to determine which competency statement was met by subjects. From the questionnaire, the time of each competency statement was calculated into credit hours units (one credit hour is equivalent to 15 hours). The analysis of the gap data was checked and rechecked by the second person or another researcher. The data was analyzed by SPSS (Version 23). Descriptive statistics including mean, SD, frequency, percentage were calculated for variables and competency coverage. The competency statements which were not taught were proposed as a gap for the pharmacy. The suggestions and comments of participants were analysed. The competency standards and suggested curriculum were proposed.

3.3. Potential ethical issues

This study followed the guidelines of the Institutional Review Board of the University of Public Health, Myanmar and was submitted to this committee. All eligible stakeholders or participants according to the selection criteria for this study have the chance to participate in this study. They were thoroughly explained in detail about the research by the investigator with an information sheet. Only after they had fully understood the nature of the study including aims and objectives, methodology, procedures, duration and benefits, they were invited to take part in the study. If they agree, they obtained the informed consent form written in Myanmar and English. The participation in the research is absolutely voluntary. Food and drink were provided because of the long conversation. The reasonable amount of 10,000 kyats was used for food and drink. The participants have the right to take part in the study and withdraw at any time from the study. The investigator strictly maintained the rules of privacy and confidentiality. No names were mentioned in this study. Only a coded system was used, and research information was kept in a password-protected file on the investigator's personal computer. The facts of the research were kept confidentially and destroyed after three years when the research was done. It was the duty of the investigator to perform the research study according to the objectives, methodology and procedures approved by the Institutional Review Board of the University of Public Health to avoid the suspicion regarding plagiarism and not to be

involved in academic and scientific misconduct. The research data was used and published for academic purposes – dissertation/thesis and papers, in seminars and journals.

CHAPTER 4
RESULTS

This chapter describes the study results of two phases. Phase one was the development of competency standards for pharmacy graduates in Myanmar. Phase two was the evaluation of the pharmacy curriculum in Myanmar towards the proposed standards.

4.1. Phase one: Development of competency standards for pharmacy graduates in Myanmar

4.1.1. Development of competency standards for pharmacy graduates in Myanmar (the first round)

The development of competency standards for pharmacy graduates in Myanmar the first round, was conducted by interviewing the stakeholders' opinions on the needs of roles, functions and activities, and the importance of competencies for pharmacy graduates.

The translated answers of stakeholders for the needs of roles, functions and activities were shown in Appendix 9. The translated answers of stakeholders for the important competencies were shown in Appendix 10.

4.1.1.1. The needs of pharmacists' roles, functions and activities in Myanmar

The needs for seven roles classified by working areas in Myanmar were obtained. The working areas for the needs for seven roles were the Ministry of Health and Departments under the Ministry of Health, hospitals, clinics, community, regulation, NGO & INGO, academic, pharmaceutical industries, alternative medicines and traditional medicine and research areas. They were mentioned in Table 7. In hospital and community areas, all seven roles, like (caregiver, manager, communicator, decision maker, leader, life-long learner and researcher) for pharmacy graduates were needed in Myanmar. In the research department, only the researcher role was needed, as well as in the clinic, the caregiver role was needed.

The needs for roles in the Ministry and Departmental area were manager, decision maker and leader.

The needs for roles in the Ministry of Health and Departments under the Ministry of Health areas, manager, decision maker and leader roles were needed.

In the regulation area, the needs of roles were manager, communicator, decision maker and leader. In the INGO and NGO areas, they were caregiver, manager, communicator, decision maker and leader. In the pharmaceutical industry, the needs were manager, decision maker, leader and researcher, and in the alternative medicines and traditional medicine areas, the needs were caregiver, manager, decision maker, leader and researcher respectively.

Table 7.Needs of pharmacy graduates' roles classified by working areas in Myanmar

Working areas	Care Giver	Manager	Communicator	Decision Maker	Leader	Life-long learner	Researcher
Ministry and Departmental areas		X		X	X		
Hospital	X	X	X	X	X	X	X
Clinic	X						
Community	X	X	X	X	X	X	X
Regulation		X	X	X	X		
NGO &INGO	X	X	X	X	X		
Academic		X		X	X	X	X
Pharmaceutical Industries		X		X	X		X
Alternative medicines and Traditional Medicines area	X	X		X	X		X
Research department							X

As shown in Table 8, the roles, functions and activities of pharmacy graduates' needs in Myanmar were also described.

In the caregiver role, pharmaceutical care was the main function needed. In addition, Medication Therapy Management, Therapeutic Drug Mortaring, dispensing were the activities needed.

In the manager role, the needs of functions are pharmacy management and administration. The needs of activities in this role were inventory management; hospital pharmacy management; drug management; managing procurement and distribution; human resource management; financial management; managing pharmacy shop or drug store, laboratory unit and industrial unit.

In a community role, the needs and functions and activities include providing drug information (drug information to patients and medication information to doctors; providing education about drugs, cosmetics and their side effects to clients or patients and reducing medication errors or improving medication adherence); demonstrating good communication (how to deal and communicate positive way and how to suggest positive communication); demonstrating Interprofessional and intraprofessional collaboration; demonstrate health promotion (provide information on healthy lifestyles and nutrition and providing basic health advice, stress management and Lifestyle change); and participate in disease prevention and control and other health-related topics.

In the role of leader, the needs for functions and activities include making policy (policymaker); leading and monitoring projects (monitoring whether the work or project was finished or not); resource mobilization; demonstrating leadership skills in the pharmacy areas and searching for funds.

In the role of decision maker, the needs for functions and activities include participating as a key person on the drug and therapeutics committee in every hospital; decision-making in selecting medicine; decision-making in the areas of the pharmaceutical industry and quality control; and decision-making in all pharmacy areas.

In the role of a lifelong learner, the needs of functions were holding conferences, and continuing pharmaceutical /pharmacy education.

In the role of a researcher, the needs for function were participating in research and development (new drug development); designing research, literature review, data collection, intervention, research training, presentation, publication; conducting research in the area of social and behavior, pharmacy, community pharmacy, pharmaceutical public health, natural products research; finding the route cause why they do not rely on explanation, how to take drugs according the doctors' prescription; conducting to search patients' belief, perception, culture; conducting natural for products production research scientifically.

Table 8. Roles, functions and activities of pharmacy graduates' needs

Roles	**Functions and Activities**
Care Giver	➢ Pharmaceutical care • Medication Therapy management - Review documents, calculate quality, safety and cost effectiveness - Ensuring that the supply of medicines is within the law, the medicines prescribed to patients are suitable. - Provide accurate and correct drugs - Negotiating insurance providers - Quality imp - rovement initiation - Patient counselling - Making sure patient are receiving good quality medication; medication are safe for particular patients; medication and administration at the right dose, right frequency and right duration; some medication are not interaction in vivo, prevent abuse/misuses of medication • Therapeutic drug mortaring - Managing drug interaction, ADR report, pharmacovigilance - Check prescription, use of drugs, dose, disease, diagnosis and creatinine clearance, label error, DC error, drug error, medical professor error - Medication reconciliation - Dealing with health care professionals and patients - Participate in rounding ward - Reconstitution of medication - Reducing medication errors or improving medication adherence • Dispensing - Dispense the drugs with proven efficacy, safety and quality by cooperation, collaboration and coordination

Roles	Functions and Activities
	among the various health professionals and other industries. - Explain how to take drugs, side effect, drug interaction
Manager	➢ Pharmacy management and administration • Inventory management • Drug management • Managing procurement and distribution • Human resource management • Financial management • Managing pharmacy shop or drug store and laboratory unit • Hospital pharmacy management How to estimate quality of medicines by documentation for the patients safety and cost effectiveness, patient records, Managing dispensary unit, clinical pharmacy unit, and sterile product unit in Hospital
Communicator	➢ Providing drug information - Drug information to the patients and medication information to the doctors - Provide education of drugs, cosmetics and their side effects to the clients or patients and to reduce medication errors or improving medication adherence ➢ Demonstrate good communication - (How to deal and communicate positive way and how to suggest positive communication) ➢ Demonstrate interprofessional and intraprofessional collaboration ➢ Demonstrate health promotion - Provide information on medicines, healthy lifestyles and nutrition - Providing basic health advice, stress management and Life style change. ➢ Participate disease prevention and control and other health-related topics
Leader	➢ Making policy (Policy maker) ➢ Leading and monitoring projects Monitoring, the work or project was finished or not ➢ Resource mobilization ➢ Demonstrate Leadership skill in pharmacy are ➢ Funding searching
Decision maker	➢ Participating as key person of drug and therapeutics committee in every hospitals ➢ Decision making on selecting medicine ➢ Decision making in the areas of Pharmaceutical industries and QC ➢ Decision making in all pharmacy areas
Life-long learner	➢ Holding conference and continuing pharmaceutical /pharmacy education
Researcher	➢ Participating in research and development (New drug development)

Roles	Functions and Activities
	➢ Designing the research, literature review, data collection, intervention, ➢ Participating in research training, presentation, publication ➢ Conducting research in the area of Social and Behavior Pharmacy, Community pharmacy, Pharmaceutical Public Health, natural products research ➢ Finding the route cause why they do not rely on explanation, how to take drugs according the doctors' prescription ➢ Conducting to search patients' belief, perception, culture ➢ Conducting natural for products production research scientifically

4.1.1.2. Competencies framework and draft competency standards for pharmacy graduates in Myanmar obtained in the first round

After conducting data triangulation, the competency framework with seven domains was obtained. They were Domain 1. Fundamental Knowledges; Domain 2. Pharmaceutical Public Health Competencies; Domain 3. Health System, Policy and Outcome Competencies; Domain 4. Pharmaceutical care competencies; Domain 5. Pharmaceutical Sciences Competencies; Domain 6. Pharmaceutical Organization and Management Competencies and Domain 7. Professional and Personal Competencies.

The draft competency standards for pharmacy graduates were obtained in the first round, including 98 competency statements (7 domains, 31 competencies and 60 sub- competencies. As shown in Appendix 11**, t**hese statements were obtained by data triangulation with interview data; the literature of competency standards as well as the framework or standard of educational or learning outcomes for pharmacy students and the opinions of internal or external experts. These competency statements of draft competency obtained from the first round were used for the second round**.**

4.1.2. Development of competency standards for pharmacy graduates (the second round)

The agreement of stakeholders on the draft competency obtained from the first round to reach consensus as well as asking the suggestions and comments of stakeholders were conducted in the second round. The percentages of agreement,

neutral and disagreement of competency statements were shown in Table 8**.** Over 70% of the agreement on the competency statements was selected. After editing the selected competency statements was done according to the suggestions and comments of stakeholders and the internal and external experts' opinion, the draft competency standards used for the third round were obtained.

There were 7 domains, 30 competencies and 72 sub-competencies were obtained from the second round. They were shown in Appendix 12**.** Seven domains of draft competency standards, obtained from the second round, were Domain 1. Fundamental Knowledges Domain 2. Pharmaceutical Public Health Competencies; Domain 3. Health System, policy and outcome Domain 4. Pharmaceutical Care Competencies; Domain 5. Pharmaceutical Sciences Competencies Domain 6. Pharmaceutical Organization and Management Competencies; Domain 7. Professional and Personal Competencies.

4.1.2.1. Consensus on the agreements of stakeholders on the draft competency standards in the second round

As shown in Table 9**,** the percentage of agreement of all stakeholders on all statements of draft competency standards obtained from the first round (the second round) was above 70%.

The maximum percentage of agreement among statements was 100% and the minimum percentage of agreement among statements was 79.1 %. Competency statements with 100% agreement were Domain 6. Pharmaceutical Organization and Management Competencies, 6.3. Supply chain management, 6.3.1. Understand how to supply medicines safely and efficiently, consistently within legal requirements and best professional practice, 6.3.2. Demonstrate knowledge of store medicines to minimize errors and maximize accuracy, 6.3.3. Ensure accurate rolling stocks, effective stock management, logistics of delivery and storage, Domain 7. Professional and personal competencies and 7.4. Research and Education and review literature and apply to research.

The maximum percentage of disagreement among statements was 2.1. % and the minimum percentage of disagreement among statements was 0 %. The maximum percentage of neutral among statements was 20.8 % and the minimum percentage of neutral among statements was 0%.

Table 9. ***Percentage of agreements of all stakeholders (n=48) on the draft competency standards in the second round.***

No	Competency statements	Dis-Agree % 1 +2	Neutral % 3	Agree % 4+5	Mean	SD
1	**Domain 1. Fundamental Knowledges**	0	4.2	95.9	4.6	.574
2	**1.1. Understand languages**	2.1	4.2	93.8	4.4.2	.679
3	1.1.1. English	2.1	4.2	93.8	4.4.2	.679
4	1.1.2. Myanmar	2.1	4.2	93.8	4.4.2	.679
5	**1.2. Understand basics sciences**	2.1	10.4	87.5	4.19	.79
6	1.2.1. Chemistry	2.1	10.4	87.5	4.19	.79
7	1.2.2. Physics	2.1	10.4	87.5	4.19	.79
8	1.2.3. Biophysics	2.1	10.4	87.5	4.19	.79
9	1.2.4. Botany,	2.1	10.4	87.5	4.19	.79
10	1.2.5. Zoology	2.1	10.4	87.5	4.19	.79
11	1.2.6. Traditional medicines	2.1	10.4	87.5	4.19	.79
12	**1.3. Understand biomedical sciences**	2.1	4.2	93.8	4.33	.663
13	1.3.1. Biochemistry	2.1	4.2	93.8	4.33	.663
14	1.3.2. Anatomy	2.1	4.2	93.8	4.33	.663
15	1.3.3. Physiology,	2.1	4.2	93.8	4.33	.663
16	1.3.4. Pharmacology	2.1	4.2	93.8	4.33	.663
17	1.3.5. Microbiology	2.1	4.2	93.8	4.33	.663
18	1.3.6. Pathology	2.1	4.2	93.8	4.33	.663
19	**Domain 2. Pharmaceutical Public Health Competencies**	0	4.2	95.9	4.48	.583
20	**2.1. Health education and promotion**	0	6.3	95	4.38	.606
21	2.1.1. Actively participate and demonstrate in health prevention and promotion issue	0	6.3	95	4.38	.606
22	**2.2. Pharmaceutical information and advice**	0	2.1	97.9	4.46	.544
23	2.2.1. Counsel population on the safe and rational use of medicines and devices	0	2.1	97.9	4.46	.544
24	2.2.2. Responds to questions using appropriate strategies	0	4.2	95.8	4.42	.577
25	**Domain 3. Health System, Policy and Outcome Competencies**	0	14.6	85.4	4.31	.719
26	**3.1. Health system and policy**	0	20.8	79.1	4.13	.733
27	3.1.1. Evaluate mechanisms and needs of the health system in Myanmar for the implementation (e.g. health policy, health reimbursement and healthcare management)	1%	18.8	79.1	4.10	.778
28	**3.2. Pharmaceutical Law and policy**	1%	0	97.9	4.42	.613

No	Competency statements	Dis-Agree % 1 +2	Neutral % 3	Agree % 4+5	Mean	SD
29	3.2.1. Apply Law, policy and regulation related to pharmaceuticals and pharmacy practice	0%	2.1	97.9	4.44	.542
30	**3.3. Health economic and outcomes**	0%	10.4	89.6	4.27	.644
31	3.3.1. Evaluate the needs of individual health status and medication safety and pharmaceutical product development	0	8.3	91.7	4.27	.610
32	3.3.2. Evaluate costs and outcome	0	8.3	91.7	4.27	.610
33	3.3.3. Recommend care plans that are cost-effective	0	8.3	91.7	4.29	.617
34	**3.4. Improvement of health services**	0	6.3	93.7	4.43	.595
35	3.4.1. Identify and evaluate the needs of health services and good pharmacy services and implement new services	0	6.3	93.7	4.35	.601
36	3.4.2. Resolve, follow up and prevent drug-related problems	0	6.3	93.8	4.33	.595
37	**3.5. Quality assurance**	0	14.6	85.4	4.19	.637
38	3.5.1. Implement, conduct and maintain a reporting system of pharmacovigilance	0	14.6	85.4	4.21	.683
39	**Domain 4. Pharmaceutical care competencies**	0	6.3	93.7	4.48	.618
40	**4.1. Assessment of medicines**	0	6.3	93.7	4.42	.613
41	4.1.1. Assess medicines and rational use of medicines and devices according to the patients, hospitals and government policy and medication interaction of the patients	0	4.2	95.8	4.46	.582
42	**4.2. Dispensing medicines**	0	4.2	95.8	4.56	.580
43	4.2.1. Dispense a product safely and accurately that is appropriate for the patient	0	4.2	95.8	4.54	.582
44	**4.3. Monitors medicines use.**	0	4.2	95.9	4.40	.574
45	4.3.1. Develop accurate, efficient patient therapeutic and monitoring plans that incorporate best practice and respect the autonomy of the patient	0	4.2	95.8	4.42	.577
46	4.3.2. Monitor the patient's progress and assess therapeutic outcomes	0	6.3	93.8	4.38	.606
47	**4.4. Monitors medication safety**	0	2.1	97.9	4.50	.546
48	4.4.1. Prioritizes medication safety and acts accordingly	0	2.1	97.9	4.48	.545
49	**4.5. Patient consultation and diagnosis**	0	12.5	87.5	4.29	.683
50	4.5.1. Discuss with the patients the	0	12.5	87.5	4.31	.689

No	Competency statements	Dis-Agree % 1 +2	Neutral % 3	Agree % 4+5	Mean	SD
	appropriate use of medicines, taking into account patient's preference					
51	4.5.2. Document any intervention	0	12.5	87.5	4.31	.689
52	4.5.3. Obtain, reconcile, review, maintain and update relevant patient medication and disease history	0	14.6	85.4	4.21	.683
53	**Domain 5. Pharmaceutical Sciences Competencies**	0	2.1	97.9	4.37	.531
54	**5.1. Drug discovery**	0	6.3	93.7	4.29	..582
55	5.1.1. Understand the process of active ingredients discovery from the natural substances synthetic and semi synthetic substances	0	4.2	95.8	4.29	.544
56	**5.2. Compounding**	0	6.3	93.7	4.29	.582
57	5.2.1. Compound extemporaneous and Cytotoxic medicines, pharmaceutical medicines, cosmetics, herbal medicines and food	0	6.3	93.7	4.29	.582
58	**5.3. Performs efficiently various tasks in pharmaceutical manufacturing**	0	8.3	91.7	4.27	.610
59	5.3.1. Demonstrate the production of pharmaceutical products, cosmetics herbal medicines and food	0	8.3	91.7	4.25	.601
60	**5.4. Performs testing the products in quality control units**	0	4.2	95.8	4.38	.570
61	5.4.1. Demonstrate quality control of pharmaceutical products, cosmetics, herbal medicines, food and traditional medicines	0	4.2	95.8	4.4	.574
62	**Domain 6. Pharmaceutical Organization and Management Competencies**	0	0	100	4.38	.489
63	**6.1. Human resources management**	0	6.3	93.7	4.33	.595
64	6.1.1. Identify and manage human resources and staffing issues and demonstrate organizational and management skill	0	8.3	91.7	4.25	.601
65	6.1.2. Recognize the potential of each member and the value of pharmacy team	0	8.3	91.7	4.27	.610
66	**6.2. Procurement**	0	2.1	97.9	4.38	..531
67	6.2.1.Demonstrate the procurement of, raw material, medicines, pharmaceutical products and devices	0	2.1	98	4.40	.536
68	6.2.2. Understand the development of efficient inventory system	0	2.1	97.9	4.38	.531

No	Competency statements	Dis-Agree % 1 +2	Neutral % 3	Agree % 4+5	Mean	SD
	management					
69	**6.3. Supply chain management**	0	0	100	4.52	.505
70	6.3.1. Understand how to supply medicines safely and efficiently, consistently within legal requirements and best professional practice.	0	0	100	4.50	.505
71	6.3.2. Demonstrate knowledge in store medicines to minimize errors and maximize accuracy	0	0	100	4.52	.505
72	6.3.3. Ensure accurate rolling stocks, effective stock management, logistics of delivery and storage	0	0	100	4.5	.505
73	**6.4. Work place management**	2.1	8.3	89.6	4.29	.713
74	6.4.1. Understand the roles in the organizational structure and works effectively within the organization's management structure	2.1	10.4	87.5	4.27	.736
75	6.4.2. Demonstrate the ability to make accurate and timely decisions and to make appropriate judgments	2.1	8.3	89.6	4.27	.707
76	**6.5. Financial management**	2.1	14.6	83.3	4.15	.743
77	6.5.1. Demonstrate the management of finance	2.1	14.6	83.4	4.13	.733
78	**Domain 7. Professional and personal competencies**	0	0	100	4.50	.505
79	**7.1. Communication**	0	2.1	97.9	4.60	.536
80	7.1.1. Communicate effectively with patients and their caregivers, with other healthcare professionals, other support staff, and other relevant third parties	0	2.1	97.9	4.60	.536
81	**7.2. Collaboration**	2.1	2.1	95.8	4.50	.652
82	7.2.1. Perform collaboratively with patients and intra- and inter-professional teams to provide safe, effective, efficient health care, thus fulfilling the needs of the community and society at large	2.1	2.1	95.8	4.48	.652
83	**7.3. Continuing professional development**	0	2.1	97.9	4.63	.531
84	7.3.1. Participate the continuing professional Development	0	2.1	97.9	4.63	.531
85	7.3.2. Engage with students/interns/ residents	0	2.1	97.9	4.63	.531
86	**7.4. Research and Education**	0	0	100	4.52	.505
87	7.4.1. Review literatures and apply to	0	0	100	4.52	.505

No	Competency statements	Dis-Agree % 1 +2	Neutral % 3	Agree % 4+5	Mean	SD
	research					
88	7.4.2. Demonstrate research performance and professional judgment to the decision-making process	0	4.2	95.8	4.46	.582
89	7.4.3. Educate all audiences by determining the most effective and enduring ways to impart information and assess learning.	0	2.1	97.9	4.50	.546
90	**7.5. Professionalism and Ethic**	0	2.1	97.9	4.60	.536
91	7.5.1. Take responsibility and accountability for delivering pharmacy care to patients, communities and society through ethical practice	0	2.1	97.9	4.6	.536
92	7.5.2. Demonstrate awareness of local/national codes of ethics and recognize own professional limitation	0	2.1	97.9	4.58	.539
93	**7.6. Pharmaceutical marketing**	0	6.3	93.7	4.33	.595
94	7.6.1. Apply and understand regulatory affairs and the key aspects of pharmaceutical registration and legislation	0	6.3	93.7	4.31	.589
95	7.6.2. Be aware of and identify the new medicines coming to the market	0	6.3	93.7	4.31	.589
96	7.6.3. Demonstrate knowledge in marketing and sale	0	6.3	93.7	4.31	.589
97	**7.7. Self-management**	0	6.3	93.7	4.37	.606
98	7.7.1. Demonstrate self-awareness, leadership, IT, innovation, entrepreneurship, assertive skill, risk management and problem solving skill	0	6.3	93.7	4.37	606

4.1.2.2. Suggestions and comments from stakeholders on the draft competency standards in the second round

A total of 26 stakeholders (13 pharmacists from industry, the community, the pharmaceutical company and regulation, 6 employers and 7 academic staff) provided suggestions and comments on the draft competency standards in the second round. They are shown in Appendix 13.

4.1.3. Development of competency standards for pharmacy graduate in Myanmar (the third round)

There were 32 stakeholders (13 pharmacists; 2 policymakers; 8 employers; 7 academic staff and 2 healthcare professionals) edited and reworded after revision of the Draft Competency Standards obtained from the second round, as well as provided suggestions and comments. Which statements were edited or reworded were described in Appendix 14**.** After editing and rewording the statements and asking for suggestions and comments from the stakeholders in Myanmar in the third round, the revised competency standards were obtained. Then, the statements were revised according to the suggestions and comments of the experts in Thailand. Finally, the agreement of stakeholders in Myanmar on the revised competency statements was done to obtain the final version of the competency standards and framework.

4.1.3.1. The agreement of competency standards for pharmacy graduates in Myanmar (final version)

Then, asking for agreement on the final version of competency standards from different stakeholders (n=41) in Myanmar was conducted. The final version of Competency Standards includes (7) Domain; (25) Competencies and (70) sub-competencies. The final version of the competency standards is shown in Table 10. Therefore, asking for agreement to the final version of the competency standards was conducted. Forty-one (41) stakeholders (85.4%) response rate provided agreement for the final version of the competency standards. The agreement of stakeholders on the competency standards for pharmacy graduates (final version) was over 70%.

As shown in Figure 9, the competency framework (the final version) includes Domain 1 Basic Biomedical Sciences, Domain 2 Pharmaceutical Public Health Competencies, Domain 3 Health Systems, Policy and Outcomes Competencies, Domain 4 Pharmaceutical Care Competencies, Domain 5 Pharmaceutical Sciences Competencies, Domain 6 Pharmaceutical Organization and Management Competencies and Domain 7 Professional and Personal Competencies.

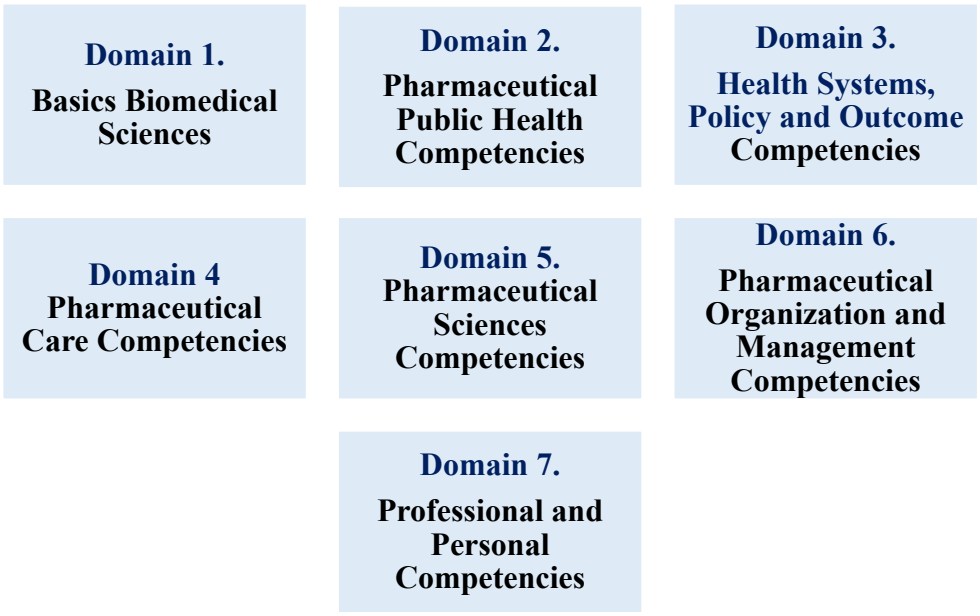

Figure 9. Competency framework of pharmacy graduates (final version)

Table 10. ***Competency standards of pharmacy graduates (final version)***

No	**Domain, Competency and Sub-competency Statements**
1	**Domain 1. Basics Biomedical Sciences**
2	1.1. **Understand basics biomedical science**
3	1.1.1. Know anatomy of the human body in relation to route of drug administration and drug disposition
4	1.1.2. Know normal physiological functions of the human body
5	1.1.3. Know biochemical composition and process in the human body
6	1.1.4. Know etiology of diseases and the pathophysiology of medical conditions
7	1.1.5. Know basic knowledge of (bacteriology, virology, parasitology) and the relationship between pathogens and the diseases
8	1.1.6. Know the mechanisms of pharmacology
9	1.1.7. Apply the principle **of p**harmacokinetics and pharmacodynamic
10	1.1.8. Know the principle of the use of medications in specific populations and pharmacogenetics
11	1.1.9. Know the basics of toxicology and clinical toxicology
12	1.1.10. Know adverse drug effects, untoward effects, drug interaction, precaution and warning
13	**Domain 2. Pharmaceutical Public Health Competencies**
14	**2.1. Health education and promotion**
15	2.1.1. Assess the needs of the primary healthcare
16	2.1.2. Actively participate and demonstrate health promotion and disease prevention and control, and healthy lifestyle
17	**2.2. Pharmaceutical information and advice**

No	**Domain, Competency and Sub-competency Statements**
18	2.2.1. Provide accurate, reliable and updated medicines information to patients, clients and healthcare providers
19	2.2.2. Counsel population for rational use of medicines and medical devices with safety manner
20	2.2.3. Respond to questions using appropriate skills
21	**Domain 3. Health Systems, Policy and Outcome Competencies**
22	**3.1. Health systems and policy**
23	**3.1.1.** Explain the components of the health systems in Myanmar and other countries for the implementation (e.g. health policy, health reimbursement, health insurance and healthcare management)
24	**3.2. Pharmaceutical Laws**
25	3.2.1. Apply policy, Laws, regulation and guidelines related to pharmaceutical products, biotechnological products, cosmetics, herbal medicine, food and health supplements to pharmacy practice
26	3.2.2. Evaluate counterfeit medicines according to the related Laws
27	**3.3. Health economic and outcomes**
28	3.3.1 Evaluate the needs of individual health status and medication safety and pharmaceutical product development
29	3.3.2. Evaluate costs and outcome
30	3.3.3. Recommend cost-effective care plans
31	3.4. **Improvement of health services**
32	3.4.1. Identify and evaluate the needs of health services and good pharmacy services and implement new services
33	**3.5. Quality assurance**
34	3.5.1. Initiate and implement audit activities and quality of pharmacy services
35	3.5.2. Develop , implement and follow Standards operation procedure (SOP)
36	3.5.3. Ensure quality control tests are performed and managed appropriately and meet quality standards
37	3.5.4. know the implementation and conducting pharmacovigilance reporting system
38	**Domain 4. Pharmaceutical Care Competencies**
39	**4.1. Assessment of medicines**
40	4.1.1. Assess medicines and rational use of medicines and devices, medication interaction and Adverse Drug Reaction in the patients according to the policy and guidelines
41	**4.2. Dispensing medicines**
42	4.2.1. Dispense medicines and medical devices safely and accurately that is appropriate for the patients
43	4.2.2. Document and act upon dispensing errors and accurately report them to the appropriate authorities
44	4.3. **Monitor medicines use**
45	4.3.1. Develop accurate, efficient patient therapeutic and monitoring plans that incorporate best practices and respect the autonomy of the patient
46	4.3.2. Monitor the patient's progress and assess therapeutic outcomes
47	4.3.3. Identify, prioritise, resolve and follow up medicines related problems and medicines management problems
48	**4.4. Patient consultation and diagnosis**
49	4.4.1. Discuss with the patients the appropriate use of medicines, taking into

No	Domain, Competency and Sub-competency Statements
	account the patient's preference
50	4.4.2. Document any intervention (eg. document allergies, medicines and food, in patient medicines history
51	4.4.3. Obtain, reconcile, review, maintain and update relevant patient medication and disease history
52	**Domain 5. Pharmaceutical Sciences Competencies**
53	**5.1. Drug discovery, design and development**
54	5.1.1. Know the process of active ingredients discovered from the natural (plant and animal origin), synthetic and semi synthetic substances
55	5.4.1. Know the structure activity relationship and chemical properties of drugs
56	5.5. **Compounding**
57	5.2.1. Know different types of dosage forms and their advantages and disadvantages
58	5.2.2. Know the new drug delivery system in pharmaceutical formulations
59	5.2.3. Compound extemporaneous medicines and follow guidelines (GMP, GDP, GLP)
60	**5.3. Performs efficiently various tasks in pharmaceutical manufacturing**
61	5.3.1. Know physicochemical properties of active ingredients and excipient
62	5.3.2. Know pharmaceutical calculations, the principle of advanced technological products and bio-pharmaceutics that underpin drug formulation into acceptable dosage forms and their therapeutic outcomes
63	5.3.3. Demonstrate the production of pharmaceutical products, cosmetics, food and alternative medicines (herbal medicines, health supplement)
64	5.3.4. Know biotechnology and biotechnological products
65	**5.4. Performs testing the products in quality control units**
66	5.4.1. Demonstrate quality control of pharmaceutical products, advanced technological products, cosmetics, food and alternative medicines (herbal medicines, traditional medicines, health supplement)
67	5.4.2. Demonstrate quality control of sterilized pharmaceutical products
68	**Domain 6. Pharmaceutical Organization and Management Competencies**
69	**6.1. Human resources management**
70	6.1.1. Identify and manage human resources and staffing issues and demonstrate organizational and management skill
71	6.1.2. Recognize the potential of each member and the value of pharmacy team
72	**6.2. Supply chain management**
73	6.2.1. Know the procurement planning and process of raw materials, medicines, pharmaceutical products and medical devices
74	6.2.2. Know the demand and forecasting of pharmaceuticals and health products requirements for a specific project or organization
75	6.2.3. Explain the development of efficient inventory control system and management
76	6.2.4. Know Good Storage Practice (GSP) for the storage of medicines and medical devices, Good Distribution Practice (GDP) to minimize errors and maximize accuracy
77	6.2.5. Ensure accurate rolling stocks, effective stock management and logistics of delivery

No	**Domain, Competency and Sub-competency Statements**
78	**6.3. Work place management**
79	6.3.1. Know the roles and responsibilities in the organizational structure and work effectively within the organization's management structure
80	6.3.2. Demonstrate the ability to make accurate and timely decisions and to make appropriate judgments
81	6.4. **Financial management**
82	6.4.1. Demonstrate the management of Finance
83	**Domain 7. Professional and personal competencies**
84	**7.1. Communication**
85	7.1.1. Know the behavior, beliefs and cultural practices of patients and public for their health and wellness plans
86	7.1.2. Communicate effectively with patients and their caregivers, with other healthcare professionals, other supportive staff, and other relevant third parties
87	**7.2. Collaboration**
88	7.2.1. Collaborate with patients and intra- and inter-professional teams to provide safe, effective and efficient health care, thus fulfilling the needs of the community and society at large
89	**7.3. Research and Education**
90	7.3.1. Review literatures and apply to research
91	7.3.2. Know the basics of Bio-stastics
92	7.3.3. Demonstrate research performance and professional judgment to the decision-making process
93	7.3.4. Educate all audiences by determining the most effective and enduring ways to impart information and assess learning
94	**7.4. Professionalism and Ethics**
95	7.4.1. Take responsibility and accountability for pharmaceutical business, pharmaceutical manufacturing & quality control tests, delivering pharmaceutical care to patients, communities and society through ethical practice
96	7.4.2. Demonstrate awareness of local/national codes of ethics and recognize own professional limitation
97	**7.5. Pharmaceutical marketing**
98	7.5.1. Apply and know regulatory affairs and the key aspects of pharmaceutical registration and legislation
99	7.5.2. Be aware of and identify the new medicines coming to the market
100	7.5.3. Demonstrate knowledge in marketing and sale
101	**7.6. Self-management**
102	7.6.1. Demonstrate self-awareness, leadership, information technology, innovation, entrepreneurship, assertive skill, risk management and problem solving skill

4.1.4. Comparison of the competency standards between the first round, the second round and the third round

There were seven domains between the first round, the second round and the third round. There were different numbers of competencies between the first round,

the second round and the third round, where 31 competencies were obtained from the first round, 30 competencies were obtained from the second round and 25 competencies were obtained from the third round. There were also 60 sub-competencies obtained from the first round, 72 sub-competencies were obtained from the second round and 70 sub-competencies were obtained from the third round. These are shown in Table 11.

Table 11. ***Comparison of competency standards between the first round, the second round and the third round***

The First round	The Second Round	The Third round
7 Domains	7 Domains	7 Domains
31 competencies	30 competencies	25 competencies
60 sub-competencies	72 sub-competencies	70 sub-competencies

4.1.5. Consensus on the opinion of all stakeholders (n=48) what are the three most important domains (the third round)

It was shown in **Figure 10** that consensus on the opinion of all stakeholders (n=48) about the three most important domains in the development of competency standards for pharmacy graduates (the third round) was conducted. Percentages (%) of the three most important domains provided by all stakeholders were Domain 5. Pharmaceutical Sciences Competencies (68.8%), Domain 4. Pharmaceutical Care Competencies (60.4%) and Domain 3. Health system, Policy and Outcomes (50%).

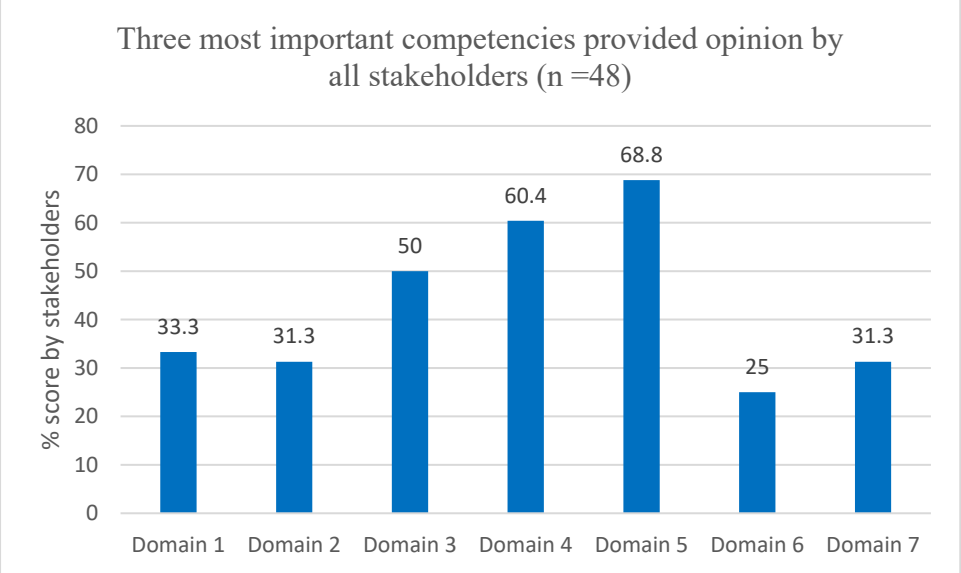

Figure 10. Three most important competencies among all stakeholders

4.1.6. Consensus on the opinion of all stakeholders (n=48) what are the three least important sub-competencies

It was shown in Figure 11 that consensus on the opinion of all stakeholders (n=48) on what are the three least important sub-competencies in the development of competency standards for pharmacy graduates (the third round) was conducted. Percentages of the three least important sub-competencies provided by all stakeholders were 1.1.1. Understand the basics of plant and animal biology (27.1 %); 2.2.2. Responds to questions using appropriate strategies (25 %) and 1.1.4. Understand the basics of statistics, calculations and mathematical analysis (20.8%).

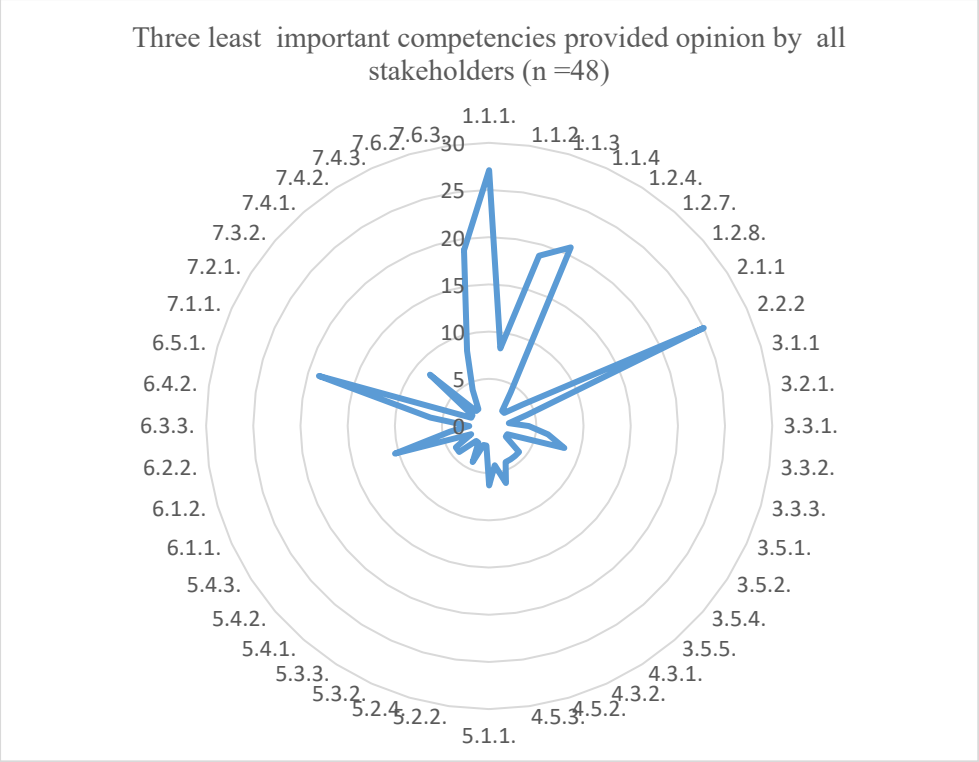

Figure 11 The three least important sub-competencies among all stakeholders

4.1.7.. The opinion of stakeholders over the years to complete the competency standards

The opinion of stakeholders over the years to complete the competency statements of competency standards for pharmacy students. Six years and five years

were the highest percentages of stakeholders' opinions, and they were 35.4% and 33.3% respectively. Then it was followed by 5 or/to 6 years (16.7%); 4 years (10.4%) and 3-4 years (4.2%) respectively. They are shown in Table 12.

Table 12. ***The opinion of stakeholders for the years to complete the competency standards (the third round)***

No	Years	Frequency (n=48)	Percentages
1	3-4 years	2	4.2 %
2	4 years	5	10.4%
3	5 years	16	33.3%
4	5 or/to 6 years	8	16.7%
6	6 years	17	35.4%

4.2. Phase II: Evaluation of current curriculum towards the proposed standards for pharmacy graduates in Myanmar

4.2.1. Socio-demographic of academic staff

As shown in Table 13, socio-demographics include age and working experience. There were 80 participants in the study.

The minimum age was 22 for academic staff and the maximum age was 62. The mean age and Standard Division were 41.75 and ±11.51 respectively. For total working experience, the minimum was 0.5 and the maximum was 39. Their mean working experience and standard division were 16.6 and ±9.47 respectively. Moreover, socio-demographics include working age group, gender, education, position, working experience and competencies of participants. In most of the age groups, mid-adult (40-59) year-old participants were 48.8 %, followed by young people (20-39) year-olds 43.8 % and older adult (60-75) year-olds 7.5 %.

Most participants in this study were female participants; 87.5% were followed by male participants, 12.5 %.

The percentage of educational status of stakeholders was also shown. Forty-seven point-five percent (47.5%) were PhD holders, followed by a Master's degree (38.8%) and a Bachelor's degree (13.8%).

The positions of participants were low level (36.3 %), mid-managing level (31.3%), and high managing level (32.5%).

Working experience groups of participants were (< 1) year 10 %; (1-5) years 3.8%; (6-10) years 13.8%; (11-15) years 12.5%; (16-20) years 22.5%, (21-25) years (25%) and more than 25 years (2.5 %) respectively.

Most participants were expert/consultant level (47.5%), followed by advanced level one (38.8%), pre-foundation level (11.3%) and general level/ foundation level 2.5%.

Table 13. ***Socio-demographic of academic staff***

Variables	Number of respondents (n=80)	Percentage
Age group (Mean=41.75 , SD=11.51, Range=22-62)		
Young people (20-39)	35	43.8%
Mid Adult (40-59)	39	48.8%
Older Adult (60- 75)	6	7.5%
Old old more than 75	-	-
Gender		
Male	10	12.5%
Female	70	87.5%
Education		
Graduate	11	13.8%
Master	31	38.8%
PhD	38	47.5%
Position		
Low-Level	29	36.3%
Mid- Level	25	31.3%
High Management Level	26	32.5%
Working Experiences group (Mean 16.6 = , SD= 9.47, Range=0.5-39)		
(< 1)year	8	10 %
(1-5) years	3	3.8%
(6-10) years	11	13.8%
(11-15) years	10	12.5%
(16-20) years	18	22.5%
(21-25) years	20	25 %
More than 25 Years	10	12.5%
Competency of stakeholders		
Pre foundation level	9	11.3%
General level/ Foundation level	2	2.5%
Advanced level one	31	38.8%
Advanced level two	-	-
Expert/consultant	38	47.5%

4.2.2. The subjects in the curriculum and their departments of the University of Pharmacy (Mandalay) and University of Pharmacy (Yangon)

As shown in Table 14, there are 19 subjects and their departments and in which year these subjects were included in the current curriculum (which is the output of 10th medical education), at the University of Pharmacy Mandalay and the University of Pharmacy Yangon. Teaching hours of each subject in the curriculum of both universities were shown.

The study revealed that the (B. Pharm) Curriculum of Universities of Pharmacy [the University of Pharmacy (Mandalay) and University of Pharmacy (Yangon) in Myanmar. The curriculum of the B.Pharm in Myanmar is a content-based curriculum. The names of 19 subjects are included in the (B, Pharm) curriculum of the University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon) and these subjects and their departments were described.

The subjects on the current curriculum of the University of Pharmacy Yangon and Mandalay were categorized into five categories of sciences according to the contents of subjects. Botany, Zoology, Chemistry, and Mathematics were Basic Sciences. Anatomy, Physiology, Biochemistry, Pathology, Medical Microbiology, and Pharmacology were Biomedical Sciences. Pharmaceutical Chemistry, Pharmacognosy, Pharmaceutical Microbiology, and Pharmaceutics I and some contents in Pharmaceutics II were Pharmaceutical Sciences. Some contents in Pharmaceutics I and II and the contents of Behavioral Sciences and Preventive and Social Medicines were matched with Social and Administrative Pharmacy Sciences. Some contents of Pharmacology were matched with Clinical Pharmacy Sciences. Languages were English and Myanmar.

Table 14. ***The names of subjects and departments and the year of the subjects included in the current curriculum***

No	Subjects	Departments	Year
1	Botany	Department of Botany	The First Year
2	Zoology	Department of Zoology	The First Year
3	Chemistry	Department of Chemistry	The First Year
4	Mathematics	Department of Mathematics	The First Year
5	Myanmar	Department of Myanmar	The First Year
6	English	Department of English	The First Year
7	Behavial Sciences	Department of Behavial Sciences	The First Year
8	Anatomy	Department of Anatomy	The First Year
9	Physiology	Department of Physiology	The Second year
10	Biochemisty	Department of Biochemisty	The Second Year
11	Pathology	Deprtment of Pathology	The Third Year
12	Medical Microbiology	Department of Microbiology	The Third Year
13	Prevntive & Social Medicines	Department of Preventive & Social Medicines	The Final Year
14	Pharmaology	Department of Pharmacology	The Second Year, The Third Year and The Final Year
15	Pharmacognosy	Department of Pharmacognosy	The Second Year, The Third Year and The Final Year
16	Pharmaceutical chemistry	Department of Pharmaceutical chemistry	The Second Year, The Third Year and The Final Year
17	Pharmaceutics I	Department of Pharmaceutics	The Second Year, The Third Year and The Final Year
18	Pharmaceutics II	Department of Pharmaceutics	The Third Year and The Final Year
19	Pharmaceutical Microbiology	Department of Pharmaceutics	The Third Year

4.2.3. Teaching Methods and teaching hours of curriculum

As shown in Table 15, teaching methods and hours of each subject in the curriculum of both universities were shown.

It also described teaching methods for each subject on the curriculum of both universities. In the curriculum of the Universities of Pharmacy Mandalay and Yangon, there were six different methods. Method 1 was lecture; Method 2 was demonstration/video clip slide show; Method 3 was assignment/ tutorial /oral presentation/discussion; Method 4 was laboratory/ practical/calculation; Method 5 was a mini research project and Method 6 was a field trip for clinical and industrial training.

As shown in Table 16**.** The total teaching hours for languages like English and Myanmar were 250 hours. The total teaching hours for Basic Sciences like (Botany, Zoology, Chemistry and Mathematics) at both universities are 542 hours. The total teaching hours for Biomedical Sciences (Anatomy, Physiology, Biochemistry, Pathology, Medical Microbiology, and Pharmacology) were (916) hours at the University of Pharmacy in Yangon and (926) hours at the University of Pharmacy Mandalay. The total teaching hours for Pharmaceutical Sciences, like (Pharmaceutical Chemistry, Pharmacognosy, Pharmaceutical Microbiology, Pharmaceutics I and Pharmaceutics II) were 1937 hours at both universities. The total teaching hours of a few contents related to Social and Administrative Pharmacy Sciences in Pharmaceutical Sciences, like Pharmaceutics I and Pharmaceutics II; Behavial Sciences and Preventive and Social Medicines, were 232 hours at the University of Pharmacy Yangon and 242 hours at the University of Pharmacy Mandalay. The total teaching hours of a few contents related to Clinical Pharmacy Sciences in Pharmacology subjects were 115 hours at the University of Pharmacy in Yangon and 130 hours at the University of Pharmacy Mandalay.

Table 15. ***Teaching methods and hours of subjects in the curriculum of the University of Pharmacy (Mandalay) and University of Pharmacy (Yangon)***

No	Subjects	Method 1	Method 2	Method 3	Method 4	Method 5	Method 6	Total teaching hours	Method 1	Method 2	Method 3	Method 4	Method 5	Method 6	Total teaching hours
1	Botany	78			48			**126**	78			48			**126**
2	Zoology	78			48			**126**	78			48			**126**
3	Chemistry	188			46			**234**	188			46			**234**
4	Mathematics	56						**56**	56						**56**
5	Myanmar	60		30				**90**	60		30				**90**
6	English	93		27				**40**	93		27				**40**
7	Behavial Sciences	25		19				**44**	25		19				**44**
8	Anatomy	70	11	15				**96**	70	11	15				**96**
9	Physiology	96		28	8			**132**	96		28	8			**132**
10	Biochemisty	112		22	13			**147**	112		22	13			**147**
11	Pathology	106	10	20				**136**	106	10	20				**136**
12	Medical Microbiology	90	10					**100**	65	10					**75**
13	Prevntive & Social Medicines	33						**33**	23						**23**

No	Subjects	Method 1	Method 2	Method 3	Method 4	Method 5	Method 6	Total teaching hours	Method 1	Method 2	Method 3	Method 4	Method 5	Method 6	Total teaching hours
14	Pharmaology	254	38	153			50	**445**	254	38	153			48	**445**
15	Pharmacognosy	383		42	100			**525**							**525**
16	Pharmaceutical chemistry	403		72	100	30		**605**	403		72	100	30		**605**
17	Pharmaceutics I&II	786		10	100		12	**896**	786		10	100		12	**896**
18	Pharmaceutical Microbiplogy	76						**76**	76						**76**
	Total teaching hours	**4027**							**3992**						

Table 16. ***Total teaching hours and their subjects in the curriculum of University of Pharmacy Yangon and Mandalay were grouped into the different categories of sciences***

Type of Sciences	Subjects and teaching hours were grouped into the different cathegories of sciences						Total Hours
Basic Sciences	Zoology 126	Botany 126	Chemistry 234	Mathematics 56			**542**
Biomedical Sciences (Pre Pharmacy subjects)	Anatomy 96	Physiology 132	Biochemistry 147	Pathology 136	Medical Microbiology 75 (Ygn) 99 (Mdy)	Pharmacology	**916 (Ygn)** **926 (Mdy)**
Pharmaceutical Sciences (Pharmacy subjects)	Pharmacognosy 525	Pharmaceutical Chemistry 605	Pharmaceutics I 1868	Pharmaceutics II 69	Pharmaceutical Microbiology 76		**1937**
Clinical Sciences (Pharmacy subjects)	Pharmacology 115 (Ygn) 130 (Mdy)						**115 (Ygn)** **130 (Mdy)**
Social and Administrative Pharmacy Sciences (Pharmacy subjects)	Pharmaceutics I 24	Pharmaceutics II 141	Behavial Sciences 44	Preventive and Social Medicines 23 (Ygn) 33 (Mdy)			**232 (Ygn)** **242 (Mdy)**
Languages	English 160	Myanmar 90					**250**

4.2.4. Types of assessment in the curriculum for pharmacy graduates from the University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon)

As shown in Table 17, there were six assessment methods for 19 subjects on the curriculum of the University of Pharmacy Mandalay and the University of Pharmacy Yangon. There were six assessment methods. Assessment 1 was Multiple Choice Questions (MCQ), assessment 2 was Multiple Short Questions (MSQ), assessment 3 was calculation/practical /laboratory exam; assessment 4 was viva/Oral exam (for excellent students only); assessment 5 was long question/essay and assessment 6 was translation.

Assessment methods used for languages (English) were MCO, MSQ, long question/essay and translation and those for Burmese were MCO, MSQ and long question/essay. Assessment methods used for Basic Sciences (Botany, Zoology, Chemistry, and Mathematics) in the current curriculum were MCQ, MSQ and calculation/practical /laboratory exams and for Behavial Sciences were MCQ and MSQ for Mathematics was calculation. Assessment methods used for the Biomedical Sciences (Anatomy, Physiology, Biochemistry, Pathology, some contents Pharmacology) in the current curriculum were MCQ, MSQ, practical /laboratory exams and Viva/Oral exams. Assessment methods used for the Pharmaceutical Sciences (Pharmaceutical Chemistry, Pharmacognosy, Pharmaceutical Microbiology, Pharmaceutics I and some contents in Pharmaceutics II) in the current curriculum were MCQ, MSQ and calculation/practical /laboratory exams. Assessment methods used for a few contents related to Social and Administrative Pharmacy Sciences included in Pharmaceutics subject in the current curriculum were MCQ and MSQ and a few contents of Behavial Sciences and Preventive and Social Medicines were MCQ only. There is no assessment method used for a few contents related to Clinical Pharmacy Sciences which were included in Pharmacology subjects.

Table 17. ***Types of assessment in the curriculum for pharmacy graduates from the University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon)***

		The University of Pharmacy (Mandalay)						The University of Pharmacy (Mandalay)					
No	**Subjects**	**MCQ**	**Viva/Oral exam for excellent Student(s)**	**Lab/Practical/ Calculation**	**Viva/Oral exam for excellent student(s)**	**Long question/Essay**	**Translation**	**MCQ**	**MSQ**	**Lab/Practical**	**Viva/Oral exam for excellent student(s)**	**Long question/Essay**	**Translation**
1	Botany	**X**	**X**	**X**				✓	✓	✓			
2	Zoology	**X**	**X**	**X**				✓	✓	✓			
3	Chemistry	**X**	**X**	**X**				✓	✓	✓			
4	Mathematics			**X**						✓			
5	Myanmar		**X**			**X**			✓			✓	
6	English	**X**	**X**			**X**	**X**	✓	✓			✓	✓
7	Behavial Sciences	**X**	**X**					✓	✓				
8	Anatomy	**X**	**X**	**X**	**X**			✓	✓	✓	✓		
9	Physiology	**X**	**X**	**X**	**X**			✓	✓	✓	✓		
10	Biochemisty	**X**	**X**	**X**	**X**			✓	✓	✓	✓		
11	Pathology	**X**	**X**	**X**	**X**			✓	✓	✓	✓		

		The University of Pharmacy (Mandalay)						The University of Pharmacy (Mandalay)					
No	Subjects	MCQ	Viva/Oral exam for excellent Student(s)	Lab/Practical/ Calculation	Viva/Oral exam for excellent student(s)	Long question/Essay	Translation	MCQ	MSQ	Lab/Practical	Viva/Oral exam for excellent student(s)	Long question/Essay	Translation
12	Medical microbiology	**X**	**X**	**X**	**X**			✓	✓	✓	✓		
13	Prevntive & Social Medicines	**X**	**X**					✓					
14	Pharmaology	**X**	**X**		**X**			✓	✓		✓		
15	Pharmacognosy	**X**	**X**	**X**				✓	✓	✓			
16	Pharmaceutical chemistry	**X**	**X**	**X**				✓	✓	✓			
17	Pharmaceutics I	**X**	**X**	**X**				✓	✓	✓			
18	Pharmaceutics II	**X**	**X**	**X**				✓	✓	✓			
19	Pharmaceutical Microbiology	**X**	**X**					✓	✓				

4.2.5.The competency statements are taught or not (Yes/No) and the names of subjects for pharmacy graduates from the University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon)

As shown in Table 18, where competency statements were taught or not according to the competency standards for pharmacy graduates. The subjects taught on competency statements were also described. The differences in the competency statements between the University of Pharmacy Mandalay and the University of Pharmacy, Yangon were described. The subjects taught in each domain, competency and sub-competency, were also described.

The competency statements are taught or not (Yes/No) and the names of subjects for pharmacy graduates from the University of Pharmacy (Mandalay)

Domains, all competencies and sub-competencies under Domain 1, 2 and 5 were taught at the Universities of Pharmacy Mandalay. The competency statements that were taught at the University of Pharmacy Mandalay were 3.1. 3.2. and 3.5. in Domain 3. The sub-competency statements were 3.1.1, 3.2.1. and 3.5.3. under this domain. On the other hand, the competency statements that were not taught at the University of Pharmacy Mandalay were 3.3. and 3.4. in Domain 3. The sub-competency statements that were not taught at the University of Pharmacy Mandalay 3.2.2., 3.3.1, 3.3.2., 3.3.3., 3.4.1., 3.5.1., 3.5.2 and 3.5.4. in this Domain.

The competency statements that were taught at the University of Pharmacy Mandalay were 4.1., 4.2 and 4.4. in domain 4. The sub-competency statements were 4.1.1. 4.2.1.,4.2.2, 4.4.1. and 4.4.3 under this domain. However, the competency statement that was not taught at the University of Pharmacy Mandalay was 4.3. in Domain 4. The sub-competency statements that were not taught at the University of Pharmacy Mandalay 4.3.1., 4.3.2., 4.3.3 and 4.4.2.under this domain.

The competency statements that were taught at the University of Pharmacy Mandalay were 6.2 in Domain 6. The sub-competency statements were 6.2.1., 6.2.2, 6.2.3, 6.2.4 and 6.2.5 under this domain. However, the competency statements that were not taught at the University of Pharmacy Mandalay were 6.1., 6.3. and 6.4. in Domain 6. The sub-competency statements that were not taught at the University of Pharmacy Mandalay were .6.1.1., 6.1.2., 6.3.1., 6.3.2. and 6.4.1 in Domain 6.

The competency statements that were taught at the University of Pharmacy Mandalay were 7.1, 7.3, 7.5 and 7.6 in Domain 7. The sub-competency statements were 7.1.1., 7.1.2, 7.3.1, 7.3.2, 7.5.1., 7.5.2., 7.5.3 and 7.6.1. under this domain. However, the competency statements that were not taught in the University of Pharmacy Mandalay were 7.2. and 7.4. under Domain 7. The sub-competency statements that were not taught at the University of Pharmacy Mandalay were 7.2.1., 7.3.3., 7.3.4., 7.4.1. and 7.4.2. under Domain 7.

The competency statements are taught or not (Yes/No) and the teaching hours of these statements, the names of subjects for pharmacy graduates from the University of Pharmacy (Yangon) were described as follows.

All the competencies and sub-competencies under Domain 1 and 5 were taught at the University of Pharmacy Yangon.

The competency statements that were taught at the University of Pharmacy Yangon were 2.1. in Domain 2. The sub-competency statements were 2.1.1. and 2.1.2. under this domain. The competency statements that were not taught at the University of Pharmacy Yangon were 2.2. under Domain 2. The sub-competency statements that were not taught at the University of Pharmacy Yangon were 2.2.1., 2.2.2. and 2.2.3 under Domain 2.

The competency statements that were taught at the University of Pharmacy Yangon were 3.2.and 3.5 in Domain 3. The sub-competency statements were 3.2.1 and. 3.5.3. in this domain. However, the competency statements that were not taught at the University of Pharmacy Yangon were 3.1., 3.3. and 3.4. under Domain 3. The sub-competency statements that were not taught at the University of Pharmacy Mandalay 3.1.1., 3.2.2., 3.3.1, 3.3.2., 3.3.3., 3.4.1., 3.5.1., 3.5.2 and 3.5.4. under Domain 3.

The competency statements that were taught at the University of Pharmacy Yangon were 4.1. and 4.2. in Domain 3. The sub-competency statements taught under this Domain were 4.1.1 and. 4.2.1. in this domain. However, the competency statements that were not taught at the University of Pharmacy Yangon were 4.3. and 4.4. under Domain 4. The sub-competency statements that were not taught at the University of Pharmacy Yangon 4.3.1., 4.3.2., 4.3.3, 4.4.1, 4.4.2. and 4.4.3. under Domain 4.

The competency statements that were taught at the University of Pharmacy Yangon were 6.2. in Domain 6. The sub-competency statements were 6.2.1., 6.2.2, 6.2.3. 6.2.4 and 6.2.5 under this domain. However, the competency statements that were not taught at the University of Pharmacy Yangon were 6.1., 6.3.and 6.4.under Domain 6. The sub-competency statements that were not taught at the University of Pharmacy Yangon were .6.1.1.,6.1.2., 6.3.1., 6.3.2. and 6.4.1 under Domain 6.

The competency statements that were taught at the University of Pharmacy Yangon were 7.1, 7.3. and 7.5 in Domain 7. The sub-competency statements were 7.1.1., 7.1.2, 7.2.1, 7.2.3, 7.5.1, 7.5.2, 7.5.3 and 7.6.1 under this domain. However, the competency statements that were not taught at the University of Pharmacy Yangon were 7.2. and 7.4. under Domain 7. The sub-competency statements that were not taught at the University of Pharmacy Yangon were 7.2.1., 7.3.3., 7.3.4., 7.4.1. and 7.4.2. under Domain 7. The difference between what competency statements were taught or not at the University of Pharmacy Mandalay and Yangon

The competency statements that were not taught at the University of Pharmacy Yangon were 2.2. under Domain 2. The sub-competency statements that were not taught at the University of Pharmacy Yangon were 2.2.1., 2.2.2. and 2.2.3 under Domain 2. However, these competency statements and sub-competency statements were taught at the University of Pharmacy, Mandalay.

The competency statements that were not taught at the University of Pharmacy Yangon were 3.1., under Domain 3. The sub-competency statements that were not taught at the University of Pharmacy Yangon 3.1.1., under Domain 3. However, these competency statements and sub-competency statements were taught at the University of Pharmacy, Mandalay.

The competency statements that were not taught at the University of Pharmacy Yangon were 4.4. under Domain 4. The sub-competency statements that were not taught at the University of Pharmacy Yangon 4.4.1, and 4.4.3. under Domain 4. However, these competency statements and sub-competency statements were taught at the University of Pharmacy, Mandalay.

Subjects for statements of competency standards at the University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon).

As shown in Table 18**,** the subjects for statements of competency standards were taught at the University of Pharmacy (Mandalay) and the University of Pharmacy were also described.

In Anatomy, Physiology, Biochemistry, Pathology, Pharmacology, microbiology (Medical and Pharmaceutical), competency statements for Domain 1 were taught at both universities.

In Pharmaceutics and Preventive and Social Medicines, competency statements for Domain 2 were taught at both universities.

In Pharmaceutics and Preventive and Social Medicines, competency statements for Domain 3 were taught at the University of Pharmacy Mandalay. However, only in Pharmaceutics competency statements for this were taught.

In Pharmacology and Pharmaceutics, competency statements for Domain 4 were taught in both universities.

In Pharmaceutics, Pharmaceutical Chemistry and Pharmacognosy, competency statements for Domain 5 were taught in both universitiesIn Pharmaceutics, competency statements for Domain 6 were taught at both universities.

In Behavior Sciences, Preventive and Social Medicines, Pharmaceutics competency statements for Domain 7 were taught at both universities.

Basic sciences like Biology (Botany and Zoology), Chemistry, Physics, Mathematics subjects as well as language subjects like English and Myanmar were not included in the competency standards.

Table 18. ***The competency statements are taught or not and the names of subjects for pharmacy graduates from the University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon) (n=80)***

No	Competency statements	UOP Mandalay		UOP Yangon	
		Yes /No	**Subjects**	**Yes /No**	**Subject(s)**
1	**Domain 1. Basic Biomedical Sciences**	**Yes**	Anatomy, Physiology, Biochemistry, Pathology, Pharmacology Microbiology (Medical and Pharmaceutical)	**Yes**	Anatomy, Physiology, Biochemistry, Pathology, Pharmacology Medical microbiology and Pharmaceutical microbiology

2	**1.1. Understand basic biomedical sciences**	**Yes**		**Yes**	
3	1.1.1. Know anatomy of the human body in relation to route of drug administration and drug disposition	**Yes**	Anatomy	**Yes**	Anatomy
4	1.1.2. Know normal physiological functions of the human body	**Yes**	Physiology	**Yes**	Physiology
5	1.1.3. Know biochemical composition and process in the human body	**Yes**	Biochemistry	**Yes**	Biochemistry
6	1.1.4. Know etiology of diseases and the pathophysiology of medical conditions	**Yes**	Pathology	**Yes**	Pathology
7	1.1.5. Know basic knowledge of (bacteriology, virology, parasitology) and the relationship between pathogens and the diseases	**Yes**	Medical microbiology and Pharmaceutical microbiology	**Yes**	Medical microbiology and Pharmaceutical microbiology
8	1.1.6. Know the mechanisms of pharmacology	**Yes**	Pharmacology	**Yes**	Pharmacology
9	1.1.7. Apply the principle of pharmacokinetics and Pharmacodynamic	**Yes**	Pharmacology	**Yes**	Pharmacology
10	1.1.8. Know the principle of the use of medications in specific populations and pharmacogenetics	**Yes**	Pharmacology	**Yes**	Pharmacology
11	1.1.9. Know the basics of toxicology and clinical toxicology	**Yes**	Pharmacology	**Yes**	Pharmacology
12	1.1.10. Know adverse drug effects, untoward effects, drug interaction, precaution and warning	**Yes**	Pharmacology	**Yes**	Pharmacology
13	**Domain 2. Pharmaceutical Public Health**	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics

	Competencies		PSM		PSM
14	**2.1. Health education and promotion**	**Yes**	PSM	**Yes**	PSM
15	2.1.1. Assess the needs of the primary healthcare	**Yes**	PSM	**Yes**	PSM
16	2.1.2. Actively participate and demonstrate health promotion and disease prevention and 8control, and healthy lifestyle	**Yes**	PSM	**Yes**	PSM
17	**2.2. Parmaceutical information and advice**	**Yes**	Pharmaceutics	No	
18	2.2.1. Provide accurate, reliable and updated medicines information to patients, clients and healthcare providers	**Yes**	Pharmaceutics	No	
19	2.2.2. Counsel population for rational use of medicines and medical devices with safety manner	**Yes**	Pharmaceutics	No	
20	2.2.3. Respond to questions using appropriate skills	**Yes**		No	
21	**Domain 3. Health Systems, Policy and Outcome Competencies**	**Yes**	PSM Pharmaceutics	**Yes**	Pharmaceutics
22	**3.2. Health systems and policy**	**Yes**	PSM	No	
23	**3.2.1.** Explain the components of the health systems in Myanmar and other countries for the implementation (e.g. health policy, health reimbursement, health insurance and healthcare management)	**Yes**	PSM	No	
24	**3.3. Pharmaceutical Laws**	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics

25	3.3.1. Apply policy, Laws, regulation and guidelines related to pharmaceutical products, biotechnological products, cosmetics, herbal medicine, food and health supplements to pharmacy practice	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics
26	3.3.2. Evaluate counterfeit medicines according to the related Laws	No		No	
27	**3.4. Health economic and outcomes**	No		No	
28	3.4.1. Evaluate the needs of individual health status and medication safety and pharmaceutical product development	No		No	
29	3.4.2. Evaluate costs and outcome	No		No	
30	3.4.3. Recommend cost-effective care plans	No		No	
31	3.5. **Improvement of health services**	No		No	
32	3.5.1. Identify and evaluate the needs of health services and good pharmacy services and implement new services	No		No	
33	**3.6. Quality assurance**	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics
34	3.6.1. Initiate and implement audit activities and quality of pharmacy services	No		No	
35	3.6.2. Develop , implement and follow Standards operation procedure (SOP)	No		No	
36	3.6.3. Ensure quality control tests are performed and managed	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics

	appropriately and meet quality standards				
37	3.6.4. know the implementation and conducting pharmacovigilance reporting system	No		No	
38	**Domain 4. Pharmaceutical Care Competencies**	**Yes**	Pharmacology Pharmaceutics	**Yes**	Pharmacology Pharmaceutics
39	**4.1. Assessment of medicines**	**Yes**	Pharmacology	**Yes**	Pharmacology
40	4.1.1. Assess medicines and rational use of medicines and devices , medication interaction and Adverse Drug Reaction in the patients according to the policy and guidelines	**Yes**	Pharmacology	**Yes**	Pharmacology
41	**4.2. Dispensing medicines**	**Yes**	Pharmaceutics Pharmacology	**Yes**	Pharmaceutics
42	4.2.1. Dispense medicines and medical devices safely and accurately that is appropriate for the patients	**Yes**	Pharmaceutics Pharmacology	**Yes**	Pharmaceutics
43	4.2.2. Document and act upon dispensing errors and accurately report them to the appropriate authorities	**Yes**	Pharmacology	No	
44	4.3. **Monitor medicines use**	No		No	
45	4.3.1. Develop accurate, efficient patient therapeutic and monitoring plans that incorporate best practices and respect the autonomy of the patient	No		No	
46	4.3.2. Monitor the patient's progress and assess therapeutic	No		No	

	outcomes				
47	4.3.3. Identify, prioritise, resolve and follow up medicines related problems and medicines management problems	No		No	
48	**4.4. Patient consultation and diagnosis**	**Yes**	Pharmacology	No	
49	4.4.1. Discuss with the patients the appropriate use of medicines, taking into account the patient's preference	**Yes**	Pharmacology	No	
50	4.4.2. Document any intervention (eg. document allergies, medicines and food, in patient medicines history)	No		No	
51	4.4.3. Obtain, reconcile, review, maintain and update relevant patient medication and disease history	Yes	Pharmacology	No	
52	**Domain 5. Pharmaceutical Sciences Competencies**	Yes	Pharmaceutics, Pharmaceutical chemistry, Pharmacognosy	Yes	Pharmaceutics, Pharmaceutical chemistry, Pharmacognosy
53	5.1. Drug discovery, design and development	Yes		Yes	
54	5.1.1. Know the process of active ingredients discovered from the natural (plant and animal origin), synthetic and semi synthetic substances	**Yes**	Pharmaceutics, Pharmaceutical chemistry, Pharmacognosy	**Yes**	Pharmaceutics,Pharmaceutical chemistry, Pharmacognosy
55	5.2.1. Know the structure activity relationship and chemical properties of drugs	**Yes**	Pharmaceutical chemistry	**Yes**	Pharmaceutical chemistry
56	**5.2. Compounding**	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics
57	5.2.1. Know different types of dosage forms and their advantages and	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics

	disadvantages				
58	5.2.2. Know the new drug delivery system in pharmaceutical formulations	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics
59	5.2.3. Compound extemporaneous medicines and follow guidelines (GMP,GDP.GLP)	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics
60	5.3. **Performs efficiently various tasks in pharmaceutical manufacturing**	**Yes**	Pharmaceutics, Pharmaceutical chemistry, Pharmacognosy	**Yes**	Pharmaceutics, Pharmaceutical chemistry, Pharmacognosy
61	**5.3.1.** Know physicochemical properties of active ingredients and excipient	**Yes**	Pharmaceutics, Pharmaceutical chemistry, Pharmacognosy	**Yes**	Pharmaceutics, Pharmaceutical chemistry, Pharmacognosy
62	5.3.2. Know pharmaceutical calculations, the principle of advanced technological products and bio-pharmaceutics that underpin drug formulation into acceptable dosage forms and their therapeutic outcomes	**Yes**	Pharmaceutics,	**Yes**	Pharmaceutics,
63	5.3.3. Demonstrate the production of pharmaceutical products, cosmetics, food and alternative medicines (herbal medicines, health supplement)	**Yes**	Pharmaceutics,	Yes	Pharmaceutics,
64	5.3.4. Know biotechnology and biotechnological products	**Yes**	Pharmaceutics,	Yes	Pharmaceutics,
65	5.4. **Performs testing**	**Yes**	Pharmaceutics,	**Yes**	Pharmaceutics,

	the products in quality control units		Pharmaceutical chemistry,		Pharmaceutical chemistry,
66	5.4.1. Demonstrate quality control of pharmaceutical products, advanced technological products, cosmetics, food and alternative medicines (herbal medicines, traditional medicines, health supplement)	**Yes**	Pharmaceutics, Pharmaceutical chemistry,	**Yes**	Pharmaceutics, Pharmaceutical chemistry,
67	5.4.2. Demonstrate quality control of sterilized pharmaceutical products	**Yes**	Pharmaceutics, Pharmaceutical chemistry,	**Yes**	Pharmaceutics, Pharmaceutical chemistry,
68	**Domain 6. Pharmaceutical Organization and Management Competencies**	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics
69	**6.1. Human resources management**	**No**		**No**	
70	6.1.1. Identify and manage human resources and staffing issues and demonstrate organizational and management skill	**No**		**No**	
71	6.1.2. Recognize the potential of each member the value of pharmacy team	No		No	
72	**6.2. Supply chain management**	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics
73	6.2.1. Know the procurement planning and process of raw materials, medicines, pharmaceutical products and medical devices	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics

74	6.2.2. Know the demand and forecasting of pharmaceuticals and health products requirements for a specific project or organization	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics
75	6.2.3. Explain the development of efficient inventory control system and management	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics
76	6.2.4. Know Good Storage Practice (GSP) for the storage of medicines and medical devices, Good Distribution Practice (GDP) to minimize errors and maximize accuracy	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics
77	6.2.5. Ensure accurate rolling stocks, effective stock management and logistics of delivery	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics
78	**6.3. Work place management**	**No**		**No**	
79	6.3.1. Know the roles and responsibilities in the organizational structure and work effectively within the organization's management structure	No		No	
80	6.3.2. Demonstrate the ability to make accurate and timely decisions and to make appropriate judgments	No		No	
81	6.4. **Financial management**	No		No	
82	6.4.1. Demonstrate the management of Finance	No		No	
83	**Domain 7. Professional and personal competencies**	**Yes**	BS, PSM, Pharmaceutics	**Yes**	BS, PSM, Pharmaceutics

84	**7.1. Communication**	**Yes**	BS, PSM, Pharmaceutics	**Yes**	BS, Pharmaceutics
85	7.1.1. Know the behavior, beliefs and cultural practices of patients and public for their health and wellness plans	**Yes**	BS, PSM, Pharmaceutics	**Yes**	BS, Pharmaceutics
86	7.1.2. Communicate effectively with patients and their caregivers, with other healthcare professionals, other supportive staff, and other relevant third parties	**Yes**	PSM, Pharmaceutics	**Yes**	Pharmaceutics
87	**7.2. Collaboration**	No		No	
88	7.2.1. Collaborate with patients and intra- and inter-professional teams to provide safe, effective and efficient health care, thus fulfilling the needs of the community and society at large	No		No	
89	**7.3. Research and Education**	Yes		Yes	
90	7.3.1. Review literatures and apply to research	Yes	BS, PSM	Yes	BS, PSM
91	7.3.2. Know the basics of Bio-stastics	Yes	PSM	Yes	PSM
92	7.3.3. Demonstrate research performance and professional judgment to the decision-making process	No		No	
93	7.3.4. Educate all audiences by determining the most effective and enduring ways to impart information and assess learning	No		No	
94	7.4. **Professionalism and**	No		No	

	Ethics				
95	7.4.1. Take responsibility and accountability for pharmaceutical business, pharmaceutical manufacturing & quality control tests , delivering pharmaceutical care to patients, communities and society through ethical practice	No		No	
96	7.4.2. Demonstrate awareness of local/national codes of ethics and recognize own professional limitation	No		No	
97	**7.5. Pharmaceutical marketing**	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics
98	7.5.1. Apply and know regulatory affairs and the key aspects of pharmaceutical registration and legislation	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics
99	7.5.2. Be aware of and identify the new medicines coming to the market	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics
100	7.5.3. Demonstrate knowledge in marketing and sale	**Yes**	Pharmaceutics	**Yes**	Pharmaceutics
101	**7.6. Self-management**	**Yes**	BS	**Yes**	BS
102	7.6.1. Demonstrate self-awareness, leadership, information technology, innovation, entrepreneurship, assertive skill, risk management and problem solving skill	**Yes**	BS	**Yes**	BS

4.2.6. Matching teaching methods and their teaching hours in the curriculum of the University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon) by using the competency standards(n=80)

As shown in **Table 18**, there were teaching methods and their hours in the curriculum for pharmacy graduates of both universities were matched using Competency Standards. There were six different methods. Method 1 was lecture; Method 2 was demonstration/video clip slide show; Method 3 was assignment/ tutorial /oral presentation/discussion; Method 4 was lab/ practical/calculation; Method 5was a mini-research project and Method 6 was a field trip for clinical and industrial training.

Matching teaching methods in the curriculum of the University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon) by using competency standards

At the University of Pharmacy (Mandalay) and (Yangon), teaching methods used for Domain 1 (Basic Biomedical Sciences) and competency statements and sub-competency statements were Method 1 (lecture); Method 2 (demonstration/video clip slide show) or Method 4 (lab/ practical/calculation).; Methods 3 (assignment/ tutorial /oral presentation/discussion).

At the University of Pharmacy (Mandalay) and (Yangon), the teaching method used in Domain 2 (Pharmaceutical Public Health competencies) and their competencies and sub-competencies was Method 1 (lecture) only.

At the University of Pharmacy (Mandalay) and (Yangon), the teaching method used in Domain 3 (Health Systems, Policy and Outcome Competencies) and their competencies and sub-competencies was Method 1 (lecture) only.

At the University of Pharmacy (Mandalay) and (Yangon), the teaching methods used in Domain 4 (Pharmaceutical Care Competencies) and their competencies and sub-competencies were Method 1 (lecture); Method 3 (assignment/ tutorial /oral presentation/discussion) and Method 6 (field trip for clinical training).

At the University of Pharmacy (Mandalay) and (Yangon), the teaching methods used in Domain 5 (Pharmaceutical Sciences Competencies) and their competencies and sub-competencies were Method 1 (lecture); Method 3 (assignment/

tutorial /oral presentation/discussion); Method 4 (lab/ practical); Method 5 (mini research project) and Method 6 (field trip for industrial training).

At the University of Pharmacy (Mandalay) and (Yangon), the teaching methods used in Domain 6 (Pharmaceutical Organization and Management Competencies), their competencies and sub-competencies were Method 1 (lecture) and Method 3 (assignment).

At the University of Pharmacy (Mandalay) and (Yangon) and the teaching methods used in Domain 7 (Professional and personal competencies), their competencies and sub-competencies were Method 1 (lecture) and Method 3 (assignment and tutorial).

Matching teaching hours in the curriculum of the University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon) by using competency standards

The total teaching hours according to the Competency Standards for the University of Pharmacy (Mandalay) were 3060 and the total teaching hours according to the Competency standards for the University of Pharmacy (Yangon) were 3025. Teaching hours of Anatomy, Biochemistry, Physiology, Pathology, Microbiology, Pharmaceutical and Medical, Behavial Sciences, Preventive and Social Medicines, Pharmacology, Pharmacognosy, Pharmaceutical Chemistry and Pharmaceutics at the Universities of Pharmacy Mandalay and Yangon were matched with Competency Standards.

Teaching hours in Botany (126) hours; Zoology (126) hours; Chemistry (234) hours; Mathematics subjects (56) hours; as well as languages subjects like English (160) hours and Myanmar (90) hours were not included in the Competency Standards. Moreover, teaching hours (134) of Pharmacognosy and teaching hours (41) of Pharmaceutical chemistry were not included because these hours were duplicated for Basic Sciences subjects.

The total teaching hours of curriculum at the University of Pharmacy Mandalay matched to that of the competency and sub-competency statements for Domains 1 (Basic Biomedical Sciences) were (996) hours. However, the total teaching hours of curriculum at the University of Pharmacy (Yangon) for Domain 1 were (992) hours.

The total teaching hours of curriculum at the University of Pharmacy Mandalay matched to that of the competency and sub-competency statements for Domain 2 (Pharmaceutical Public Health competencies) were (14) hours. However, the total teaching hours of curriculum at the University of Pharmacy (Yangon) for Domain 2 were 6 hours.

The total teaching hours of curriculum at the University of Pharmacy Mandalay matched to that of the competency and sub-competency statements for Domain 3 (Health Systems, Policy and Outcome Competencies) were (30) hours. However, the total teaching hours of curriculum at the University of Pharmacy (Yangon) for Domain 3 were 27 hours.

The total teaching hours of curriculum at the University of Pharmacy Mandalay matched to that of the competency and sub-competency statements for Domain 4 (Pharmaceutical Care Competencies) were (146) hours. However, the total teaching hours of curriculum at the University of Pharmacy (Yangon) for Domain 4 were 131 hours.

The total teaching hours of curriculum at the University of Pharmacy Mandalay matched to that of the competency and sub-competency statements for Domain 5 (Pharmaceutical Sciences Competencies) were (1640) hours. However, the total teaching hours of curriculum at the University of Pharmacy (Yangon) for Domain 5 were (1642) hours.

The total teaching hours of curriculum at the University of Pharmacy Mandalay and Yangon matched to that of the competency and sub-competency statements for Domain 6 (Pharmaceutical Organization and Management Competencies) were (122) hours respectively.

The total teaching hours of curriculum at the University of Pharmacy (Mandalay) matched to that of the competency and sub-competency statements for Domain 7 (Professional and personal competencies) were (112) hours. However, the total teaching hours of curriculum at the University of Pharmacy (Yangon) for Domain 7 were (105) hours.

Teaching hours of curriculum at the Universities of Pharmacy (Mandalay and Yangon) matched to that of the competency and sub-competency statements together with teaching methods were also described in Table 19.

Table 19. ***Teaching hours of six different methods and their teaching hours of competencies in the competency standards of the*** **University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon)**

No	Competency	Teaching hours of six different methods University of Pharmacy Mandalay							Teaching hours of six different methods University of Pharmacy Yangon						
		Method 1	Method 2	Method 3	Method 4	Method 5	Method 6	Total	Method 1	Method 2	Method 3	Method 4	Method 5	Method 6	Total
1	Domain 1.	754	34	187	21			**996**	742	34	195	21			**992**
2	1.1.	754	34	187	21			**996**	742	34	195	21			**992**
3	1.1.1.	70	11	15				**96**	70	11	15				**96**
4	1.1.2.	96		28	8			**132**	96		28	8			**132**
5	1.1.3	112		22	3			**147**	112		22	3			**147**
6	1.1.4	106	10	20				**136**	106	10	20				**136**
7	1.1.5.	166	10					**176**	141	10					**151**
8	1.1.6.	18		12				**30**	20		15				**35**
9	1.1.7.	50		24				**74**	55		30				**85**
10	1.1.8.	60		30				**90**	60		27				**87**
11	1.1.9.	30	3	4				**37**	30	3	6				**39**
12	1.1.10.	46		32				**78**	52			32			**84**
13	Domain 2	14						**14**	6						**6**

No	Competency	Teaching hours of six different methods University of Pharmacy Mandalay							Teaching hours of six different methods University of Pharmacy Yangon						
		Method 1	Method 2	Method 3	Method 4	Method 5	Method 6	Total	Method 1	Method 2	Method 3	Method 4	Method 5	Method 6	Total
14	2.1.	6						**6**	6						**6**
15	2.1.1.	3						**3**	3						**3**
16	2.1.2.	3						**3**	3						**3**
17	2.2.	8						**8**							
18	2.2.1.	2						**2**							
19	2.2.2.	4						**4**							
20	2.2.3.	2						**2**							
21	Domain 3.	30						**30**	27						**27**
22	3.1.	3						**3**							
23	3.1.1.	3						**3**							
24	3.2.	14						**14**	14						**14**
25	3.2.1.	14						**14**	14						**14**
26	3.2.2.														
27	3.3.														
28	3.3.1.														

No	Competency	Teaching hours of six different methods University of Pharmacy Mandalay							Teaching hours of six different methods University of Pharmacy Yangon						
		Method 1	Method 2	Method 3	Method 4	Method 5	Method 6	Total	Method 1	Method 2	Method 3	Method 4	Method 5	Method 6	Total
29	3.3.2.														
30	3.3.3.														
31	3.4.														
32	3.4.1.														
33	3.5.	13						**13**	13						
34	3.5.1.														
35	3.5.2.														
36	3.5.3.	13						**13**	13						**13**
37	3.5.4														
38	Domain 4	59		43			44	**146**	48		35			48	**131**
39	4.1.	15		20			20	**55**	32		35			40	**107**
40	4.1.1.	15		20			20	**55**	32		35			40	**107**
41	4.2.	31					6	**37**	16					8	**24**
42	4.2.1.	25					6	**31**	16					8	**24**
43	4.2.2.	6						**6**							

No	Competency	Teaching hours of six different methods University of Pharmacy Mandalay							Teaching hours of six different methods University of Pharmacy Yangon						
		Method 1	Method 2	Method 3	Method 4	Method 5	Method 6	Total	Method 1	Method 2	Method 3	Method 4	Method 5	Method 6	Total
44	4.3.														
45	4.3.1.														
46	4.3.2.														
47	4.3.3.														
48	4.4.	13		23			18	**54**							
49	4.4.1.	7		12			10	**29**							
50	4.4.2.														
51	4.4.3.	6		11			8	**25**							
52	Domain 5	1157		135	300	30	18	**1640**	1168		132	300	30	12	**1642**
53	5.1.	443		50				**493**	443		50				**493**
54	5.1.1.	368		31				**399**	368		31				**399**
55	5.1.2.	75		19				**94**	75		19				**94**
56	5.2.	228			80		10	**318**	234			80		4	**318**
57	5.2.1.	72			30		4	**106**	72			30		4	**106**
58	5.2.2.	42						**42**	42						**42**

No	Competency	Teaching hours of six different methods University of Pharmacy Mandalay							Teaching hours of six different methods University of Pharmacy Yangon						
		Method 1	Method 2	Method 3	Method 4	Method 5	Method 6	Total	Method 1	Method 2	Method 3	Method 4	Method 5	Method 6	Total
59	5.2.3.	114			50		6	**170**	120			50			**170**
60	5.3.	346		44	35		21	**429**	351		41	35		4	**431**
61	5.3.1.	136		35	21			**192**	136		35	21			**192**
62	5.3.2.	42						**42**	42						**42**
63	5.3.3.	75		5	14		2	**96**	80		2	14		2	**98**
64	5.3.4.	93		4			2	**99**	93		4			2	**99**
65	5.4.	140		41	185	30	4	**400**	140		41	185	30	4	**400**
66	5.4.1.	90		37	165	26	2	**320**	90		37	165	26	2	**320**
67	5.4.2	50		4	20	4	2	**80**	50		4	20	4	2	**80**
68	Domain 6	108		14				**122**	108		14				**122**
69	6.1.														
70	6.1.1.														
71	6.1.2.														
72	6.2.	108		14				**122**	108		14				**122**
73	6.2.1.	25		4				**29**	25		4				**29**

No	Competency	Teaching hours of six different methods University of Pharmacy Mandalay							Teaching hours of six different methods University of Pharmacy Yangon						
		Method 1	Method 2	Method 3	Method 4	Method 5	Method 6	Total	Method 1	Method 2	Method 3	Method 4	Method 5	Method 6	Total
74	6.2.2.	8		2				**10**	8		2				**10**
75	6.2.3.	25		2				**27**	25		2				**27**
76	6.2.4.	25		2				**27**	25		2				**27**
77	6.2.5.	25		4				**29**	25		4				**29**
78	6.3.														
79	6.3.1.														
80	6.3.2.														
81	6.4.														
82	6.4.1.														
83	Domain 7	87		25				**112**	80		25				**105**
84	7.1.	43		25				**68**	32		25				**57**
85	7.1.1.	28		22				**50**	22		22				**44**
86	7.1.2.	15		3				**18**	10		3				**13**
87	7.2.														
88	7.2.1.														

No	Competency	Teaching hours of six different methods University of Pharmacy Mandalay							Teaching hours of six different methods University of Pharmacy Yangon						
		Method 1	Method 2	Method 3	Method 4	Method 5	Method 6	Total	Method 1	Method 2	Method 3	Method 4	Method 5	Method 6	Total
89	7.3.	18						**18**	22						**22**
90	7.3.1.	15						**15**	17						**17**
91	7.3.2.	3						**3**	5						**5**
92	7.3.3.														
93	7.3.4.														
94	7.4.														
95	7.4.1.														
96	7.4.2.														
97	7.5.	18						**18**	18						**18**
98	7.5.1	6						**6**	6						**6**
99	7.5.2.	6						**6**	6						**6**
100	7.5.3.	6						**6**	6						**6**
101	7.6.	8						**8**	8						**8**
102	7.6.1.	8						**8**	8						**8**

4.2.7. Types of assessment of competency statements in the competency standards for pharmacy graduates from the University of Pharmacy (Mandalay) and (Yangon)

As shown in Table 20, there were assessment methods of statements of competency standards for pharmacy graduates in both universities. There were four assessment methods. Assessment 1 was Multiple Choice Question (MCQ), assessment 2 was Multiple Short Question (MSQ), assessment 3 was calculation/practical /laboratory exam and assessment 4 was viva/Oral exam (for excellent students only).

At the University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon), most of the assessment methods used in Domain 1 (Basic Biomedical Sciences) and their competency were Multiple Choice Question (MCQ); Multiple Short Question (MSQ); and viva/oral exam.

At the University of Pharmacy (Mandalay), the assessment methods used in Domain 2 (Pharmaceutical Public Health competencies) and their competencies and sub competencies were Multiple Choice Question (MCQ) and Multiple Short Question (MSQ). At the University of Pharmacy (Yangon), there were not assessment methods used in Domain 2 (Pharmaceutical Public Health competencies); their competency and sub-competency statements.

At the University of Pharmacy (Mandalay) and (Yangon), the assessment method used in Domain 3 (Health Systems, Policy and Outcome Competencies) and their competencies and sub competencies were Multiple Choice Question (MCQ) and Multiple Short Question (MSQ).

At the University of Pharmacy (Mandalay) and (Yangon), most of the assessment methods used in Domain 4 (Pharmaceutical Care Competencies), and their competencies and sub-competencies were Multiple Choice Question (MCQ) and Multiple Short Question (MSQ).

At the University of Pharmacy (Mandalay) and (Yangon), the assessment methods used in Domain 5 (Pharmaceutical Sciences Competencies)**, a**nd their competencies and sub-competencies were Multiple Choice Question (MCQ); Multiple Short Question (MSQ) and practical /laboratory exam.

At the University of Pharmacy (Mandalay) and (Yangon), the assessment methods used in Domain 6 (Pharmaceutical Organization and Management Competencies) and their competencies and sub-competencies were Multiple Choice Question (MCQ) and Multiple Short Question (MSQ).

At the University of Pharmacy (Mandalay) and (Yangon), the assessment methods used in Domain 7 (Professional and personal competencies) and their competencies and sub-competencies were Multiple Choice Question (MCQ) and Multiple Short Question (MSQ).

Table 20. Types of assessment of competency statements in the competency standards for pharmacy graduates in the University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon) (n=80)

No	Competency statements	University of Pharmacy (Mandalay) Types of assessment (If it is, X)				University of Pharmacy (Yangon) Types of assessment (If it is, ✓)			
		MCQ	MSQ	Lab/Practical/Calculation	Viva/Oral exam	MCQ	MSQ	Lab/Practical	Viva/Oral exam
1	**Domain 1.**	X	X	X	X	✓	✓	✓	✓
2	**1.1.**	X	X	X	X	✓	✓	✓	✓
3	1.1.1.	X	X			✓	✓		✓
4	1.1.2.	X	X	X	X	✓	✓	✓	✓
5	1.1.3.	X	X	X	X	✓	✓	✓	✓
6	1.1.4.	X	X		X	✓	✓		✓
7	1.1.5.	X	X	X	X	✓	✓	✓	✓
8	1.1.6.	X	X		X	✓	✓		✓
9	1.2.7.	X	X		X	✓	✓		✓
10	1.2.8.	X	X		X	✓	✓		✓
11	1.2.9	X	X		X	✓	✓		✓
12	1.2.10.	X	X		X	✓	✓		✓
13	**Domain 2.**	X	X			✓			
14	**2.1.**	X				✓			
15	2.1.1.	X				✓			
16	2.2.2.	X				✓			
17	**2.2.**	X	X						
18	2.2.1.	X	X						
19	**2.2.2.**	X	X						
20	2.2.3.	X	X						
21	**Domain 3.**								
22	**3.1.**		X						
23	3.1.1.		X						

No	Competency statements	University of Pharmacy (Mandalay) Types of assessment (If it is, X)				University of Pharmacy (Yangon) Types of assessment (If it is, ✓)			
		MCQ	MSQ	Lab/Practical/Calculation	Viva/Oral exam	MCQ	MSQ	Lab/Practical	Viva/Oral exam
24	**3.2.**	X	X			✓	✓		
25	3.2.1.	X	X			✓	✓		
26	3.2.2.								
27	**3.3.**								
28	3.3.1.								
29	3.3.2.								
30	3.3.3.								
31	3.4.								
32	3.4.1.								
33	**3.5.**	X	X			✓	✓		
34	3.5.1.								
35	3.5.2.								
36	3.5.3.	X	X			✓	✓		
37	3.5.4.								
38	**Domain 4.**	X	X			✓	✓		
39	**4.1.**	X	X			✓	✓		
40	4.1.1.	X	X			✓	✓		
41	**4.2.**	X	X			✓	✓		
42	4.2.1	X	X			✓	✓		
43	4.2.2.	X	X						
44	4.3.								
45	4.3.1.								
46	7.6.2.								
47	7.6.3.								
48	**7.7.**								
49	7.7.1.								
50	7.7.2.								
51	7.7.3.								
52	**Domain 5.**	X	X	X		✓	✓	✓	
53	**5.1.**	X	X			✓	✓		
54	5.1.1.	X	X			✓	✓		
55	5.1.2.	X	X			✓	✓		
56	**5.2.**	X	X			✓	✓		
57	5.2.1.	X	X	X		✓	✓	✓	
58	5.2.2.	X	X			✓	✓		
59	5.2.3.	X	X	X		✓	✓	✓	
60	5.3.	X	X	X		✓	✓	✓	
61	5.3.1.	X	X	X		✓	✓	✓	
62	5.3.2.	X	X			✓	✓		
63	5.3.3.	X	X	X		✓	✓	✓	
64	5.3.4.	X	X			✓	✓		

No	Competency statements	University of Pharmacy (Mandalay) Types of assessment (If it is, X)				University of Pharmacy (Yangon) Types of assessment (If it is, ✓)			
		MCQ	MSQ	Lab/Practical/Calculation	Viva/Oral exam	MCQ	MSQ	Lab/Practical	Viva/Oral exam
65	5.4.	X	X	X		✓	✓	✓	
66	5.4.1.	X	X	X		✓	✓	✓	
67	5.4.2.	X	X			✓	✓		
68	**Domain 6.**	X	X			✓	✓		
69	**6.1.**								
70	6.1.1.								
71	6.1.2.								
72	**6.2.**	X	X			✓	✓		
73	6.2.1.	X	X			✓	✓		
74	6.2.2.	X	X			✓	✓		
75	6.2.3.	X	X			✓	✓		
76	6.2.4.	X	X			✓	✓		
77	6.2.5.	X	X			✓	✓		
78	**6.4.**								
79	6.4.1.								
80	6.4.2.								
81	6.5.								
82	6.5.1.								
83	**Domain 7.**	X	X	X		✓	✓	✓	
84	7.1.	X	X						
85	7.1.1.	X	X			✓	✓		
86	7.1.2.	X	X			✓	✓		
87	7.2.								
88	7.2.1.								
89	7.3..	X				✓			
90	7.3.1.	X				✓			
91	7.3.2.	X				✓			
92	7.3.3.								
93	7.3.4.								
94	**7.4.**								
95	7.4.1.								
96	7.4.2.								
97	7.5.	X	X			✓	✓		
98	7.5.1.	X	X			✓	✓		
99	7.5.2.	X	X			✓	✓		
100	7.5.3.	X	X			✓	✓		
101	**7.6.**	X	X			✓	✓		
102	7.6.1.	X	X			✓	✓		

4.2.8. Percentages of teaching hours of domains of competency standards between the University of Pharmacy Yangon and the University of Pharmacy Mandaly

As shown in **Figure 12**, the percentage of teaching hours at the University of Pharmacy (Yangon and Mandalay for all Domains (Domain 1, 2, 3, 4, 5, 6 and 7) were not significantly different. The percentage of teaching hours at both Universities of Pharmacy for Domain 2 were the lowest, and they were (0.46 %) at University of Pharmacy Mandalay and (0.2%) at University of Pharmacy Yangon. The percentage of teaching hours in both Universities of Pharmacy for Domain 5 were the highest, and they were (53.6 %) at the University of Pharmacy Mandalay and (54.3%) at the University of Pharmacy Yangon. The percentage of teaching hours at both Universities of Pharmacy for Domain 1 was the second highest, and they were (32.5%) at the University of Pharmacy Mandalay and (32.8%) at the University of Pharmacy Yangon. It was followed by (4.8%) at University of Pharmacy Mandalay and (4.33%) at University of Pharmacy Yangon for Domain 4; (4%) at both Universities for Domain 6; (3.66%) at University of Pharmacy Mandalay and (3.47%) in University of Pharmacy Yangon for Domain 7; (0.98 %) in University of Pharmacy Mandalay and (0.9%) in University of Pharmacy Yangon for Domain 3.

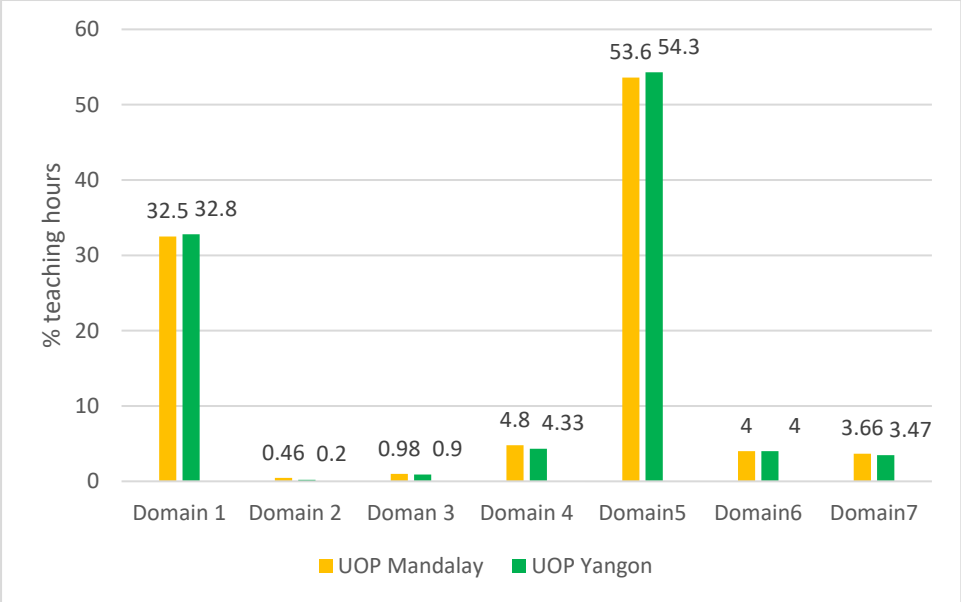

Figure 12. Teaching hours (%) of seven domains of competency standards for pharmacy graduates at the University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon)

4.2.9 .Percentages of teaching hours of competency statements of competency standards between the University of Pharmacy Yangon and the University of Pharmacy Mandaly

As shown in Figure 13, the percentage of teaching hours at the University of Pharmacy (Yangon and Mandalay for most competency statements like 1.1., 6.1, 5.2, 5.3 and 5.4 were significantly different compared to other competency statements. However, for 2.2.; 3.1. and 4.4., the percentage of teaching hours was only at the University of Pharmacy Mandalay. For both universities, there was no seen percentage of teaching hours for 3.3., 3.4., 4.3, 6.1., 6.3, .6.4., 7.2. and 7.4 respectively. The percentages of teaching hours were the highest for 1.1. statements in the University of Pharmacy Mandalay (32.5%) and the University of Pharmacy Yangon (32.8%). The second highest percentages of teaching hours were for a 5.1 statement in the University of Pharmacy Mandalay (16%) and in the University of Pharmacy Yangon (16.3%). The third-highest percentages of teaching hours were for 5.3 statements at the University of Pharmacy Mandalay (14%) and at the University of Pharmacy Yangon (14.3%) as well as 5.4 statements at the University of Pharmacy Mandalay (13.07%) and at the University of Pharmacy Yangon (13.2%) respectively. Then, it was followed by 5.2., 6.2. 4.1., 7.1, 4.2, 7.3, 7.5., 3.2, 7.6, and 2.1 respectively.

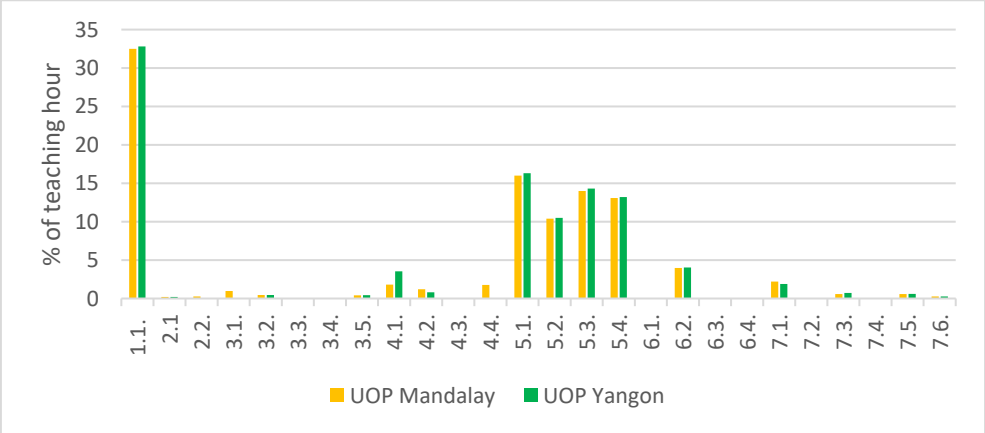

Figure 13. Teaching hours (%) of competency of competency standards taught by pharmacy graduates at the University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon) (n=80)

4.2.10. Percentages of teaching hours of sub-competncies of competency standards between University of Pharmacy Yangon and Mandaly

As shown in **Figure 14**, the percentages of teaching hours for all sub-competencies were nearly the same. However, the percentages of teaching hours for sub-competency statements 1.1.5 were a little different between the University of Pharmacy Mandalay and Yangon. The percentages of teaching hours for sub-competency statements 1.1.5 at the University of Pharmacy (Mandalay) was (5.75%) and at the University of Pharmacy Yangon (5%).

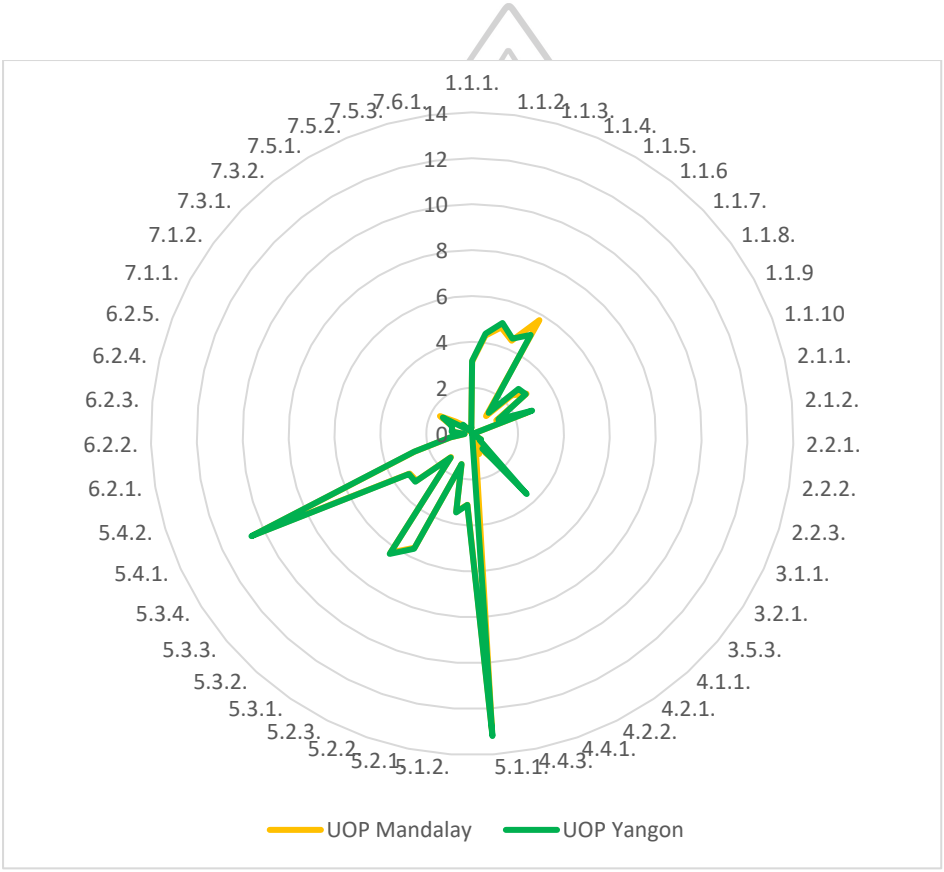

Figure 14. Teaching hours (%) of sub-competency of competency standards taught by pharmacy graduates at the University of Pharmacy (Mandalay) and (the University of Pharmacy Yangon)

4.2.11. Teaching hours (%) of patient-oriented, product-oriented, SAP-oriented in the curriculum of University of Pharmacy (Yangon) and (Mandalay)

As shown in Figure 15, the percentage of teaching hours for product-oriented hours were highest in the University of Pharmacy Mandalay (53.6%) and Yangon

(54.3%). The second-highest percentage of teaching hours was the patient-oriented curriculum; Mandalay (37.3%) and Yangon (37.1%). The lowest teaching hours were SAP-oriented curriculum, Mandalay (9.1 %) and Yangon (8.6 %).

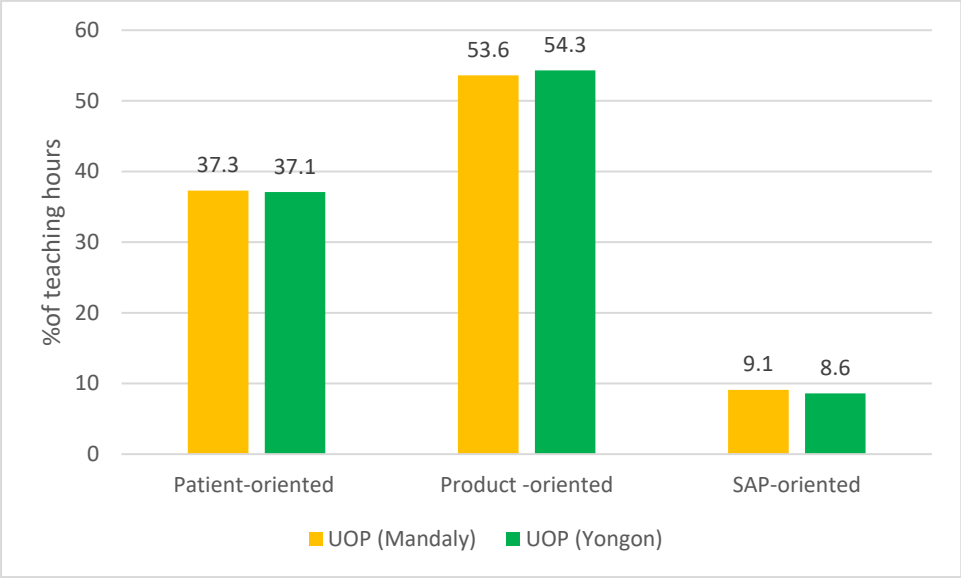

Figure 15. Teaching hours (%) of patient-oriented, product-oriented, SAP-oriented curriculum at the University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon)

4.1.12. Suggestions and comments of academic staff on the current curriculum

Thirty-five (35) academic staff provide suggestions and comments on the content and teaching methods of the current curriculum. Thirty-three (33) academic staff provide suggestions and comments on the hours of the current curriculum as well as 12 academic staff provide the assessment. 27 academic staff provide overall suggestions and comments. The results revealed that the suggestions and comments of academic staff were nearly the same as the gaps in content, teaching methods, hours and assessment and the year of program obtained from the evaluation of curriculum by using competency standards obtained from Phase one. The suggestions and comments provided by academic staff gave the information to confirm the requirements of the current curriculum and the future curriculum they would like to implement. Therefore, it is certain that the need for the development of pharmacy education and upgrading the pharmacy curriculum in Myanmar.

(1) Academic staff provided suggestions and comments on the contents were
   (a) Should add advanced technology in Pharmaceutics subjects and quality control of advanced technological products in Pharmaceutics and Pharmaceutical Chemistry; should add Hospital Service Quality Management in the content and hospital pharmacy; contents of Clinical pharmacy including prescribing, dosage calculation; MOA of natural drugs, herbal medicines or product production, herbal cosmetics in Pharmacognosy subject
   (b) The contents of pharmaceutics focus on many diverse areas because the content of Pharmaceutical Microbiology and a few contents related to Social and Administrative Pharmacy Sciences.

(2) Academic staff provided suggestions and comments on the teaching methods were
   (a) They should train the students in field-based training /experienced training/ intensive training/ in hospitals to acquire clinical experience in clinical experience, industrial experience in pharmaceutical industries and community experience, and should use research-based teaching methods and simulation methods.
   (b) It should include group work, role play, group discussion and presentation, mini-case study and assignment. Presentation time should be added after each lecture.

(3) The suggestions and comments of academic staff on the teaching hours of the current curriculum were
   (a) There were too many hours of lectures for the Pharmaceutical Sciences and practical teaching hours for advanced technology of the Pharmaceutical Sciences are few.
   (b) Hours for intensive training are needed

(4) The suggestions and comments of academic staff on the teaching hours of the current curriculum were
   (a) Not only depend on the test and exam, we should assess/judge the individual's performance and the viva/oral exam for every student in every subject.

(b) Currently, there are MCQ and MSQ to assess their theoretical knowledge and a practical exam for their practical performance. However, it should be assessed by Internationally OSCE and Single Best Answer (SBA). Project work must include

(c) Assessment of subjects in a curriculum should be designed to comprehensively evaluate students to assess their problem-solving skill, counseling skill, communication skill and critical thinking by using standardized problems or standardized problems that can assess the students' skill.

The suggestions and comments of academic staff on the durations of the curriculum were

1. It should be a 5 or 6-year Pharm D program.
2. The current pharmacy Bachelor program is a four-year program in Myanmar. In the first year, the student learns the basic sciences and then, in the following years, they learn the pharmaceutical sciences within those 3 years.
3. The current 4-year program is not really enough to meet the aim and objectives of our program to becoming competent pharmacists. All over the world, there are pharmacy programs that are more than four years old. There is a lot of evidence that these programs are effective and productive.
4. Clinical, social and medical skills are needed. Therefore, it should be upgraded to a 5- or 6-year program.
5. Over all, comments and suggestions on the current curriculum
6. It is needed for an updated curriculum to ASEAN level by comparing it with India, Thailand, China, Europe and the USA.
7. We should transform specific programs; clinical pharmacy sciences and pharmaceutical sciences and social and administrative pharmacy sciences.
8. Social, administrative and economic subjects and clinical subjects should be added in the undergraduate curriculum.
9. Convenient and comfortable lecture room to concentrate well on teaching
10. Academic staff should be sent for staff exchange to foreign countries.

11. Botany, Chemistry, Basic Behavioral Sciences and Physics should be added as basic sciences because the output of 11th medical education was rejected Basic Sciences subjects.

CHAPTER 5
DISCUSSION AND CONCLUSIION

5.1. Discussion

5.1.1. Phase one: Development of competency standards for pharmacy graduates in Myanmar with three rounds

For the development of competency standards of pharmacy graduates in Myanmar, the unmet needs of pharmacy services of pharmacy graduates, and the importance of competency for pharmacy graduates were asked in the first round from key stakeholders such as pharmacists and employers, healthcare professionals working in public and private areas, policymakers, academic staff in the university of pharmacy Yangon and Mandalay and patients. Then agreement of draft competency standards and suggestions and comments were requested from these stakeholders in the second round. Finally, the revision of competency statements by these stakeholders was conducted in the third round. The final version of competency standards of pharmacy graduates was obtained by asking for the agreement of the stakeholders.

The needs of roles for pharmacy graduates in Myanmar

The needs of roles for pharmacy graduates in Myanmar were seven roles, such as caregiver, manager, decision maker, communicator, leader, lifelong learner and researcher.

The WHO introduced the concept of the ‘Seven-star pharmacist’, detailing the roles each pharmacist must perform: caregiver, decision maker, communicator, manager, life-long-learner, teacher and leader. The inclusion of two new criteria, thereby giving rise to the ‘Nine-star pharmacist’. In addition to the seven roles, the inclusion of a pharmacist as a researcher and an entrepreneur is quite significant (46).

In hospital and community areas, all seven roles, like (caregiver, manager, communicator, decision-maker, leader, life-long learner and researcher) for pharmacy graduates were needed in Myanmar. In the research department, only the researcher role was needed, as well as in the clinic, the caregiver role was needed. The needs of roles in the government area were manager, decision maker and leader. In the regulation area, the needs of roles were manager, communicator, decision maker and

leader. In the INGO and NGO areas, they were caregiver, manager, communicator, decision maker and leader. In the pharmaceutical industry, they were manager, decision maker, leader and researcher, and alternative medicine and, in traditional medicine areas, they were caregiver, manager, decision maker, leader and researcher, respectively. In the Ministry of Health and Departments, under the Ministry of Health areas, manager, decision maker and leader roles are needed.

In Thailand, pharmacists are responsible for all activities regarding the country's access to medicines throughout the drug supply chain: the manufacturers who develop drugs, the pharmacies and hospitals that distribute them, the government agencies that oversee the process, and the primary care units that empower people to use them properly. Therefore, the needs of the Thai pharmacist workforce are unique. For example, in Thailand, the majority of pharmacists work in hospitals, community pharmacies, and the pharmaceutical industry.

The workplaces of pharmacists in Indonesia are the government, community pharmacy, hospitals, clinics, academia, manufacturers, and drug distributors.

Those in Malaysia are in the public (hospitals, clinics, National Regulatory Bureau, public healthcare) and in private [hospitals, community pharmacy, industry (drug production, research and development), and Aacademia].

Those in the Philippines are drug outlets, drug establishments, academia, government agencies, health maintenance organizations, research institutions, non-government organizations, private corporations.

Those in Vietnam are community pharmacy, hospitals and other institutions, the pharmaceutical industry, pharmaceutical affairs and policy, academia, manufacturers/marketing and the insurance industry.

The needs of roles, functions and activities of pharmacy graduates in Myanmar

The needs of (roles, functions and activities) in Myanmar were also described. In the caregiver role, the needs functions were pharmaceutical care functions.

In the manager role, the needs of functions were pharmacy management and administration in most of the pharmacy working areas.

In the community role, the needs and functions and activities were to provide drug information; demonstrate good communication; demonstrate interprofessional

and intraprofessional collaboration; demonstrate health promotion; and participate in disease prevention and control and other health-related topics.

In the role of leader, the needs of functions and activities were making policy (policymaker); leading and monitoring projects; resource mobilization; demonstrating leadership skills in the pharmacy area and searching for funds.

In a decision maker's role, the needs of functions and activities include participating as a key person on the drug and therapeutics committee in every hospital; decision-making in selecting medicine; decision-making in the areas of the pharmaceutical industry and quality control; and decision-making in all pharmacy areas. As a lifelong learner, the needs of functions were holding and in participating/Pharmacy Conference and Continuing Pharmaceutical /Pharmacy Education.

In a researcher's role, the needs were in the research center and the pharmacy areas, such as pharmaceutical, herbal medicine, pharmaceutical public health and clinical pharmacy and new drug development.

According to Lwin Nyein Aye, a hospital pharmacist in Myanmar had very limited roles and functions. Most hospital pharmacists concentrate on procurement functions and inventory. Dispensing functions for compounders and nurses. Out-patient drug dispensing is assigned to pharmacy assistants, while some hospitals delegate in-patient drug dispensing to nurses. Double-checking of prescribed drugs for drug interaction or possible ADR may be omitted when drugs are handed to patients by non-pharmacists (27). Pharmacy management is held by medical doctors (80).

An evolving healthcare workforce is one that can adapt its core roles and responsibilities to meet the new and emerging needs of patients and the public. For pharmacists, this means developing entry-level pharmacists to meet the changing demographic and healthcare needs of an aging population with increasingly complex medicine regimens within a cost-constrained healthcare system. The pharmacy workforce needs to grow in clinical capability, generalist and specialist skills development and, most importantly, the flexibility to adapt to changing patient and health system needs (81).

The role and contribution of pharmacists in the overall context of healthcare delivery is, however, changing dramatically on a global level. The changes can be summarised as pharmacists' focus on assuming a greater responsibility for the safe, effective and responsible use of medications by patients and populations, with the main goal of optimising therapeutic outcomes. Additionally, pharmacists assume key roles in health promotion, disease prevention and the management of systems and resources associated with healthcare delivery. These developments, such as medication therapy management, evidence-based pharmacy, collaborative practice, independent prescribing, and rational and responsible use of medicines, require clinical and communication skills, decision-making and critical thinking, leadership, innovation and research abilities (17). There is a projected gap between the health workforce and health system needs around the world, and especially in low-income countries (82).

The FIP Workforce Transformation Programme (WTP) is a global programme that supports FIP's member organisations and stakeholders in leading the advancement of their national pharmaceutical workforces. FIP believes that the development of the pharmaceutical workforce must be based on needs and that every country has its own distinct needs and health system circumstances (83).

Investing in transforming and scaling up pharmaceutical education is crucial for preparing a workforce that is able to adapt to new roles. In an era of rapidly accelerating changes in healthcare delivery, the roles of pharmacists are being constantly redefined. This is driving continuous change in competency and training requirements, but there is still variation and gaps in pharmaceutical education and the range of quality assurance systems (82).

Development of Competency Standards for Pharmacy Graduates in Myanmar with three rounds.

There were seven domains in the draft Competency Standards for Pharmacy Graduates after finishing the first round. They were Domains 1 Fundamental Knowledges, Domain 2 Pharmaceutical Public Health Competencies, Domain 3 Health Systems, Policy and Outcomes Competencies, Domain 4 Pharmaceutical Care Competencies, Domain 5 Pharmaceutical Sciences Competencies, Domain 6

Pharmaceutical Organization and Management Competencies and Domain 7. Professional and Personal Competencies.

The percentage of agreement of all stakeholders on all statements of draft competency standards obtained from the first round (the second round) was above 70%. The maximum percentage of the agreement among statements was 100% and the minimum percentage of agreement among statements was 79.1 %.

The response rate of stakeholders in the third round was (85.4%) and agreement of stakeholders on the final version was over 70%.

There were different numbers of competencies among competency standards obtained from the first round, the second round and the third round. There were 7 domains, 31 competitions and 60 sub-competencies in the first round. There were 7 domains, 30 competencies and 72 sub-competencies in the second round. There were 7 domains, 25 competitions and 70 sub-competencies in the third round (final version).

The names of the Domains of Competency standards final version were Domain 1 Basic Biomedical Sciences, Domain 2 Pharmaceutical Public Health Competencies, Domain 3 Health Systems, Policy and Outcomes Competencies, Domain 4 Pharmaceutical Care Competencies, Domain 5 Pharmaceutical Sciences Competencies, Domain 6 Pharmaceutical Organization and Management Competencies and Domain 7. Professional and Personal Competencies.

In 2012, the International Pharmacy Federation, through the Pharmacy Education Initiative (FIPEd), developed an evidenced-based Global Competency Framework (GbCF). The structure of (Global Competency Framework) GbCF was categorized into the four domains of Pharmaceutical Public Health, Pharmaceutical Care, Organisation and Management, and Professional/Personal. This document includes 4 domains, 20 competencies and 100 behaviors in the content (25).

In 2002, the Thai Pharmacy Council established their first competency standards with the goal that new pharmacy graduates would know how to apply the knowledge and skills they have attained during pharmacy school. These standards contain 8 domains, 40 competencies, and 71 sub-competencies. The revision of Thai pharmacy competency standards was conducted in 2008 (20). It is included seven

domains and 46 competency statements with the expectation of pharmacy graduates (12).

The General pharmaceutical council (GPhC) published standards for the initial education and training of pharmacists to provide schools of pharmacy in May 2011. In this document. The outcomes in Standard 10 refer to outcome levels for an M Pharm degree and outcome levels for pre-registration training. Standard 10 contains learning outcomes where 2 statements and 5 sub-statements and 58 specific outcomes (44).

The Centre for the Advancement of Pharmacy Education (CAPE) 2013 represents the fourth version (preceded by panels in 1992, 1998 and 2004) of educational outcomes created to guide curricular discussions between faculty and preceptors. Educational Outcomes were released and revised at the AACP July 2013 Annual meeting. These outcomes include 4 broad domains, 15 specific subdomains, and 84 example learning objectives (61).

Accreditation Standards and key elements for the professional program in pharmacy leading to a Doctor of Pharmacy Degree have been published by the Accreditation Council for Pharmacy Education (ACPE). These Standards include the 25 standards, required (key) elements, assessment elements, and required documentation for each individual standard. In this document, Standards 1- 4 describe where programs can experiment and innovate within the didactic and experiential components of their curricula to meet the required educational outcomes (45).

Stupans I, et*al*, have published the development of learning outcomes and exemplar standards in Australia for all entry-level pharmacy graduates in the International Journal of Pharmacy Practice since 2015. In this article, 8 pharmacy learning outcomes and 32 exemplar standards (PhLOS) are included (46).

The Quality Assurance in European Pharmacy Education and Training (PHAR-QA) project is producing a harmonized competence framework for pharmacy practice to be used as a basis for a QA system for the evaluation of university pharmacy education and training at the institutional, national and/or European levels. It is included in the framework of 13 clusters in two major domains with a total in all of 68 competences (79).

The Association of Faculties of Pharmacy of Canada (AFPC) Task Force on Educational Outcomes was hit by the AFPC Council of Faculties in mid-2016 to revise the 2010 version in 2016 for all entry-to-practice pharmacy programs in Canada and their work was completed in 2017. This document consists of 7 roles, 20 key competencies and 71 enabling competencies (48).

Pharmacy Board Malaysia (PBM), Ministry of Health Malaysia, published standard on approval and recognition of pharmacy programs in 2018, providing information on completing the pharmacy program and professional competencies for graduates. Three Knowledge domains, 1 Attitude domain, 9 professional competencies and a curriculum are included in this document (49).

The Standards for Undergraduate Pharmacy Education and Training in Singapore were developed by the Pharmacy Program Review Committee (PPRC) in 2015 and published by the Singapore Pharmacy Council (SPC) in 2018. It is also mentioned that 21 competency requirements related to this topic for pharmacy students. The descriptions of the topics and learning outcomes are provided for the education provider to design suitable courses for pharmacy undergraduate students (32).

This Model Core Curriculum for Pharmacy Education (2015 Version), a 6-year course, was developed through a process of review and revision by a work group to help students acquire the final “Professional Competencies for Pharmacists by Pharmaceutical Society of Japan through a process of review and revision, including The Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) approval. It was published in 2018. It includes curriculum obtained from outcome-based education in term of 10 professional competencies (84).

The structure and the number of statements of GbCF were also different from those of Thailand 2002 and 2008, Singapore 2020, Canada 2017, Australia 2016, USA 2013 and 2016 and UK 2011. The structure and the number of statements of Competency Standards for Pharmacy Graduates in Myanmar were different from that of GbCF and other countries.

The nature of national, societal and population needs, policies, and priorities will determine the services that must be provided by the pharmacy workforce to meet these needs. In turn, these services will determine what competencies must be

developed by members of the pharmacy workforce in order to deliver the services. Educational programmes must be designed and delivered (curricular content, teaching and learning methodologies, educational outcomes, etc.) to ensure that these competencies are achieved by all graduates. This is the needs-based education model (85). Therefore, the structure the number of statements of competency standards for Pharmacy Graduates in Myanmar was different from that of GbCF and other countries.

According to FIP, educators and policymakers are considering education from a standpoint of "fitness for purpose" for current needs and priorities in the healthcare system as well as for the desired and anticipated expanded roles and responsibilities in the future. Among other things, educational outcomes, competencies to be achieved, curricular content and structure will need to be modified.

The school should clearly identify and publish the educational competencies that graduates must achieve to address current and future national health-related needs using a needs-based educational model (25). In Competency-Based Education, students demonstrate mastery of explicit and measurable knowledge, skill, and attitude outcomes (competencies) and receive individualized support that is tailored to their specific developmental needs (26).

The competency standards for Pharmacy Graduates in Myanmar obtained from this study should be published at the national level and used as a pivotal guideline evaluation of curriculum for pharmacy schools in Myanmar and for the development and implementation of curriculum standards in all pharmacy schools in Myanmar.

Consensus on the opinion of all stakeholders (n=48) what are the three most important domains (the third round)

In Myanmar, consensus on the opinion of all stakeholders (n=48) about what are the three most important domains in competency statements for pharmacy graduates (the third round). Percentages (%) of the three most important Domains provided by all stakeholders are Domain 5. Pharmaceutical Sciences Competencies (68.8%), Domain 4. Pharmaceutical Care Competencies (60.4%) and Domain 3. Health system, Policy and Outcomes Competencies (50%).

In Thailand, the majority of the respondents were supportive of all 46 proposed competencies. The highest ranked domain was Domain 1 (Practice Pharmacy within Law, Professional Standards, and Ethics). The second and third-highest expectations of pharmacy graduates were Domain 4 (Provide pharmaceutical care) and Domain 3 (Communicate and disseminate knowledge effectively).

In Europe, for pharmacy practice competences in the areas of “drug interactions”, “need for drug treatment” and “provision of information and service” were ranked highest (74).

The highest % of the three most important domains provided by the stakeholders in Myanmar was Pharmaceutical sciences competencies. It has been shown that they are highly valued in the pharmaceutical sciences in Myanmar. The second highest % in the three most important domains they provided were Pharmaceutical Care Competencies. It was also shown that they taught that it was also essential. It was similar to the expectations of Thailand and Europe (11). The third highest % in the three most important domains they provided were Health systems, Policy and Outcome Competencies.

In Europe, the education and training of undergraduate students and pharmacists should be leaders/future leaders in their field and actively engaged in their discipline or profession. Therefore, all pharmacists undertaking a tutoring role will be expected to be a member of the RPS. All student pharmacists (undergraduate and those in postgraduate formal programmes) should have ready access to leaders in pharmaceutical science, policy and clinical practice to act as role models.

One of the visions in workforce development in Europe is agreed that in order for the pharmacy profession to develop and reach its true potential, clinical/policy/science leadership must be nurtured at an early stage and should be demonstrated in curricula (68). Therefore, these competencies are also essential for the development of health systems and policies as well as the regulation of medicines and pharmaceutical products, and pharmacists and pharmacy students to the quality, safety and efficacy use of medicines by patients and the public.

Consensus on the opinion of all stakeholders (n=48) what are the three least sub-competencies statements (the Third round)

In Myanmar, the three least important sub-competencies statements provided by all stakeholders were 1.1.1. Understand the basics of plant and animal biology (27.1 %); 2.2.2. Responds to questions using appropriate strategies (25 %) and 1.1.4. Understand the basics of statistics, calculations and mathematical analysis (20.8%).

In Myanmar, the first and the third-highest percentages provided by stakeholders on the three least important sub competencies were 1.1.1. Understand the basics of plant and animal biology" and "1.1.4. Understand the basics of statistics, calculations and mathematical analysis" respectively. They were basic sciences, and they believed that they were not the main pharmacy competencies. The second-highest percentages provided by stakeholders on the three least important sub-competency statements were 2.2.2. Respond to questions using appropriate strategies. However, according to the culture and behavior of Myanmar, they think that it is not essential.

However, in Thailand, there were three competency statements in which the expectation was moderately less than other competency statements. These statements included the preparation of sterile products and chemotherapeutic agents, and analyzing drug-related problems for national policy planning. Pharmacists did not expect that all pharmacists would be able to prepare sterile products and chemotherapeutic agents because these roles would require special skills and facilities. Therefore, these competencies were rated lower by the respondents in Thailand (20).

In Europe, for pharmacy practice, competences in the areas of "ability to design and conduct research" and "development and production of medicines" were ranked lower (74).

The opinion of stakeholders for the years to complete the competency standards (the third round)

The opinions of stakeholders in Myanmar in the years completing competency statements on these competency standards for pharmacy students were described. Six years and five years were the highest percentages of stakeholders' opinions, and they

were 35.4% and 33.3% respectively. Then it was followed by 5 or/to 6 years (16.7%); 4 years (10.4%) and 3–4 years (4.2%) respectively.

In developed countries, there are similar in course length. Most are approximately 6 years Pharm D if pre-entry standards and internships are included in the USA, Canada, Japan (36) and South Korea (78).

Accreditation Standards and key elements for the professional program in pharmacy leading to a Doctor of Pharmacy Degree have been published by the Accreditation Council for Pharmacy Education (ACPE) (72).

In the UK, there are five years under the graduate M.Pharm. programme and a 6-month sandwich placement would equate to 6 months of pre-registration training being added to become pharmacists (79). General Pharmacy Counsel published in 2011 standards for initial education and training of pharmacists, in which it is mentioned that in Great Britain the four-year M. Pharm. degree is separate from the 52-week pre-registration training with one exception: a five-year M. Pharm. degree with two intercalated periods of pre-registration training (71).

The Quality Assurance in European Pharmacy Education and Training (PHAR-QA) project is producing a harmonized competence framework for pharmacy practice to be used as a basis for a QA system for the evaluation of university pharmacy education and training at the institutional, national and/or European levels. The framework is intended for a European 5-year pharmacy degree (74).

In 2008, all Thai pharmacy graduates from either the 5-year Bachelor's degree or 6-year PharmD degree had to take the same licensure examination, which is based on the Thai competency standards. Currently, Thailand has a 6-year Pharm D Program (80).

Stupans I, et*al*, have published the development of learning outcomes and exemplar standards in Australia for all entry-level pharmacy graduates in the International Journal of Pharmacy Practice since 2015. In Australia, there is a four-year Bachelor's program, a two-year Master's program and, following successful completion of one of these university-based bachelor's or master's degree programs. Graduates must complete approximately 12 months of internship in a practice setting under the supervision of a Pharmacy Board-approved pharmacist (86).

Pharmacy Board Malaysia (PBM), Ministry of Health Malaysia, published standards on approval and recognition of pharmacy programs in 2018. The program will last for a minimum of 4 calendar years and provides Bachelor of Pharmacy, Bachelor of Science (Pharmacy), and Bachelor of Pharmacy (Honours) degrees.

The Standards for Undergraduate Pharmacy Education and Training in Singapore were developed by the Pharmacy Program Review Committee (PPRC) in 2015 and published by Singapore Pharmacy Council (SPC) in 2018. The descriptions of the topics and learning outcomes are provided for the education provider to design suitable courses for pharmacy undergraduate students. Singapore has a BS pharmacy (4 years Undergraduate and one-year pre-registration training and experienced learning) program to become pharmacists (32, 87) and it is also starting a Pharm D program.

This Model Core Curriculum for Pharmacy Education (2015 Version), a 6-year course, was developed through a process of review and revision by a work group to help students acquire the final "Professional Competencies for pharmacists" by the Pharmaceutical Society of Japan through a process of review and revision, including the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) approval. It was published in 2018 (84). Therefore, in Myanmar, to meet the competency for pharmacy graduates according to the competency standards, it should be upgraded to a 5-or 6-year Pharm D program leading to pre-registration level.

5.1.2. Phase two: Evaluation of current curriculum towards the proposed standards for pharmacy graduates in Myanmar

The analysis of current undergraduate pharmacy curriculum at the University of Pharmacy Yangon and the University of Pharmacy

The study revealed that the B. Pharm. curriculum of Universities of Pharmacy [the University of Pharmacy (Mandalay) and University of Pharmacy (Yangon) in Myanmar. The curriculum of B. Pharm. in Myanmar is content-based. The names of 19 subjects are included in the B. Pharm curriculum of University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon) and these subjects and their departments were described.

The subjects on the current curriculum of the University of Pharmacy Yangon and Mandalay were categorized into five categories of sciences according to the

contents of subjects. Botany, Zoology, Chemistry, and Mathematics were Basic Sciences. Anatomy, Physiology, Biochemistry, Pathology, Medical Microbiology, and Pharmacology were Biomedical Sciences. Pharmaceutical Chemistry, Pharmacognosy, Pharmaceutical Microbiology, and Pharmaceutics I and some contents in Pharmaceutics II were Pharmaceutical Sciences. Some contents in Pharmaceutics I and II and the contents of Behavioral Sciences and Preventive and Social Medicines were matched with Social and Administrative Pharmacy Sciences. Some contents of Pharmacology were matched with Clinical Pharmacy Sciences. The languages were English and Myanmar.

The 11th Medical Education Seminar was held by the leader of the Department of Human Resources for Health at Nay Pyi Daw in August and presented reviewed and revised (B. Pharm.) Pharmacy curriculum in this seminar. The reason why, reviewing and revising the pharmacy curriculum was the course schedule and curriculum for those who passed the university entrance examination under the new education system, such as KG+ 12 (KG+, a 4- year primary school, a 4-year middle school and a 4-year-high school), at medical universities and medical related universities including Universities of Pharmacy. The old education system was KG+ 10 (KG+, a 4-year-primary school, a 4-year-middle school and a 2-year-high school). The Union Minister, the Ministry of Health instructed the duration of the course and the curriculum to be taught that needs to be in line with what is being taught in ASEAN countries and international standards. Therefore, reviewing and revising the curriculum for all universities under the Ministry of Health has to continue to be set up on time.

The output of the 11th Medical Education seminar was that this program would be B. Pharm. In this program, Botany, Zoology, Chemistry, and Mathematics, subjects were omitted. Anatomy, Physiology and Biochemistry are taught in the first year. Medical Microbiology and Pathology will be taught in the second year. Pharmacology will be taught in the second year and third year. Pharmaceutical Chemistry, Pharmacognosy Pharmaceutics I will be in the first year, the second year, the third year and final year. Clinical Pharmacy will be taught in the final year. Pharmaceutical Microbiology will be added in Pharmaceutics I, Pharmaceutics II will be taught in the third year and final year. Research Methodology will be taught in the

third year. There are no social and administrative pharmacy subjects in the future curriculum they would like to set up. The future curriculum they would like to implement is also a content-based curriculum, because the competency standards for pharmacy graduates have not been developed, launched and implemented yet.

According to the Accreditation Council for Pharmacy Education (ACPE) guidelines for foundation in Sciences, the pharmacy curriculum includes four categories: the Basic Biomedical Sciences, Pharmaceutical Sciences, Social/ Behavioral/Administrative Pharmacy Sciences and Clinical Sciences. In Basic Biomedical Sciences, the courses included were Anatomy, Physiology, Pathology/Pathophysiology, Microbiology, Immunology, Biochemistry, Bio-technology, Molecular Biology/Genetics, and Biostatistics. In Pharmaceutical Sciences, the courses included were Medical Chemistry, Pharmacology, Pharmacognosy and Alternative and Complementary treatments, Toxicology, Bio-analysis/Clinical chemistry, Pharmaceutics/Biopharmaceutics, Pharmacokinetics/Clinical Pharmacokinetics, Pharmacogenomics/genetics, Extemporaneous Compounding/Parenteral/External. In Social/ Behavioral/Administrative Pharmacy Sciences, the courses included were Healthcare Delivery Systems, Economics/Pharmacorconomics, Practice Management, Pharmacoepidemology, Pharmacy Law and Regulatory Affairs, History of Pharmacy, Ethics, Professional Communication, Social and Behavioral Aspects of Practice, Informatics. In Clinical Sciences. Courses included were Pharmacy Practice and Pharmacists Provided Care, Medication Dispension and Distribution Systems, Pharmacotherapy, Pharmacist providing care for Special Populations, Drug information, Medication Safety, Literature Evaluation and Research Design, and Patient Assessment Laboratory (41).

An appropriate balance of the curricular components of Basic Sciences, Pharmaceutical Sciences, Biomedical and Clinical Sciences, Socioeconomic and Behavioral Sciences with practical experience has been recommended by WHO (41, 45). The components of the Undergraduate program, Doctor of Pharmacy curriculum (Pharm D) in the USA (72) include Basic Biomedical Sciences, Pharmaceutical Sciences, Social/Behavioral/ Administrative Pharmacy Sciences and Clinical Sciences (41, 72).

Currently, the Myanmar pharmacy undergraduate curriculum is exposed to the 4-year (B. Pharm.) program. A few contents related to Clinical Pharmacy Sciences were taught in Pharmacology subject. A few contents of the Social and Administrative Pharmacy Sciences were taught in Pharmaceutics, Behavioral Science and Preventative and Social Medicines. The contents of Pharmaceutics were under Pharmaceutical Sciences and the contents of Pharmacology were Biomedical Sciences/Pharmaceutical Sciences. The definition and outcomes of the Clinical Pharmacy subject were different from those of the Pharmacology subject. The definition and outcomes of the Social and Administration Pharmacy subject were different from those of pharmaceutics. In the future, the curriculum that the academic leaders would like to implement is also a 4-year undergraduate B. Pharm curriculum. In the future curriculum they have planned and would like to implement, and subjects of the Biomedical Sciences Division, subjects of the Pharmaceutical Sciences Divisions, and subjects of clinical pharmacy will be included but the subjects of the Social and Administrative Pharmacy Sciences Division will not be included. These situations heavily impact on the quality of pharmacy education and also hinder the development of human resources for health. The development of human resources depends on the quality of Pharmacy education to produce competent Pharmacy graduates. Moreover, the duration (4 years) of the current curriculum(the output of 10th medical education) and the future curriculum they have planned (the output of 11th medical education) are not enough to meet Pharmaceutical Sciences, Clinical Pharmacy Sciences and Social and Administrative Pharmacy Sciences areas with effective teaching learning methods, hours and assessment)to become competent pharmacists.

For the development of pharmacy education curriculum, to become competent pharmacists is that pharmacy education development is under the control of Medical Education. Currently, the authorized person from the Department of Human Resources for Health set/puts the Pharmacy Education under Medical Education. The definition, curriculum and outcomes of medication are not the same and are really different from the definition, curriculum and outcomes of Pharmacy Education. Medication Education is to produce medical doctors and Pharmacy Education is to produce pharmacists.

For the development of the pharmacy education curriculum to meet international recognition to become competent pharmacists, it is necessary to transform the Organization Structures of the University of Pharmacy Yangon and Mandalay for the development of pharmacy education. All subjects/courses in the Basic Biomedical Sciences Division, like (Anatomy, Physiology, Biochemistry, Pathology, Microbiology, and Pharmacology), each one has their own departments, and they have their own roles and responsibilities. All the subjects in the Pharmaceutical Sciences Division, like (Pharmaceutical Chemistry, Pharmacognosy and Pharmaceutics), each and every have their own departments, and they have their own roles and responsibilities. However, for the Clinical Sciences Division, there are no departments for the subjects/courses for Clinical Pharmacy area subjects, as well as for the Social and Administrative Pharmacy Sciences Division. This organizational structure in the Universities of Pharmacy for the effective management system also negatively impacts on the development of pharmacy education and curriculum development because of the misuse of the right person and biased use of human resources.

Therefore, contents related to Clinical Pharmacy should not be under pharmacology departments. For this subject, Clinical Pharmacy should be set up under Clinical Pharmacy departments. In the same situation, the content related to the Social and Administration Pharmacy should not be included under Pharmaceutics subject, because Pharmaceutics is a product-oriented curriculum and Social and Administrative Pharmacy (SAP) is a SAP-oriented curriculum. The Social and Administration pharmacy department should be set up to meet a SAP-Oriented curriculum to become competent Pharmacists. The way the strategies of teaching and learning is different for those subjects, and they are the right person should be to become a competent pharmacy graduate.

Last but not least, in Myanmar, the Ministry of Health for Doctors, Dentists, Nurses and Traditional Medicines Practitioners have licenses and their own Council, like Medical Counsel, Dental Counsel, Counsel of Nursing and Counsel of Traditional Medicines. However, for pharmacy graduates to become pharmacists, there is no licensure examination to become a competent pharmacist and to meet an internationally recognized pharmacy program.

Evaluation of current undergraduate pharmacy curriculum at the University of Pharmacy (Yangon) and (Mandalay) by using competency standards obtained from the Phase one

The competency statements are taught or not (Yes/No) and the names of subjects for pharmacy graduates from the University of Pharmacy (Mandalay) and (Yangon)

All the competencies and sub-competencies under Domain 1 (Basic Biomedical Sciences), 2 (Pharmaceutical Public Health competencies) and 5 (Pharmaceutical Sciences Competencies) were taught at the Universities of Pharmacy Mandalay. However, all the competencies and sub-competencies under Domain 1 (Basic Biomedical Sciences) and 5 (Pharmaceutical Sciences Competencies) were taught at the University of Pharmacy Yangon. A few competencies and sub-competencies under Domain 2 (Pharmaceutical Public Health competencies) were taught with a few teaching hours at the University of Pharmacy Yangon.

Some of the competencies and sub-competencies under Domain 3 (Health Systems, Policy and Outcome Competencies) (Health Systems, Policy and Outcome Competencies), 4 (Pharmaceutical Care Competencies), 6 (Pharmaceutical Organization and Management Competencies) and 7 (Professional and Personal competencies) were not taught in both Universities. A few competencies and sub-competencies of these domains were taught within a few teaching hours.

Therefore, competency gaps occurred when meeting competencies and sub-competencies under Domain 3 (Health Systems, Policy and Outcome Competencies), 4 (Pharmaceutical Care Competencies), 6 (Pharmaceutical Organization and Management Competencies) and 7 (Professional and Personal competencies) of competency standards in both universities. However, competency gaps occurred when meeting competencies and sub-competencies under Domain 2 (Pharmaceutical Public Health competencies) of competency standards at the Universities of Pharmacy Yangon. Competency statements 2.2.and their sub-competency statements in Domain 2 were not taught at the University of Pharmacy Yangon. Competency statements 3.3. and 3.4. and their sub-competency statements in Domain 3 were not taught at the University of Pharmacy Mandalay. Competency statements 3.1., 3.3. and 3.4. and

their subcompetency statements in Domain 3. were not taught at the University of Pharmacy Yangon.

Competency statements 4.3. and their sub-competency statements in Domain 4 were not taught at the University of Pharmacy Mandalay. Competency statements 4.3. and 4.4. And their sub-competency statements in Domain 4 were not taught at the University of Pharmacy Yangon.

Competency statements 6.1., 6.3. and 6.4. their subcompetency statements in Domain 6 were not taught at both universities. Competency statements 7.2. and 7.4. their sub-competency statements in Domain 7 were not taught at both universities.

The difference between what competency statements were taught or not at the University of Pharmacy Mandalay and Yangon

Competency statements 2.2. and their sub-competency statements under Domain 2 were not taught at the University of Pharmacy Yangon. Competency statements 3.1. and their sub-competency statements were not taught at the University of Pharmacy Yangon under Domain 3. Competency statements 4.4. and their sub-competency statements under Domain 4 were not taught at the University of Pharmacy. However, these competency statements and sub-competency statements were taught at the University of Pharmacy, Mandalay for a few hours.

Matching teaching methods in the subjects of the curriculum of the University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon) by using the competency standards(n=80)

The teaching methods used for the competency statements of Domain 1 (Basic Biomedical Sciences) were Method 1 (lecture); Method 2 (demonstration/video clip slide show) or Method 4 (lab/ practical/calculation) and Methods 3 (assignment/ tutorial /oral presentation/discussion). The teaching methods used for some competency statements of Domain 4 (Pharmaceutical Care Competencies) were Method 1 (lecture); Method 3 (assignment/ tutorial /oral presentation/discussion) and Method 6 (field trip for clinical training).

The teaching methods used for competency statements of Domain 5 (Pharmaceutical Sciences Competencies) were Method 1 (lecture); Method 3(assignment/ tutorial /oral presentation/discussion); Method 4 (lab/ practical); Method 5 (mini research project) and Method 6 (field trip for industrial training)

teaching methods used for most of the competency statements in Domain 1 (Basic Biomedical Sciences) and Domain 5 (Pharmaceutical Sciences Competencies) were teacher-centered as well as student and not only to meet knowledge, but also to meet skills.

On the other hand, the teaching method used for competency statements in Domain 2 (Pharmaceutical Public Health competencies), Domain 3 (Health Systems, Policy and Outcome Competencies), Domain 4 (Pharmaceutical Care Competencies) and Domain 6 (on Pharmaceutical Organization and Management Competencies) and Domain 7 (Professional and personal competencies) was lecture method, so it was teacher centered to meet knowledge only.

The teaching methods implemented the most were lectures and presentations, followed by class discussions and collaborative classwork (92). Patient assessment skills should also be taught to identify, resolve, and prevent drug therapy problems. Since patient assessment skills are part of the everyday practice of pharmacists, it is important that pharmacy students are properly trained with these skills (93). Some teaching and learning approaches are integrative, including case-based learning, team-based learning, problem-based learning, and enquiry-based learning and through experiential learning (94). Learner-centered, active learning methods allow us to achieve learning outcomes effectively, mostly in the field of practical skills, so important in healthcare professions. Case-studies, role-play and simulation exercises turned out to be the most popular methods in teaching Pharmaceutical Care. The changing role of pharmacists in community pharmacies and active learning methods can be particularly useful in providing pharmacy students with the necessary skills to deliver pharmaceutical services.

Therefore, case-studies and various faces of simulation are particularly popular among active learning methods at Pharmacy Faculties, and they meet the necessary skills. Moreover, medical educators have to provide practical experience for their learners, necessary to achieve competencies in the fields of interpersonal communication, decision-making and management (90).

Therefore, teaching methods for Domain 1 and Domain 5 should be used, especially experiment learning to achieve skill and experienced learning in the laboratory and the pharmaceutical factory to achieve performance. Teaching Methods

for Domain 4 should be used in case-based learning, team-based learning, problem-based learning, various types of simulation and clinical experiential learning methods, including patient assessment skills to achieve skills and performance. Teaching Methods for Domain 2, Domain 3, Domain 6 and Domain 7 should be used for case-based learning, team-based learning, problem-based learning, enquiry-based learning, various faces of simulation, experiential and research/project-based learning methods in the area of pharmaceutical public health and community to get skill and performance.

Matching teaching hours in the subjects of curriculum of the University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon) by using competency standards

The total teaching hours of the subjects in the curriculum, matched to the competency statements of Domain 5 (Pharmaceutical Sciences Competencies) and those of Domains 1 (Basic Biomedical Sciences), were significantly large. However, the total teaching hours of the subjects in the curriculum matched to the competency statements of Domain 2 (Pharmaceutical Public Health competencies), Domain 3 (Health Systems, Policy and Outcome Competencies), Domain 4 (Pharmaceutical Care Competencies) and Domain 6 (Pharmaceutical Organization and Management Competencies) and Domain 7 (Professional and personal competencies) were significantly low.

Therefore, total teaching hours of competency statements for Domain 2 (Pharmaceutical Public Health competencies), Domain 3 (Health Systems, Policy and Outcome Competencies), Domain 4 (Pharmaceutical Care Competencies) and Domain 6 (Pharmaceutical Organization and Management Competencies) and Domain 7 (Professional and personal competencies) should be needed to meet competency for pharmacy graduates.

T**ypes of assessment of competency statements in the competency standards for pharmacy graduates from the University of Pharmacy (Mandalay) and (Yangon)**

The assessment methods used for most of the competency statements of Domain 1 (Basic Biomedical Sciences) were Multiple Choice Question (MCQ); Multiple Short Question (MSQ); practical /laboratory exam and viva/oral exam at

both universities. Assessment methods used for most of the competency statements of Domain 1 (Basic Biomedical Sciences) and Domain 5 (Pharmaceutical Sciences Competencies) were not only to assess knowledge but also skills (for practical or demonstration skills).

Assessment methods used for most of the competency statements of Domain 5 (Pharmaceutical Sciences Competencies) were Multiple Choice Question (MCQ); Multiple Short Question (MSQ) and practical /laboratory exam at both universities.

The assessment method used for a few competency statements in Domain 2(Pharmaceutical Public Health competencies), Domain 3 (Health Systems, Policy and Outcome Competencies) and Domain 4 (Pharmaceutical Care Competencies), Domain 6(Pharmaceutical Organization and Management Competencies) and Domain 7 (Professional and personal competencies) were Multiple Choice Question (MCQ) and Multiple Short Question (MSQ) in both Universities and to assess knowledges only.

Various assessment methods used in the curriculum include essays/short essays, multiple choice questions (MCQ), practical exercises and viva voce/oral examination. These assessments are done periodically at regular intervals at the end of each semester (formative) and at the end of the course (summative) examinations (95).

The most common assessment method was standardized tests with open- and closed-ended questions, followed by tests with open-ended questions, experiment reports, and project portfolios (92).

Competency-based assessment measures students' performance against previously defined standards. Assessment methods based on competencies could be grouped into:

1. Self-assessment and self-reflection tasks, experiential placement or work-based learning activities.
2. Annual competence-based assessments, performance-based assessments, ability-based outcome, pre- and post-course comparisons of competence, OSCEs, student acceptance into placements and the concept of programme level assessment
3. Portfolios

Multiple-choice testing is a widely implemented method used to assess student performance in doctor of pharmacy (PharmD) programs. However, this form of testing may not be the best way to assess clinical and communication skills. Multiple-choice examinations are reliable for measuring knowledge, but interviewing, interpersonal, physical examination, and problem-solving skills are not assessed objectively. The use of OSCEs to evaluate clinical knowledge and competence, professional judgment, problem-solving skills, and interpersonal and communication skills. Integrated assessments include simulated/real patient care within dispensing classes, Objective Structured Clinical Examinations (OSCEs), case- and poster-presentations and the competency assessments administered by the placement preceptors.

Therefore, integrated, competency-based assessment in the curriculum of the University of Pharmacy Yangon and Mandalay should be used to assess not only knowledge and skill, but also to assess attitude and performance for producing competent pharmacists.

Matching the subjects at the University of Pharmacy (Mandalay) and the University of Pharmacy (Yangon) with for competency statements of competency standards

Most of the competency statements of Domain 1 (Basic Biomedical Sciences) were taught in the contents of Anatomy, Physiology, Biochemistry, Pathology, and Pharmacology, microbiology (Medical and Pharmaceutical) at both universities.

The few competency statements of Domain 2 (Pharmaceutical Public Health competencies), were taught in the contents of Pharmaceutics and Preventive and Social Medicines at both universities.

The few competency statements of Domain 3 (Health Systems, Policy and Outcome competencies) were taught in Pharmaceutics I and II and Preventive and Social Medicines, at the University of Pharmacy Mandalay. However, these competency statements of Domain 3 (Health Systems, Policy and Outcome Competencies) were taught only in Pharmaceutics at the University of Pharmacy Yangon.

A few competency statements of Domain 4 (Pharmaceutical Care Competencies) were taught in Pharmacology and Pharmaceutics at both universities.

Most of the competency statements for Domain 5 (Pharmaceutical Sciences Competencies) were taught in Pharmaceutics I & II, Pharmaceutical Chemistry and Pharmacognosy at both universities.

A few competency statements for Domain 6 (Pharmaceutical Organization and Management Competencies) were taught in Pharmaceutics and were taught at both universities.

A few competency statements of Domain 7 were taught in Behavial Sciences, Preventive and Social Medicines, Pharmaceutics II at both universities.

Basic sciences like Biology (Botany and Zoology), Chemistry, Physics, Mathematics subjects as well as language subjects like English and Myanmar were not mapped/included with these competency standards.

According to the results of patient-centred educational content in the undergraduate pharmacy curriculum in Australia, Canada, USA and New Zealand, there were four large groups in the first hierarchical level, such as Clinical Sciences Aspects, Social and Behavioral Pharmacy Sciences Aspects, and Administrative Pharmacy Sciences Aspects, and Miscellaneous (41). Pharmaceutical public health is one of the four domains recognised by the International Pharmaceutical Federation's Global Competency Framework Version 2 (International Pharmaceutical Federation, 2020b) and incorporates emergency response, health promotion, and medicine information and advice. A public health perspective in all pharmacy competency domains assists pharmacists to understand their responsibility to improve the health and wellbeing of communities and populations. Pharmacist services providing health promotion, screening and disease prevention should be directed at community needs. The evolution of pharmacy competencies in global health, health informatics and disaster management are current topics. The inclusion of public health competencies in undergraduate training and professional development is important to ensure that pharmacists are aware of their responsibilities at a community or population level (91).

The competency statements of Domain 2. Pharmaceutical Public Health Domain 3, Health Systems, Policy and outcomes, Domain 6, Pharmaceutical Organization and Management, and Domain 7. Professional and Personal competencies of competency standards obtained from Phase one, should not be taught

in the content of Pharmaceutics, Preventive and Social Medicines and Basic Behavial Sciences, because Preventive and Social Medicines are the curriculum of doctors' professions and Basic Behavial Sciences is basic sciences. Pharmaceutics subjects should only be under the Pharmaceutical Sciences Domain because these subjects are under the product-oriented curriculum. Moreover, the competency statements of Domain 4 Pharmaceutical Care competencies should not be taught in Pharmacology subjects.

Therefore, improving health and pharmaceutical care for patients and populations requires the right number of pharmacy workforce with the right competencies in the right places and teaching the right competencies in the right subjects. Moreover, to meet the required competency statements as well as to fill the gaps in competency statements of competency standards obtained from Phase I, it is necessary to transform the pharmacy education system, including curriculum, to become internationally recognized pharmacy schools.

Percentages of Teaching hours of Domains, Competencies and Sub-Competencies of Competency Standards between University of Pharmacy Yangon and Mandaly

The percentage of teaching hours for Domain 5 Pharmaceutical Sciences Competencies was the highest in both universities. The teaching hours and percentage of competency statements are 1.1. Basic Biomedical Sciences was the largest of both universities. The teaching hours and percentage of sub-competency statements 5.1.1. was the significantly largest. The percentages of teaching hours for Domain 2 Pharmaceutical Public Health Competencies and Domain 3 Health Systems, Policy and Outcomes were significantly lowest. The percentage of teaching hours for competency statement 2.2. ; 3.1. and 4.4., was too low and can be seen only at the University of Pharmacy Mandalay. For both universities, there was not seen percentage of teaching hours for 3.3., 3.4., 4.3, 6.1., 6.3, .6.4., 7.2. and 7.4 respectively. The percentages of teaching hours for sub-competency statements 2.2.1 and 2.2.3 were the lowest.

In Thailand in 2008, it was no surprising that the percentage of credit hours for the domain of ‘‘manufacturing and quality assurance’’was the highest for the

Bachelor of Pharmacy program. However, the PharmD programs were less focused on the domain of manufacturing and quality assurance (19).

Teaching hours (%) of patient-oriented, product-oriented, SAP-oriented in the curriculum of University of Pharmacy (Yangon) and (Mandalay)

The percentage of teaching hours for product-oriented curriculum was significantly the largest in both universities. Then followed by the percentage of teaching hours for patient-oriented curriculum. The percentage of teaching hours on the SAP-oriented curriculum was significantly lowest in both universities. The ratio between the patient-oriented curriculum, the product-oriented curriculum, and the SAP-oriented curriculum was 1.86:2.68.:0.45 for the University of Pharmacy Mandalay and the University of Pharmacy Yangon was 1.86:2.7:0.43. The BS programs predominantly had product-oriented content. Similar to the undergraduate programs in Thailand, New Zealand and European countries, the major focus of pharmacy education was traditional, product-oriented topics. The ratio of 3:2:1 for the patient-oriented, the product-oriented, and the SAP-oriented components developed by the Thai Pharmacy Council forms the basis of the Thai licensure examination and all Thai pharmacy schools were aware of this ratio (19). Therefore, the ratio of the patient-oriented curriculum, the product-oriented curriculum, and the SAP-oriented curriculum in Myanmar were more aligned with those recommended by the Thai Pharmacy Council or Myanmar Pharmacy Council when it was set up.

The suggestions and comments of academic staff on the current curriculum

The suggestions and comments provided by academic staff gave the information to confirm the requirements of the current curriculum and the future curriculum they would like to implement. Therefore, there is certainly the need for the development of pharmacy education and upgrading the pharmacy curriculum in Myanmar.

Limitations and Further Study

One limitation of this study is that the grouping of competencies was based on literature review and expert discussions. While these methods provide valuable insights, they may involve a degree of subjectivity. To enhance the reliability of the competency structure, future research could apply factor analysis to statistically validate the grouping of competencies.

In addition, conducting stakeholder hearings with broader groups such as educators, practitioners, policymakers, and students could help refine the competency framework and ensure that it aligns more closely with real-world needs. These steps would contribute to strengthening the validity and applicability of the proposed competencies for pharmacy education development.

5.2.Conclusions

Phase one: Development of competency standards for pharmacy graduates in Myanmar (with three rounds)

It is concluded that pharmacy services should be necessary to be improved in Myanmar. To improve services, it is essential to transform the advancement and development of the pharmacy workforce to achieve universal health coverage. For the development of the pharmacy workforce, competency-based education should be changed in Myanmar. For the transformation of competency-based education, the development of competency standards is essential.

It is concluded that the final version of the competency statements of competency standards includes (7) Domains; (25) Competencies and (70) Sub-competencies. The competency framework (the final version) of the competency standards includes Domain 1 Basic Biomedical Sciences, Domain 2 Pharmaceutical Public Health Competencies, Domain 3 Health Systems, Policy and Outcomes Competencies, Domain 4 Pharmaceutical Care Competencies, Domain 5 Pharmaceutical Sciences Competencies, Domain 6 Pharmaceutical Organization and Management Competencies and Domain 7 Professional and Personal Competencies.

The consensus on the opinion of all stakeholders on the three most important domains in the development of competency standards for pharmacy graduates is Domain 5. Pharmaceutical Sciences Competencies, Domain 4. Pharmaceutical Care Competencies and Domain 3. Health system, Policy and Outcomes.

The consensus on the opinion of all the stakeholders on the three least important sub-competencies statements provided by all stakeholders was 1.1.1. Understand the basics of plant and animal biology; 1.1.4. Understand the basics of statistics, calculations and mathematical analysis and 2.2.2. Responds to questions using appropriate strategies

In Myanmar, to meet the competency of pharmacy graduates according to the Competency Standards, it should be upgraded to a 5-or 6-year Pharm D program leading to a pre-registration level.

Phase two: Evaluation of current pharmacy curriculum towards the proposed standards for pharmacy graduates in Myanmar

There are no subjects for Clinical Sciences and Social and Administrative Sciences.

All the competencies and sub-competencies of competency standards with the highest teaching hours and lectures and practical were taught in Domain 5. All the competencies and sub-competencies of competency standards with the second-highest teaching hours with lecture and demonstration were taught in Domain 1.

Most of the competencies and sub-competencies of Domain 3 (Health Systems, Policy and Outcome Competencies), 4 (Pharmaceutical Care Competencies), 6 (Pharmaceutical Organization and Management Competencies) and 7 (Professional and personal competencies) of competency standards were not taught at both universities.

Some competencies and sub-competencies of Domain 2 (Pharmaceutical Public Health competencies) were taught with a few teaching hours and lecture method at the University of Pharmacy Mandalay. However, a few competencies and sub-competencies of Domain 2 with a few teaching hours and lecture method were taught at the University of Pharmacy Yangon.

Forty (40) competency statements (11 competencies and 29 sub-competencies) were not taught in all subjects at the University of Pharmacy Yangon. However, sixteen (16) competency statements (7 competencies and 9 sub-competencies) were taught in the Pharmaceutics and Preventive and Social Medicines and Behavial Sciences and Pharmacology with a few teaching hours at the University of Pharmacy Yangon. However, the teaching method was lecture only, so it is a teacher-centered method to meet knowledge only.

Thirty (30) competency statements (8 competencies and 22 sub-competencies) were not taught in all subjects at the University of Pharmacy Mandalay. However, twenty-six (26) competency statements (10 competencies and 16 sub-competencies) were taught in Pharmaceutics and Preventive and Social Medicines and Behavial

Sciences and Pharmacology within a few teaching hours. The teaching method was lectures only, so it is a teacher-centered method to meet knowledge only.

It is concluded that Domain 2, Domain 3 and Domain 4 were the most lack competency statements of competency standards. It is followed by Domain 6 to fill the gap with competency standards for pharmacy graduates.

Recommendations

It is recommended that the pharmacy curriculum in Myanmar be revised toward a competency-based education model, aligning with international trends in health professions education. The set of competencies developed from this study should serve as a foundational framework to guide curriculum design, ensuring that graduates are well-prepared to meet the evolving needs of the healthcare system.

To strengthen the curriculum and enhance graduates' readiness for real-world practice, it is also advised to introduce and expand coursework in the areas of Social and Administrative Pharmacy and Clinical Pharmacy. These subject areas are essential for equipping students with:

- A deeper understanding of the primary healthcare, health system, health policy, pharmaceutical law, health economic, and health service. (Social and Administrative Pharmacy)
- Practical skills in patient-centered care, medication management, and patient counselling and monitoring. (Clinical Pharmacy)

APPENDICES

Appendix 1. Inform Consent for Phase one

Informed consent

This informed consent of the stakeholders in Phase one is the one that pharmacists, pharmaceutical scientists, health care professionals, employers, policy makers and patients are invited to participate in the research which will be conducted in Myanmar, titled "**Development of competency standard for pharmacy graduates in Myanmar".**

Name of principal investigator- Mi Mi Saw

Name of organizations - Department of Pharmaceutics, University of Pharmacy, Yangon

Name of proposal - Development of competency standard and evaluation of pharmacy curriculum in Myanmar towards the proposed standards

Part I: Information sheet (Phase one)

1. **Introduction**

   I am Mi Mi Saw, and working in University of Pharmacy, Yangon. I am doing research on "Development of competency standard and evaluation of pharmacy curriculum in Myanmar towards the proposed standards". I would like to give you information and invite you to participate in this research. If you have any quarries during conducting research, you can ask me to explain them. If you have questions later, you can also ask me again or another researcher.

2. **Purpose of the research**

   In this study, we would like to gather the information about needs of roles, functions and activities and the important competencies of pharmacy graduates. This information might be helpful to develop competency standards for pharmacy graduates in Myanmar.

3. **Type of research intervention**

   The research will involve your participation in Delphi with three rounds.

4. **Participant selection**

   You are being invited to take part in this research because we feel that your experiences can contribute much to our understanding on the needs of (roles,

function and activities) and the importance of competency of pharmacy graduates.

5. Voluntary participants

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. You may stop participating in the interview at any time that you wish without your job being affected.

6. **Procedure**

We are inviting you to take part in the research project. If you accept, you will be asked for this research. It includes three rounds in this research.

For the first round, a semi-structure questionnaire with open-ended questions will be used to ask stakeholders' opinion through online or in a convenience room or in a comfortable place or at the place you prefer. It will be last about 45 minutes to one hour. The entire interview will be audio recorded. However, no one will be identified by name on the recording. It will be kept by only me (Mi Mi Saw).

About three month later, second round will be started. For the second round, you will be asked a questionnaire containing draft competency standards. Your comments and suggestion will be asked. It will be taken about 45 minutes to one hour.

About two months later, third round will also be done. For the third round, you will be asked to justices the statements containing in the draft competency standard. Your suggestion and comments will also be asked. It will also be taken 45 minutes to one hour.

If you do not wish to answer any of the questions the next question can be answered. The facts of the research will be kept confidentially and destroyed after three years when the research has been done.

7. Risk and discomforts

There is a risk that may make participants physical discomfort due to long conversation. Break will be taken if the conversation is too long. Participants do not have to answer the questions that are too personal or that make you uncomfortable.

8. Benefits

There will be no direct benefits for you but your participation will assist for the development of pharmacy competencies standard of pharmacy graduates. It will be used to evaluate the curriculum towards the proposed standards.

9. Incentives

You will not be provided any incentive to take part in the research.

10. Confidentiality

We will not be sharing information about you to anyone outside the research team. The information that we collect from this research project will be kept private. Any information about you is a number instead of your name on it. Only the researcher will know what your name is and will keep the number only.

11. Sharing the results

The knowledge that we get from the research will be shared with you and pharmacists and pharmaceutical scientists before it is made widely available to the public. We will publish the results and the other people who are interested in may learn the facts from the research.

12. Right to refuse and withdraw

You do not have to take part in this research if you do not wish to do so, and choosing not to participate will not affect your rights and advantages in any way. You may stop participating in the interview at any times and it will not affect you any way.

13. Who to contact

If you have any questions, you can ask them now or later. If you wish to ask questions later, you may contact Mi Mi Saw, Ph No 5060428 and University of Pharmacy in Yangon.

Appendix 2. Phase one questionnaires

Development of competency standards for pharmacy graduates in Myanmar

(I) The first round

Questionnaire on interview with pharmacists and pharmaceutical scientists, academic staffs, health care professionals, employers, patients and policy makers

No.	Questions		Answer
1	**Demographic**		
	a. Age	Completed age (years)	
	b. Gender	Male/Female	
	c Education	- Read and write but no formal education - Primary school - Middle school -High school - Undergraduate - Graduate -post graduate (master) -post graduate (PhD)	
	d. Where do you work in?	Public Private	
	e. Working area	hospital, drug shops, FDA, pharmaceutical industry, pharmaceutical company, traditional medicines, NGO/INGO, business, research and other(please specify)	
	f. Position	his / her level in their work	
	g. Working experiences	Total working experiences in their professional working area	
2	What are the roles, functions and activities of pharmacy graduates needed in your practice setting?		
3	What are important knowledges that pharmacy graduates should have, to work in your setting?		
4	What are important skills that pharmacy graduates should have to work in your setting?		
5	What are important attitude that pharmacy graduates should have, to work in your setting?		
6	What are important performance/behaviors that pharmacy graduates should have, to work in your setting?		

Remarks

For academic staff, the phrase “in your setting” will be changed to “when they graduate” in all questions.

For health care professional, policy maker, employers and patients, the phrase “in your setting” will be changed to “in their working area” in all questions.

(I) The second round

Development of competency standards for pharmacy graduates in Myanmar

Questionnaire for pharmacists and pharmaceutical scientists, academic staffs, health care professionals, employers, patients and policy makers

No.	Questions		Answer				
1	**Demographic**						
	a. Age	Completed age (years)					
	b. Gender	Male/Female					
	c Education	- Read and write but no formal education - Primary school - Middle school -High school - Undergraduate - Graduate -post graduate (master) -post graduate (PhD)					
	d. Where do you work in?	Public Private					
	e.Working area	hospital, drug shops, FDA, pharmaceutical industry, pharmaceutical company, traditional medicines, NGO/INGO, business, research and other(please specify)					
	f. Position	his / her level in their work					
	g. Working experiences	Total working experiences in their professional working area (s)					
2.	How do you agree with each competency statements? Please Click (✓)	1. represents “strongly disagree” 2. represents “disagree” 3. represents “neutral” 4.represents “agree” 5.represents“strongly agree”	1	2	3	4	5
3.	Please provide suggestion comments on the statements	Stakeholder’s suggestion comments on the statements					

(II) The third round

Development of competency standards for pharmacy graduates in Myanmar

Questionnaire on interview with pharmacists and pharmaceutical scientists, academic staffs, health care professionals, employers, patients and policy makers

No.	Questions		Answer
1	**Demographic**		
	a. Age	Completed age (years)	
	b. Gender	Male/Female	
	c. Education	- Read and write but no formal education - Primary school - Middle school -High school - Undergraduate - Graduate -post graduate (master) -post graduate (PhD)	
	d. Where do you work in?	Public Private	
	e. Working area	hospital, drug shops, FDA, pharmaceutical industry, pharmaceutical company, traditional medicines, NGO/INGO, business, research and other(please specify)	
	f. position	his / her level in their work	
	g. Working experiences (years)	Total working experiences in their professional working area (s)	
2	Please provide Judgment on the competencies	Editing or rewording each statement if needs revision and to provide additional information as appropriate	
3	Provide suggestion comments on the competency statements	Stakeholder's suggestion comments on the statements	
4	What are the three most important Domains in this competency standards?	Stakeholder's opinion on the three most important Domains	

5	What are the three least important sub-competencies in this competency standards? (sub-competencies are three digit numbers)	Stakeholder's opinion the three least important sub-competencies	
6	How many years pharmacy students should study to complete competency statements in this competency standards?	Stakeholder's opinion on the years pharmacy students should study complete competency statements in this competency standards	

Appendix 3. Interview guide for the first round in Phase one

Development of competency standards for pharmacy graduates in Myanmar

	Questions
Background information of stakeholders	Demographic (Age, (age, gender education, working in public or private, working area, position and working experiences)
Opinion of Pharmacists and Pharmaceutical scientists	(1)What are the roles, functions and activities of pharmacy graduates needed in your practice setting? (2)What are important knowledges that pharmacy graduates should have, to work in your setting? (3)What are important skills that pharmacy graduates should have,to work in your setting? (4)What are important attitude that pharmacy graduates should have, to work in your setting? (5)What are important performance/behaviors that pharmacy graduates should have, to work in your setting?
Opinion of Academic staff	(1)What are the roles, functions and activities of pharmacy graduates needed when they graduate? (2)What are important knowledges that pharmacy graduates should have, to work when they graduate? (3)What are important skills that pharmacy graduates should have to work when they graduate? (4)What are important attitude that pharmacy graduates should have, to work when they graduate? (5)What are important performance/behaviors that pharmacy graduates should have, to work when they graduate?
Opinion of health care professional, policy maker, employers and patients	(1)What are the roles, functions and activities of pharmacy graduates needed in their working area? (2)What are important knowledges that pharmacy graduates should have, to work in their working area? (3)What are important skills that pharmacy graduates should have, to work in their working area? (4)What are important attitude that pharmacy graduates should have, to work in their working area (5)What are important performance/behaviors that pharmacy graduates should have, to work in their working area?

Appendix 4. Variables and operational definition for the second round in Phase one

Development of competency standards for pharmacy graduates in Myanmar

No	**Variables**	**Operational definition**	**Scale of measure ment**
1	**Demographic**		
	a. Age	Completed age (years)	Ratio
	b. Gender	Male/Female	Nominal
	c Education	- Read and write but no formal education - Primary school - Middle school -High school - Undergraduate - Graduate -post graduate (master) -post graduate (PhD)	Nominal
	d. Where do you work in?	Public Private	Nominal
	e. Working area	hospital, drug shops, FDA, pharmaceutical industry, pharmaceutical company, traditional medicines, NGO/INGO, business, research, and other(please specify)	Nominal
	f. Position	his / her level in their work	Nominal
	g. Working experiences	Total working experiences in their professional working area (s)	Ratio
2.	Agreement on each competency statements	1. represents “strongly disagree” 2. represents “disagree” 3. represents “neutral” 4.represents “agree” 5.represents“strongly agree”	Ratio
3.	Suggestion comments on the statements	Stakeholder’s suggestion comments on the statements Nominal	

Appendix 5. Variables and operational definition for the third round in Phase one

Development of competency standards for pharmacy graduates in Myanmar

No	**Variables**	**Operational definition**	**Scale of measurement**
1	**Demographic**		
	a. Age	Completed age (years)	Ratio
	b. Gender	Male/Female	Nominal
	c Education	- Read and write but no formal education - Primary school - Middle school -High school - Undergraduate - Graduate -post graduate (master) -post graduate (PhD)	Nominal
	d. Where do you work in?	Public Private	Nominal
	e. Working area	hospital, drug shops, FDA, pharmaceutical industry, pharmaceutical company, traditional medicines, NGO/INGO, business, research, and other(please specify)	Nominal
	f. Position	his / her level in their work	Nominal
	g. Working experiences	Total working experiences in their professional working area (s)	Ratio
2.	Please provide judgment on the competencies. Editing or rewording each statement if needs revision and to provide additional information as appropriate	Stakeholders' Judgment on each competency statements	
3.	Provide suggestion comments on the competency statements.	Stakeholders' Suggestion comments on the competency statements Nominal	

Appendix 6. Variables and operational definition for Phase two

Evaluation of pharmacy curriculum in Myanmar towards the proposed standards

No	**Variables**	**Operational definition**	**Scales of measurement**
1	Name of Department	Name of Department in the University of Pharmacy and Yangon and Mandalay	Nominal
2	Subject	The name of subject in Department in the University of Pharmacy and Yangon and Mandalay	Nominal
3	Credits /hours	Total teaching hours	Ratio
4	Demographic		
	Age	Completed age (years)	Ratio
	Gender	Male/Female	Nominal
	Education	(Bachelor/ Master /PhD)	Ratio
	The name of your university name you graduated or post graduated	University of Pharmacy, Yangon University of Pharmacy, Mandalay Other	Nominal
	Position	his / her level in work	Nominal
	Working experiences (Total experiences)	Total working experiences in their professional working area (s)	Ratio
5	Teach or not competency statement in class	Participant teach or not the competency statements obtained from Phase One in his /her curriculum (Yes/No).	Ratio
6	The teaching method	The teaching method used by participant for each competency Lecture Laboratory Assignment Others	Ratio
7	The number of teaching hour	The number of teaching hour taken by participant for each competency (min /hours)	Ratio
8	The assessment method	. The assessment method used by participant to complete competency to his or her students MCQ/MSQ/viva / others	Ratio
9	Suggestion and comments on the curriculum (Contents, teaching methods, teaching hours and assessment)	Participant' suggestion and comments on the current curriculum	

Appendix 7. Inform consent for Phase two

Informed consent

This informed consent of the participants in Phase two is the one that academic staff are invited to participate in the research which will be conducted in Myanmar, titled "**Evaluation of pharmacy curriculum in Myanmar towards the proposed standards".**

Name of principal investigator- Mi Mi Saw

Name of organizations - Department of Pharmaceutics, University of Pharmacy, Yangon

Name of proposal - Development of competency standard and evaluation of pharmacy curriculum in Myanmar towards the proposed standards

Part I: Information sheet (Phase two)

1. **Introduction**

   I am Mi Mi Saw, and working in University of Pharmacy, Yangon. I am doing research on "Evaluation of pharmacy curriculum in Myanmar towards the proposed standards". I would like to give you information and invite you to participate in this research. If you have any quarries during conducting research, you can ask me to explain them. If you have questions later, you can also ask me again or another researcher.

2. **Purpose of the research**

   In this study, we would like to evaluate current pharmacy curriculum by using competency standards for pharmacy graduates in Myanmar. .

3. **Type of research intervention**

   The research will involve your participation in questionnaire survey.

4. **Participant selection**

   You are being invited to take part in this research because we feel that your experiences can contribute much to our understanding curriculum including syllabus of pharmacy graduates.

5. **Voluntary participants**

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. You may stop participating to answer questionnaire at any time that you wish without your job being affected.

6. **Procedure**

We are inviting you to take part in the research project. If you accept, you will be asked for this research. Questionnaire obtained Phase One will be provided to you. It includes the number of course units, the number of hours taught for each topic and the year when the subject is taught in the curriculum. Each subject will be asked if they accomplish which competency statements, teaching methods, teaching hours and assessments methods. Suggestion and comments on curriculum will also be asked. It will also be taken 45 minutes to one hour.

If you do not wish to answer any of the questions, the next question can be answered. The facts of the research will be kept confidentially and destroyed after three years when the research has been done.

7. **Durations**

It will be taken about four months

8. **Risk and discomforts**

There is a risk that may make participants physical discomfort due to long conversation. Break will be taken if the conversation is too long. Participants do not have to answer the questions that are too personal or that make you uncomfortable.

9. **Benefits**

There will be no direct benefits for you but your participation will assist evaluation of curriculum to proposed standards of pharmacy graduates. Therefore, it will also assist for the development and the implementation of competency standards and curriculum in Myanmar.

10. **Incentives**

You will not be provided any incentive to take part in the research.

11. **Confidentiality**

We will not be sharing information about you to anyone outside the research team. The information that we collect from this research project will be kept

private. Any information about you is a number instead of your name on it. Only the researcher will know what your name is and will keep the number only.

12. Sharing the results

The knowledge that we get from the research will be shared with you and pharmacists before it is made widely available to the public. We will publish the results and the other people who are interested in may learn the facts from the research.

13. Right to refuse and withdraw

You do not have to take part in this research if you do not wish to do so, and choosing not to participate will not affect your rights and advantages in any way. You may stop participating to answer the questions at any times and it will not affect you any way.

14. Who to contact

If you have any questions, you can ask them now or later. If you wish to ask questions later, you may contact Mi Mi Saw, Ph No 5060428 and University of Pharmacy in Yangon.

Appendix 8. Questionnaire for academic staffs for Phase two

Evaluation of pharmacy curriculum in Myanmar towards the proposed standards

(a) Department …….

(b) Subject……..

(c) Credit hours (total)……

No	Questions		Answer
	Demographic		
	Age		
	Gender	Male Female	
	Education	Bachelor Master PhD	
	The name of your university name you graduated or post graduated	University of Pharmacy, Yangon University of Pharmacy, Mandalay Other (Please specify)	
	Position (his or her level)	his / her level in their work	
	Working experiences (Total experiences)	Total working experiences in their professional working area (s)	
2	A. Do you teach this competency statement in your class? If yes, please continue to question B to C to D. If no, please skip to next competency statement	(Yes/No).	
3	B. How do you teach/learn this competency statements to your students? Please check all teaching methods in your class. Click (✓)	Lecture Laboratory Assignment Others (Please specify)	
4	C. Please specify how long this competency statement has been taught?	(min /hours)	
5	D. What assessment method do you use to complete competency statement to your students?(Please specify)	MCQ/MSQ/viva / others (Please specify)	
6	Please provide suggestion and comments on the curriculum	Participant' suggestion and comments on the current curriculum	

Appendix 9. The translated answer of stakeholders about the needs of roles, function and activities

Type of stakeholders	The needs of roles, functions and activities
Pharmacists and pharmaceutical scientists in public and private area	**In patients care in public and private hospitals** "It is necessary for the pharmaceutical care in hospitals. Pharmacist working in a ward (cancer ward), e.g. not only a general pharmacy, but also a resident degree for infection and specialized pharmacist (example, cancer or infection)" "In both hospital, participating in rounding wards and checking the use of drugs, e.g. Vancomysin, like broad spectrum drugs, should be done for therapeutic drug monitoring" "Counseling is necessary" "Pharmaceutical care services for in-patients unit provide few/limited private hospitals in Yangon" "It is needed to participate as a key person drug and therapeutics committee in every hospital. And both (Local and international hospitals)" **In public hospitals** "Clinical pharmacist services/pharmacy services in hospitals do not have, but about pharmacists in 2 private hospitals in Myanmar CP services already have where participating ward round involvement. However, checking interaction dosage and judgment according to guidelines are needed" " It is also needed Medication Therapy management (review patient medication (review patient medication profiles to identify any potential drug interactions or medication-related problems and work with their healthcare providers to adjust medication regimens); Reconstitution, ' Therapeutic drug mortaring" **In an in-patient private hospital** "Pharmacist roles, including clinical pharmacist in an in-patient unit do not exist in most hospitals.… .but

Type of stakeholders	The needs of roles, functions and activities
	pharmacist roles in an out-patient unit are in private hospitals” **In hospitals, clinics and communities** “Patient care (pharmaceutical care) in hospitals, clinics and communites is necessary” **In public hospitasl only** “Dispensing in in-patient unit and out-patient unit in public hospitals is needed” **In INGO** “The needs of roles in Ingo are…… - Rational drug use, antibiotic misuse, - Prioritize and facilitate rational drug use - Drug uses in patients to solve complaints of patients - Pharmacovigilance, adverse drug reaction report “Pharmaceutical care should be provided more in clinics and hospitals in general….. but the community pharmacy dispensing role occurred as I have experience of it, and it is required in the community. As the dispensing role is expensive and wider, this role is also required in INGO” In **rural and urban areas, in clinics** “Needs in rural areas are patients and the public do not know pharmacists, so it is needed to know what a pharmacist is.” **In hospital, community and INGO** “It is necessary health education about medicine for doctors and patients” **In community and public health areas** “Needs are public counseling in the community and drug information to patients and in the community and the public” ……. “Drug information to the patients and medication information to doctors “ **In both public and private areas, pharmacists work**

Type of stakeholders	The needs of roles, functions and activities
	"Managing roles is necessary" **In the laboratory** "Management role in a laboratory is needed eg. Lab supervisor" **In public and private hospitals** "The need is a pharmaceutical care report. It is needed Pharmacy management roles." "It is also needed document for suggestions, comments, reports, records of patients; prescription verification; inventory management" **In drug shops, drug stores** The needs are…… "To manage pharmacy shops and drug stores" "To manage dispensary Unit and sterile product unit in hospital" **In both public and private hospitals** "Management roles are needed " "Store management, procurement management and human resources are also needed." "Needs are to hold Continuing pharmacy education ……hold a conference" "Leadership roles were needed. " "It is needed as a policymaker to have a policy making role in the pharmacy area" **In the pharmaceutical industry** "The services of research and development are needed"
Employers	**Hospitals** "The needs of caregiver roles and function and activities in hospitals are …..

Type of stakeholders	The needs of roles, functions and activities
	• Deal with clinician • Deal with patients • Suggest a patient's chart for each patient • How to take drugs, side effects • Check and put medicines in the cup of patients • Participate in ward round • Documentation and record of patient charts for pharmacy • Check Label error, DC error, Drug error, DC medical professor error • To prevent abuse/misuse of medication • "Selection and use of drugs in hospitals is doctors' choice and doctor-centered, not patient-centered" "Role would like to be wanted to provide better pharmaceutical care……. -It is needed to do clinician and pharmacist monthly discussions. - At the pharmacy counter, drugs and every prescription are checked by pharmacists and systematically- -Just the only role, activities and functions a pharmacist can be able to do are indent, classification, store and distribution. And prescriptions are only checked in the VIP unit but not the OPD unit. Care should be provided directly meets with patients." "There is no decision-making role for pharmacist." "Just only specialist doctors and consultants decide selecting medicine to select medicines. " "In this committee they do not permit pharmacists to participate in drug selection in this committee meeting" "The needs in the hospitals are ……. Communication with compounders and doctors and nurses Communication and counseling to patients Explanation of drugs to the patients' contra indications, side effects of drugs and how to take medicines in drug shops" "Management roles, functions and activities are….. "How to estimate the quality of medicines by documentation for patients' safety and cost-effectiveness." "Estimate and calculate the quality and cost-effectiveness of drugs from the documents is needed." "Continuing pharmaceutical/ pharmacy education is needed in hospitals."

Type of stakeholders	The needs of roles, functions and activities
	"Leading the project is needed" "Monitoring, whether the work or project is finished or not and resource mobilization is needed" "Funding searching role do not have. These roles should be explored." The needs are … • Research activities • Literature review • Designing the research, data collection, research investigation in the lab. • Research training, presentation, publication Research in public and private hospitals **Community** "The needed roles in the community are 1. Processing of Prescription 2. Checking for Drug Interactions 3. Dispensing medication 4. Providing advice and knowledge sharing of medication 5. Right Medication 6. "Patient safety" "The needs of the community are ….. "Promoting a healthy lifestyle….. The responsibilities of a community pharmacist. 'The needs for managing roles in the community are…… At chain pharmacies in the community ….inventory management, expiratory checking…. First in, first out, management managing roles in the community." "Program roles are needed in INGO. However….. Program e.g. project management fund management communicate with partners in other INGOs." "Management is needed to train, such as quality management (QM), occupational health and management, environmental management, use of guidelines, human resources management, finance and accounting." **Community and hospital** "The need for a communicator role in the community and hospitals is…….

Type of stakeholders	The needs of roles, functions and activities
	Patient counseling Communication How to deal with and communicate in a positive way and how to suggest positive To connect with doctors, distributors and users of medicines Pharmaceutical public health roles" **Drug shop** "The needs for roles, functions and activities are • Financial management • Management in the QA ….for safety and efficacy." "Quality of medicines should be estimated with database and documentation (GMP)." "The requirements and qualifications and forecasting should be calculated." "Shelf control and inventory management WHO Guidelines, World Guidelines." **FDA** "Administrative skills in FDA are needed" "Preventive and social skills in FDA"
Academic staff	The needs of roles, functions and activities are… "Utilize and dispense the drugs with proven efficacy, safety and quality." "As clinical and community pharmacists, the roles and responsibilities should be …… • The quality of medicines supplied to patients. • Ensuring that the supply of medicines is within the law, ensuring that the medicines prescribed to patients are suitable. "They are not assigned both in-patient and out-patient in the ward. ….. "There is a gap in clinical pharmacy services in hospitals… Patient care in hospitals is needed." "The roles in this area are required by the Head of Pharmaceutical Factories(GM)" "The roles and functions needed by decision makers (decision-making roles) in pharmacy areas" "Decision makers and pharmacists are needed in the QC Department and in industry" "Distribute and dispense the drugs with proven efficacy, safety and quality by cooperation, collaboration and

Type of stakeholders	The needs of roles, functions and activities
	coordination among the various health professionals and other industries." "Dispense the drugs with proven efficacy, safety and quality by cooperation, collaboration and coordination among the various health professionals and other industries." "Advising patients about medicines, including how to take them, what reactions may occur and answering patients' questions." "Drug management is needed. " "The needs are QC lab in private traditional medicine and natural products in FDA." "In QC, production of TM and natural products is necessary" "For Pharmacognosy, at QC lab in Traditional medicine production /Factory Manager level is occurred" There are no pharmacists in leadership roles and skills under MOH. "It is needed to conduct research in a research center." "There is no research on Social and Behavioral Pharmacy." "In the area like finding the route cause why they do not rely on explanation, how to take drugs according to the doctors' prescription to search for their beliefs, perceptions, culture"
Health Care Professionals	**In INGO and public hospitals** "Dispensing, dosing, storage and maintenance of drugs are needed" **In private hospitals** - Specific role in explaining drug interaction in patient units in public and private hospitals like in foreign hospitals - Managing drug interaction -Making sure patients are receiving good quality medication -Making sure medication is safe for particular patients -Making sure medication and administration are at the right dose, right frequency and right duration - Making some medication is not an interaction in vivo. - Formulation and preparation and dispensing medication - Dispensing Medication - Managing Medication Therapy - Compounding medicines - Ensuring medication safety

Type of stakeholders	The needs of roles, functions and activities
	- Patient education - Medication order review - Medication management - Medication administration - Drug utilization review - Medication counseling -Drug information\ -Medication reconciliation -Quality improvement initiation (such as reducing medication errors or improving medication adherence) **In public hospitals** "In ward the responsibility should be taken for providing required medicine to patients….. Provide services medicines about the services… Check the right dose and the right drug… Explain how to take drug…. These functions are in private hospitals, but public hospitals do not have them." **The needs in the public health area are** "Health education for patients (Nutrition)…… Communication …… Counseling section (e.g. Psychological patients)" The needs in hospitals are • Medication counseling • Drug information • Medication reconciliation • Quality improvement initiation such as reducing medication errors or improving medication adherence "In charge of drug stores in hospitals, including drug calculation….. Inventory management …. Pharmacy management (eg, Manager)" **"In all pharmacy areas……** …… Demonstrate leadership skills in the pharmacy area …. Administration level in the pharmacy area in

Type of stakeholders	The needs of roles, functions and activities
	hospitals. “ “Pharmacists should conduct natural product production research scientifically.”
Patients	“Providing pharmacy services in hospitals….. At the clinic, the current role is to provide medicines pharmacy counters….can provide the right medicines accurately and quickly…accurate, correct and fast.” “Drug information in universities, schools and in public areas….. Provide drugs, explain how to use drug” “It is necessaryto provide pharmacy services to the public in rural areas and the countryside.”
Policymakers	**In private hospitals** “Functions of pharmacy graduates are the use and administration of medicines and dispensing prescribed medicines “ **In a public hospitals** • Marinating customer records, • Providing basic health advice, • Stress management and lifestyle change. “Community pharmacist in a public health area…. Cooperation with nurses is required.” “Community pharmacists, Hospital pharmacists roles are needed” “Side effects, drug interaction, vaccination, RBS, cholesterol level, Health education to patients. Consultation, doctor’s prescription for specific customers, basic wellness screening” **In community clinic and mobile clinic** “Roles are curative, preventive in the community, clinics and mobile clinics” “Preventive in the community clinic and mobile clinic “In healthcare services like curative preventive and rehabilitation, pharmacists should provide services in curative and preventive because of drugs for vitamin A deficiency in children after five years.”

Type of stakeholders	The needs of roles, functions and activities
	"**In public health**, pharmacists should be assigned to community clinics and mobile clinics."

Appendix 10. The translated answer of stakeholders about the importance of competencies (Knowledge, skills, attitudes and performances)

I. The answer of stakeholders about the importance knowledges for pharmacy graduates

No	Experts	Important knowledge
1	Patients	"Must know disease and update of disease for example, Covid 19" "For outbreaks, drug information, side effects, health education of medicines, resistant drugs" "Must know updated medicines, drugs and cosmetics and the right drug accurately" "Must-know medicines used for general and history taking " "Should know the list of medicines, uses, side effects of medicines"
2	Healthcare professionals	"Specific disease-related drugs (Hematology, Psychology) Kinetic and dynamic dosage duration side effects" "Some knowledge of pharmacokinetic and pharmacodynamics" "Should provide them with a solid foundation in pharmacology, disease states, pharmacokinetics and dynamics," "Medicines, Nutrition, Infection control" "Current health promotion and prevention (Covid 19)" "Regulatory requirements and quality assurance (should understand the principles of QA and will be able to identify potential risks to patient safety " "Clinical pharmacy subject clinical knowledge" "Knowledge about traditional medicine"……" Additionally, double check for drug interactions and doses, reconstitution and stability of medication, TPN operation, drug interaction" "Knowledge of the formula of traditional medicine from traditional medicine texts, pharmacists should learn traditional medicine" "For the stoke patients, uses for diseases each ingredient of the formula is not traditional medicine tests. Pharmacy should be assigned to traditional medicine hospitals." "Therapeutic drug monitoring....they should be familiar with the procedures for respiratory Adverse Drugs Reactions (ADRS) and medication errors to prepare them for working in a hospital setting." "Regulatory requirements and quality assurance (should understand the principles of QA and will be able to identify potential risks to patient safety" "The method of documentation …… The required medicines are listed as daily used, monthly used, sub stock, main stock, indent medicines for one month"
3	Policymakers	"Pharmacology" ….. "Pharmacokinetic and Pharmacodynamics, drug interactions, mechanisms of action"

No	Experts	Important knowledge
		“Pharmacy subjects (Community pharmacy)……PMS activities in Drug Division, Cosmetic Division, Medical Products Division” “Knowledges, Pharmaceutics, Pharmacognosy, Pharmaceutical Chemistry subjects Knowledge about ISO activities and Tender Procedure for Laboratory pharmacists” “Good Medical Practice, uses of drugs and updated drugs”
4	Employers	“Pharmacology (generic and Brand), Pharmacological knowledge” “Mainly Social knowledge” “Legal Knowledge of medical-related issues and consumer protection” “Up-to-date machines, out of date to be up-to-date in Pharmaceutics, familiar with these machines, GMP Pharmaceutical care, counseling” “The service pharmaceutical care wants to provide, so pharmaceutical care should know better. “ “Drug to drug interaction should also be known better” “Therapeutics management should be able to provide……. For example, renal disease what dose will be used.” "Therapeutic drug monitoring currently does not know." "Problem-solving skills are required ..... When the problem with patients and drug errors occur, problem-solving cannot be able to drug dispensing practice, patient compliance, and patient counseling. “ “Supply chain Management, Inventory management, Regulation when contact with principal and FDA "Procurement (buying pharmaceutical products), logistics (transportation till the end user should be known)” “It is important to know business and financial knowledge, not only competent pharmacy subjects." "Logistics and supply chain management” “Regulatory, Procurement and supply chain management (First procurement to end user, storage distribution, Rational drug use” Management….. "Business Management; General management; Human Resources Management; Organizational Management; Sales Management; Marketing Management” “Presentation skills” “Usage of drug pharmacokinetic and Pharmacodynamic” “Survey what drugs patients are taking according to the disease” “Should know to inform illegal drugs on time to hospitals and at their clinical sites” “Knowledge of pharmacy, such as pharmaceutical chemistry, Pharmacognosy, Traditional medicines Research knowledge in Pharmaceutical Sciences”

No	Experts	Important knowledge
		" GMP, ISO 9001: 2015, ISO 17025: 2017, ISO 45001: 2018 " " Myanmar Drug Law, FDA guidelines for Drug Registration order from Myanmar FDA" "Be Familiar with clinical usage, practically use drugs on the ground · Updated drugs approved by FDA, The information like (Warning, Withdraw, Extension) of announced/noticed drugs by FDA" "Explain patiently to the patients to understand about medicine, history taking" "Background knowledge of research, knowledge of research methodology, research design, protocol writing, scientific paper writing, knowledge of research methodology, scientific paper writing, IT International Training, updated knowledge, continuous learning"
5	Academic staff	"Diagnose and treat human injuries, diseases, and deformities, pharmacokinetics, diagnose and treat human injuries, diseases, and deformities, pharmacokinetics" "Manufacturing…. Knowledge of GMP, GLP, BP, US Pharmacopoeia….design of new drugs, quality of raw materials for pharmaceuticals, production of chemicals from the raw pharmaceuticals, quality, efficacy and side effects of new drugs, development of useful drugs, estimate and predict of drug storage, calculate and predict the expired date of new drugs Physicochemical properties of drugs produce raw materials for pharmaceutical products. "Pharmaceutical Analysis" "QC of natural products (medicines, herbal drugs, supplements, cosmetics)" "Knowledge such as scientific analysis of chemical constituents or their activity from natural sources". "Theory of Pharmaceutical Sciences, Design dosage, Formulation and production, Evaluation and manufacture " "Based on pharmaceutical microbiology, production of antibiotics, immunological products, biotechnological products " "QC and Drug synthesis….there are two types …first type includes (Identification, extraction of constituents, separation and isolation …second type search activities of isolated compounds and mechanism of action." "Symptoms, treatment alternatives, drug properties and interactions, and preventive healthcare measures"....." Mathematics – to calculate the dosage form, solution concentration" "Therapeutic drug monitoring, patient care processes for dispensing, and current trends should be updated." In hospitals and clinical pharmaceutical care ..... patient counseling, explaining drug interaction, cooperating with healthcare professionals or patients' quality of life, clinical evidence"

No	Experts	Important knowledge
		"Regulation, supply chain management, procurement, interprofessional collaboration practice, Procurement and supply chain management should be updated. " "Hospital pharmacists whose level of procurement and supply chain management should be trained by a university " "Procurement (to get good procurement practice.... knowledge of procurement is needed), logistics and supply change management (how to store drugs bought by procurement (good storage practice, how to store drugs to meet with good storage practice and how to distribute drugs to match with good distribution practice" "Procurement extimate purchase of drugs, legal and regulatory knowledge (should be familiar with state and female laws and inventory management, business acumen, managing the pharmacy shops, pharmacoeconomic knowledge" "At least, the fresher graduates should well know our professional job and what job responsibilities are and job descriptions, at least mentioned in the government regulation guidelines, Hospital management, store management, inventory control management." "Marketing, leadership, professional knowledge are complete. I think, if law and ethics are added more, it is better, research knowledge, communication, content on PC, critical thinking, research on social"
6	Pharmacists and Pharmaceutical Scientists	"Pharmacology should be known. Disease should be known because it should be known together with drugs and disease if others ask you…..diagnosis should be read….basic knowledge of medicines…disease and medicines." "Human and educational psychology to communicate with humans (IPE, patients and public, training process)" "Survey of the public that they use drugs effectively and safety, patients' perception', people's perception" "QC of Formulated product, Pharmacopeia, validation, raw material test, example Indian-Pharmacopeia for natural products, formulation of natural products" "Clinical knowledge. School should provide complete knowledge. Currently, if authority would be provided to pharmacists such as checking dosage, regulation and monitoring, clinical pharmacy, pharmaceutical care (how to provide counseling which is under pharmaceutical care)" "Pharmacists in patients have a responsibility for therapeutic drug monitoring, so pharmacists should read" "Medication management (including dosage, causing)…dispensing (controlled substances and other prescribing

No	Experts	Important knowledge
		medication)” .“Procurement and pharmacy management should also be known” “Legal and regulatory knowledge (Should be familiar with state and female laws and regulations related to pharmacy practice” “Inventory management, managing the pharmacy shops” “At least, the fresher graduates should well know our professional job and what job responsibilities are and job descriptions, at least mentioned in the government regulation guidelines, hospital management, store management, inventory control management.” “Knowledge of medicines, adverse effects, drug interaction, pharmacology, English” “Next is waste management (expired drugs, drugs do not have proper storage practices (e.g. Temperature-sensitive drugs are put under the sunlight. Stores at high room temperature are required to do waste management.” “ Pharmaceutical knowledge…. such as ….understanding the knowledge of the following storage of products formulation" ‘The new products' physiochemical properties of ingredients are up-to-date and follow the new information’ “Management, rules and regulation of civil services, cooperation with others, store management” “The finding of differences and investigation of pilot scale commercial scale” “Should teach the concept of self-learning and continuous learning” “Research area in R and D, formulation there are three parts. In development, basic are okay, but courses in advanced courses should be added and taught such knowledge.” “Understand the roles of pharmacists”

II **The answer of stakeholders about the importance skills for pharmacy graduates**

No	Experts	Important skills
1	Patients	“Advocacy…… how to relate to social workers, how to receive drugs, when the cost of drugs is not available "Familiarity with drug regulation and policies” “Prepare medicines and cosmetics” “Produce medicines for most diseases in local areas for a cheap price, to be useful” “Explain the uses and side effects of medicines when the patient/client asks, side effects, uses and effects of medicines, drug information advice medicines to the patients.” “Management skill”….. “Problem-solving skill, Communication skill, English language skill” “Communicate with doctors for medication to minimize the amount of unused drugs and to discuss treatment queries like long-term prescription of analgesics or double prescriptions” “Social skill , skill of Information Technology and critical thinking” “Communication skill ….. “Communicating with patients, healthcare professionals and other staff members Must be able to communicate clearly and concisely both verbally and in writing.”
2	Health Care professionals	“Skill for patient safety and satisfaction”….. “Skill for rational drug use” “Formulate injection” “How to test and what will be tested for traditional medicines”…. “Skill in formulation of traditional medicines …… “For stoke patients, skill in uses for diseases each ingredient of the formula no in the traditional medicines texts……uses of the main diseases of formula no in traditional medicines texts” “Skill in calculation of dose” “Provide drug, dosage and duration” “Skill in team work and group work and team building” “Collaborative mindset with other healthcare professionals to ensure that patients receive optimal care…..skill in interprofessional collaboration with doctors and other healthcare professionals, including sharing relevant information and discussing treatment plans.” “Intellectual skill ….cognitive skill ….other skills such as critical thinking, analytical thinking, logic, creativity and problem-solving skills” “Communication skills (verbal and written), interprofessional skills, personal skills, because if they work in the clinical area, if they have to communicate with patients and their family, doctors, nurses, medtech, radio technologists in different categories.”

No	Experts	Important skills
3	Policymakers	"Survey what drugs patients are taking according to the disease" "Formulation of pharmaceutical products" "Apply Good review practice, Good Medical Practice, Good Regulatory Practice (Drug/cosmetics/medical device division)" "Skill in use of drugs"
4	Employers	"Can search for solutions in local context and conceptuals such as political, economic and social thinking" "Skill in GMP" "Skill HVAC system/clean room"…to get practice skills in industrial microbiology ….evidence-based practice and research" "Skill in Pharmaceutical sciences" "In hospital, the main thing is dispensing skills, how to dispense drugs to understand patients." "Counseling can be served to patients, counseling skills" "Must have better social skills when working together with a team of workers" "Counseling can be served to patients, and counseling skills are required." "Apply drug dispensing practice….patient's counseling skills" "Skill in Therapeutic drug monitoring" "Skill in patient care process" "Clinical pharmacists can point out doctors about drug interaction…. Clinical skill …skill in history taking." "Inventory management skill"… "Do better together with a team"…. "Pharmaceutical logistics and supply chain management skill"…. "Skill in Pharmaceutical Procurement and supply chain management (First procurement to end user, storage distribution" "Better assessment skill, analysis skill and reporting skill" "General Management skills… Human Resources Management skills… Organizational Management skills … Sales Management skills… Marketing Management skills" "In the management area, management skills and human resource management skills are needed. Leadership is also needed ….management training for soft skills… store management" "Problem-solving skill (how to solve cases)" …. "Technical skill (Updated machine) (it was not taught in school) " Leadership skill and management skill and interpersonal skill (it was not taught in school)" "Use of words, communication skills, body language"

No	Experts	Important skills
		"Leadership skill, team management" "Time management skills …. Presentation skills"
5	Academic staff	"Search solution local context and conceptuality such as political economical social thinking" Perform limit tests and qualitative tests for the inorganic pharmaceuticals – chemical Kinetics for prediction of stability such as shelf-life and half-life and how to test the stability of drugs " Principles of mechanism and reactivity in heterocyclic systems, which are key components in pharmaceuticals …main reactions of different functional groups ….basic physical properties of simple organic compounds; major products of selected organic reactions……rates of decompositions -physicochemical properties and stereochemistry of drugs ….. "Effect of chemical structures on drug action (i.e. structure-activity relationships) ….classifying drugs in regard to their therapeutic activity based on their chemical structures …..qualitative and quantitative analysis of raw materials and finished pharmaceutical products - official test for the limitations of preservatives and food additives" "Skill in therapeutic management but not absent stock among patients and in the community and controlling the quality of drugs " "Check Dose duration ….listen to patients ask and explain clearly" "Counsel patients inpatient and outpatient" "In the practice area, communication skills…..skills in analytical thinking and critical thinking… problem-solving skills"…. "Communication & interpersonal skills" "Skill in research for social pharmacy ….cultural, environmental and social factors for the failure of medical adherence" "IT skill … English language…communication skill…social skill" "In research, skill in research methodology should "
6	Pharmacists and Pharmaceutical Scientists	"Next is waste management (expired drugs, drugs do not have proper storage practices (e.g. Temperature-sensitive drugs are put under the sunlight…. "Stored at high room temperature) are required to use waste management units and provide drug information to them about what they want." "The main point is that drug information and counseling skills can be able for drug information."

No	Experts	Important skills
		…… Providing drug information to clinicians as they are busy. They think pharmacists are the most skilled at the drugs that they want. They asked them. Pharmacists and clinicians should provide drug information not only to patients but to doctors or healthcare professionals. “Skill in how to handle instruments and equipment” For the natural substances powder and their derivatives, the important skills are ….. Identification: Extraction of constituents; Separation and Isolation to search for the activity of isolated compounds (Biological screaming, ant-anti-hypertensive activity, anticancer activities) and mechanism of action. “Quality control of drugs from natural substances" “In the Cosmetics and food Department, pharmacy graduates must lead QA and QC labs in traditional medicines.” “Exposure pharmaceutical analysis” “The skill on the concept and consequences, the reason why ingredients are added in the formulation and QC, the reason why the results are obtained” “Skill in Pharmacognosy” . “Skill in checking dosage, therapeutic uses, drug interaction, regulation and monitoring, Adverse Drug Reaction, Pharmaceutical care” “In pharmaceutical care, not only patient care but public health in the community sector where the provision of medication is used by the public.” “Skill in ……what types of medicine by which hospitals ….which medicines are used by specialized medicines ….which drugs are the most used drugs….what are the updated trends medicines “Skill in medication management (including dosage, causing)” “Dispensing (controlled substances and other prescribing medication)…patient counseling (including dosing, side effects and interaction)” “Manage the pharmacy shops" …. "Inventory management skills" “Marketing skill”

No	Experts	Important skills
		"Skill in Distribution….management...purchasing…store management…. Inventory control management and checking stock" "The skills like logistics, for transportation, supply chain, computer skills" "Creative thinking skill, problem-solving skill, communication skill, technique on how to counsel patients" xt, interpersonal skills, not only him/herself, but other interpersonal skills: how to deal with doctors and how to communicate with nurses" "Coordination skills were coordinated with colleagues at work and clinical team members, medical doctors and nurses. For example, in INGO, pharmacists coordinate with program managers who are linked to the program as well as other INGO." "Next in work, if gaps occur, how to do gap analysis and the skill how to fill gaps" "In skill in research like in vivo and in vitro, clinical trials. "Journal reading and literature review" "Professional competency…additionally, they would have a professional mindset, including competence, emotional intelligence, conscientiousness, and appropriateness with good knowledge and respect esteem" "Not only professional subject skills, but leadership skill, time management, stress management, excellent analytical skill, observation skill, lifelong learning skill ….continuous learning" "Next, interpersonal skills, not only him/herself, but other interpersonal skills: how to deal with doctors and how to communicate with nurses." "Coordination skills were coordinated with colleagues at work and clinical team members, medical doctors and nurses. For example, in INGO, coordinate with program managers who are linked to the program as well as other INGOs." "Next in work, if gaps occur, how to do gap analysis and the skill how to fill gaps" "In skill in research like in vivo and in vitro, clinical trials. "Journal reading and literature review" "Professional competency…additionally, they would have a professional mindset, including competence, emotional intelligence, conscientiousness, and appropriateness with good knowledge and respect esteem" "Not only professional subject skills, but leadership skill, time management, stress management, excellent analytical skill, observation skill, lifelong learning skill ….continuous learning"

III. The answer of stakeholders about the importance attitudes for pharmacy graduates

No	Experts	Important attitudes
1	Patients	"Should have in their mind to provide the best services for health (health education, production of drugs) for the people" "Aware of producing medicines for most diseases in local areas for a cheap price, to be useful"
2	Health Care professionals	"They should have in their mind better behavior when they meet patients and provide care directly …..advise adverse effect of each ingredient in the formula no "Attention to patient safety"
3	Policymakers	"Have in their mind better behavior when they meet patients and provide care directly "Have Interprofessional Collaboration Practice" "Aware of the value of your profession……must obey the professional ethics of pharmacists "
4	Employers	"Must have in their mind for the development of the department and of themselves" "Ethical awareness as well as personal & professional integrity"
5	Academic staff	"The attitude to safety, efficacy, and quality they were taught in school. Wellness, Patients when dealing with others" "Should have in their mind to be trusted by the patients …..not to be errors of drugs and correct drugs. …… not to be error medicine" "The attitude to safety, efficacy, and quality they were taught in school and wellness, patients when dealing with others" "Be assume professional and drug experts and be professional" "Attitudes on professionalism, good citizenship and ethics, interprofessional skills" "Attitude of willingness to serve the country as good manners competent pharmacists"
6	Pharmacists and Pharmaceutical Scientists	"Should have better mind on the public" "Good attitude on dutiful in their work and take responsibility and accountability". "Mindset should always have on for the patients can be used safe, effective and quality. Anywhere pharmacy graduate are assigned, they have ethic and morality" "The importance attitude is rely on rules and regulation provided by their work" "Must have attitude on value own profession believe and must be loyal. In setting, it is occurred more that the attitude of most pharmacists are inferior him/herself than others. First what in our mind is should be self-confident"

IV. The answer of stakeholders about the importance performances for Pharmacy graduates

No	Experts	Important Performances
1	Patients	"Providing education about cosmetics" "Dispense medicines" "Lead to procure in urban area" "Human resource management" "Behave on patients or people warmly and politely" "Leadership skill"
2	Health Care professionals	"Health education" "Interpret prescription accuracy and provide appropriate medication recommendations to healthcare providers" "Attention to detail prevents medication errors, ensures accurate dispensing and minimizes patient" "Clinical posting in clinical ward, interest in the patients and their family" "Do together with doctors and nurses in patients and out-patients in hospitals" "Documentation with software" "Organization skill" "Inter-professional relations" "Collaboration" "Professionalism" "Confident" "Conduct Project " "Work accurately and correctly for the patients" "Sociable"
3	Policymakers	"Sharing knowledge of drugs with the public (vitamin A, deficiency for a child under five years, explaining how to take anti-malaria drugs)" "Show their performance by providing safe and effective medication to patients as well as making sure patients are satisfied with their services" "Better rapport with healthcare professionals" "Must rely on the rules, regulations and ethics of employees/servants" "Must rely on professional ethics" "Artificial intelligence"

No	Experts	Important Performances
		"Leadership skill" "Management skill" "Time management" "Communication skill"
4	Employers	"Providing health education including pharmaceuticals of natural products (Adverse effect, drug interaction and drug information the patients who take natural products and synthetic drugs" "Participate in Health Promotion ….marketing skills…search solutions, local context and conceptuals such as political economical and social thinking" "Providing services for cost-effectiveness by cooperating with other healthcare professionals" "Participate in implementing a pharmaceutical manufacturing industry project" "Perform production and Quality Control" Communication skills "Sales and promotion" "Prescription by doctors" "Communication skills" "Product management" "Communication and negotiation skills" "Wear dress neat and tidy" "Lifelong learning" "Creative thinking skills" "Soft skills" "Justice and accountability"
5	Academic staff	"Observation" "Have the ability to plan and to execute experimental work" "Lead team" "Perform an official test for the limited preservatives and food additives" "Natural sources of western medicines" "Prepare medicines from natural example: antibiotics (Bleomycin, Doxorubicin), anticancer drugs (e.g. Taxol)" "Perform separation, purification and isolation"

No	Experts	Important Performances
		“Perform biological activity tests on isolated compounds and search for the mechanism of action of isolated compounds or mixtures of compounds” “Perform qualitative and quantitative analysis of raw and finished products of food, drugs, cosmetics and herbal materials” “Provide drug information” “Pharmacy management/Pharmaceutical management” “Skill in therapeutic activity, " Skill in the formulations of Nutraceuticals, Cosmeceuticals, food and supplements” “Procurements” “Cooperation and coordination” “Inventory management” “Business objective achievement” “Follow up on the principle of registration and importation of new products between principal and distributor)” “Registered drug Renewal (not to pass expiry date, the time of renewal process” “Documentation (SOP and format)” “Job description and job analysis” “Problem-solving skills by critical/reasoning thinking” “Be good leaders, followers, managers and citizens” “The most important one is that they should value their professionalism and ethics, their dignity and those of other people when they work with other people.” “Collaboration among users and producers is essential to getting better performance”
6	Pharmacists and Pharmaceutical Scientists	“Able to conduct ADR report and process “Providing drug information to others (patients and doctors)”…..better performance in team work “Educate to have safe disposal” “Competent in pharmaceutical public health service” “Participate in the SRH project, nutrition project, immunization project....should perform to get awareness of such an area.” “Explain and present the medicines of the company to patients and doctors” “Formulate of natural products or medicines “ “Quality control of traditional medicines”

No	Experts	Important Performances
		“Clever and smart on pharmaceutical care”. “Provide intervention examples to be distinguished easily” “Provide patient care” “Experts in medicines or drugs” “Approach to tasks such as dispensing medications” “Not to be conflict …..negotiation” “Checking drug interaction or alleges and maintaining their records. “Maintain quality in your department” “Hospital management” “Store management” “Inventory control management "Human resource management” “Management of the pharmaceutical industry” “Manage inventory to minimize errors” “Ethical conduct is essential for pharmacy professionals” “Leadership” “Competent communication skills” “Problem-solving skills …. They can solve problems in a practice setting….. for example, in clinical setting to solve complaints.” “Gap analysis” “When you work…..they should use a Standard Operating Procedure (SOP)” “Using Inventory is software” “Better teamwork ability”

Appendix 11. Draft Competency standards obtained from the first round

No	Competency statements
1	**Domain 1. Fundamental Knowledges**
2	**1.1 Understand languages**
3	1.1.1. English
4	1.1.2. Myanmar
5	**1.2 Understand basics sciences**
6	1.2.1 Chemistry
7	1.2.2 Physics
8	1.2.3 Biophysics
9	1.2.4 Botany,
10	1.2.5 Zoology
11	1.2.6 Traditional medicines
12	**1.3 Understand biomedical sciences**
13	1.3.1 Biochemistry
14	1.3.2 Anatomy
15	1.3.3 Physiology,
16	1.3.4 Pharmacology
17	1.3.5 Microbiology
18	1.3.6 Pathology
19	**Domain 2. Pharmaceutical Public Health Competencies**
20	**2.1. Health education and promotion**
21	2.1.1. Actively participates and demonstrate in health prevention and promotion issue
22	**2.2. Pharmaceutical information and advice**
23	2.2.1.Counsel population on the safe and rational use of medicines and devices
24	2.2.2. Responds to questions using appropriate strategies
25	**Domain 3. Health System, Policy and Outcome Competencies**
26	**3.1. Health system and policy**
27	3.1.1. Evaluate mechanisms and needs of the health system in Myanmar for the implementation (e.g. health policy, health reimbursement and healthcare management)

No	Competency statements
28	**3.2. Pharmaceutical Law and policy**
29	3.2.1. Apply Law, policy and regulation related to pharmaceuticals and pharmacy practice
30	**3.3. Health economic and outcomes**
31	3.3.1. Evaluate the needs of individual health status and medication safety and pharmaceutical product development
32	3.3.2. Evaluate costs and outcome
33	3.3.3. Recommend care plans that are cost-effective
34	**3.4. Improvement of health services**
35	3.4.1. Identify and evaluate the needs of health services and good pharmacy services and implement new services
36	3.4.2. Resolve, follow up and prevent drug-related problems
37	**3.5. Quality assurance**
38	3.5.1.. Implement, conduct and maintain a reporting system of pharmacovigilance
39	**Domain 4. Pharmaceutical care competencies**
40	**4.1. Assessment of medicines**
41	4.1.1. Assess medicines and rational use of medicines and devices according to the patients, hospitals and government policy and medication interaction of the patients
42	**4.2. Dispensing medicines**
43	4.2.1. Dispense a product safely and accurately that is appropriate for the patient
44	**4.3. Monitors medicines use.**
45	4.3.1. Develop accurate, efficient patient therapeutic and monitoring plans that incorporate best practice and respect the autonomy of the patient
46	4.3.2. Monitor the patient's progress and assess therapeutic outcomes
47	**4.4. Monitors medication safety**
48	4.4.1. Prioritizes medication safety and acts accordingly
49	**4.5. Patient consultation and diagnosis**
50	4.5.1. Discuss with the patients the appropriate use of medicines, taking

No	Competency statements
	into account patient's preference
51	4.5.2. Document any intervention
52	4.5.3. Obtain, reconcile, review, maintain and update relevant patient medication and disease history
53	**Domain 5. Pharmaceutical Sciences Competencies**
54	**5.1. Drug discovery**
55	5.1.1. Understand the process of active ingredients discovery from the natural substances synthetic and semi synthetic substances
56	**5.2. Compounding**
57	5.2.1. Compound extemporaneous and cytotoxic medicines, pharmaceutical medicines, cosmetics, herbal medicines and food
58	**5.3. Performs efficiently various tasks in pharmaceutical manufacturing**
59	5.3.1. Demonstrate the production of pharmaceutical products, cosmetics herbal medicines and food
60	**5.4. Performs testing the products in quality control units**
61	5.4.1. Demonstrate quality control of pharmaceutical products, cosmetics, herbal medicines, food and traditional medicines
62	**Domain 6. Pharmaceutical Organization and Management Competencies**
63	**6.1. Human resources management**
64	6.1.1. Identify and manage human resources and staffing issues and demonstrate organizational and management skill
65	6.1.2. Recognize the potential of each member and the value of pharmacy team
66	**6.2. Procurement**
67	6.2.1.Demonstrate the procurement of, raw material, medicines, pharmaceutical products and devices
68	6.2.2. Understand the development of efficient inventory system management
69	**6.3. Supply chain management**
70	6.3.1.. Understand how to supply medicines safely and efficiently,

No	Competency statements
	consistently within legal requirements and best professional practice.
71	6.3.2.. Demonstrate knowledge in store medicines to minimize errors and maximize accuracy
72	6.3.3. Ensure accurate rolling stocks, effective stock management, logistics of delivery and storage
73	**6.4. Work place management**
74	6.4..1.. Understand the roles in the organizational structure and works effectively within the organization's management structure
75	6.4.2. Demonstrate the ability to make accurate and timely decisions and to make appropriate judgments
76	**6.5. Financial management**
77	6.5.1.. Demonstrate the management of finance
78	**Domain 7. Professional and personal competencies**
79	**7.1. Communication**
80	7.1.1.. Communicate effectively with patients and their caregivers, with other healthcare professionals, other support staff, and other relevant third parties
81	**7.2. Collaboration**
82	7.2.1. Perform collaboratively with patients and intra- and inter-professional teams to provide safe, effective, efficient health care, thus fulfilling the needs of the community and society at large
83	**7.3. Continuing professional development**
84	7.3.1. Participate the continuing professional Development
85	7.3.2. Engage with students/interns/ residents
86	**7.4. Research and Education**
87	7.4.1. Review literatures and apply to research
88	7.4.2. Demonstrate research performance and professional judgment to the decision-making process
89	7.4.3. Educate all audiences by determining the most effective and enduring ways to impart information and assess learning.
90	**7.5. Professionalism and Ethic**

No	Competency statements
91	7.5.1. Take responsibility and accountability for delivering pharmacy care to patients, communities and society through ethical practice
92	7.5.2. Demonstrate awareness of local/national codes of ethics and recognize own professional limitation
93	**7.6. Pharmaceutical marketing**
94	7.6.1. Apply and understand regulatory affairs and the key aspects of pharmaceutical registration and legislation
95	7.6.2. Be aware of and identify the new medicines coming to the market
96	7.6.3. Demonstrate knowledge in marketing and sale
97	**7.7. Self-management**
98	7.7.1. Demonstrate self-awareness, leadership, IT, innovation, entrepreneurship, assertive skill, risk management and problem solving skill

Appendix 12. Draft competency standards obtained from the second round

No	Domain, Competency and Sub-competency Statements
1	**Domain 1. Fundamental Knowledges**
2	**1.1. Understand Basic Sciences**
3	**Botany and zoology** 1.1.1. Understand the basics of plant and animal biology,
4	**Chemistry** 1.1.2. Understand the basics of organic and inorganic chemistry
5	**Physic and Bio physic** 1.1.3. Understand the basics of physics and biophysics
6	**Mathematics** 1.1.4. Understand the basics of statistics, calculations and mathematical analysis
7	**1.2. Understand biomedical sciences**
8	**Anatomy,** 1.2.1. Understand anatomy of the human body in relation to route of drug administration and drug disposition
9	**Physiology** 1.2.2. Understand normal physiological functions of the human body and potential dysfunctions
10	**Biochemistry,** 1.2.3. Understand biochemical composition and pathways in the human body
11	**Pathology** 1.2.4. Understand basic knowledge of disease diagnosis
12	**Pharmacology** 1.2.5. Understand the mechanisms of pharmacology,
13	1.2.6. Know pharmacokinetics and Pharmacodynamic
14	1.2.7. Know about the use of medications in specific populations and pharmacogenetics
15	1.2.8. Know the basics of toxicology and clinical toxicology
16	**Domain 2. Pharmaceutical Public Health Competencies**
17	**2.1. Health education and promotion**
18	2.1.1. Actively participates and demonstrate in health prevention and promotion issue
19	**2.2. Pharmaceutical information and advice**
20	2.2.1.Counsel population on the safe and rational use of medicines and medical devices
21	2.2.2. Responds to questions using appropriate strategies
22	**Domain 3. Health System, Policy and Outcome Competencies**
23	**3.1. Health system and policy**
24	3.1.1. Evaluate mechanisms and needs of the health system in Myanmar for the implementation (e.g. health policy, health reimbursement and healthcare management)
25	**3.2. Pharmaceutical Law**
26	3.2.1. Apply Law, policy and regulation related to pharmaceuticals and pharmacy practice
27	3.2.2. Ensure medicines are not counterfeit and quality standards
28	**3.3. Health economic and outcomes**

No	Domain, Competency and Sub-competency Statements
29	3.3.1. Evaluate the needs of individual health status and medication safety and pharmaceutical product development
30	3.3.2. Evaluate costs and outcome
31	3.3.3. Recommend care plans that are cost-effective
32	**3.4. Improvement of health services**
33	3.4.1. Identify and evaluate the needs of health services and good pharmacy services and implement new services
34	3.4.2. Resolve, follow up and prevent drug-related problems
35	**3.5. Quality assurance**
36	3.5.1. Audit quality of services
37	3.5.2. initiate and implement audit activities and services
38	3.5.3.Develop and implement Standards Operation Procedure (SOP)
39	3.5.4. Ensure quality control tests are performed and managed Appropriately
40	3.5.5. Implement, conduct and maintain a reporting system of Pharmacovigilance
41	**Domain 4. Pharmaceutical Care Competencies**
42	**4.1. Assessment of medicines**
43	4.1.1. Assess medicines and rational use of medicines and devices according to the patients, hospitals and government policy and medication interaction of the patients
44	**4.2. Dispensing medicines**
45	4.2.1. Dispense a product safely and accurately that is appropriate for the Patient
46	**4.3. Monitors medicines use.**
47	4.3.1. Develop accurate, efficient patient therapeutic and monitoring plans that incorporate best practice and respect the autonomy of the patient
48	4.3.2. Monitor the patient's progress and assess therapeutic outcomes
49	**4.4. Monitors medication safety**
50	4.4.1. Prioritizes medication safety and acts accordingly
51	**4.5. Patient consultation and diagnosis**
52	4.5.1. Discuss with the patients the appropriate use of medicines, taking into account patient's preference
53	4.5.2. Document any intervention
54	4.5.3. Obtain, reconcile, review, maintain and update relevant patient medication and disease history
55	4.5.4. Understand genetic makeup of a person in relation to disease etiology and response to medicine
56	**Domain 5. Pharmaceutical Sciences Competencies**
57	**5.1. Drug discovery**
58	5.1.1. Understand the process of active ingredients discovery from the natural substances synthetic and semi synthetic substances
59	**5.2. Compounding**
60	5.2.1. Understand different types of dosage forms and their advantages
61	5.2.2. Understand the new drug delivery system in pharmaceutical formulations
62	5.2.3. Compound extemporaneous and cytotoxic medicines, Total Parental

No	Domain, Competency and Sub-competency Statements
	Nutrition, pharmaceutical medicines, cosmetics, herbal medicines, food and supplement
63	5.2.4. Compound under the good manufacturing practice(GMP) for pharmaceutical medicines
64	**5.3. Performs efficiently various tasks in pharmaceutical manufacturing**
65	5.3.1. Understand the principles of physical pharmacy, pharmaceutical calculations and bio-pharmaceutics that underpin drug formulation into acceptable dosage forms and their therapeutic outcomes.
66	5.3.2. Demonstrate the production of pharmaceutical products, cosmetics herbal medicines, food and alternative medicines, (herbal medicines, dietary supplement)
67	5..3.3.Understand biotechnology and biotechnological products
68	**5.4. Performs testing the products in quality control units**
69	**5.4.1.** Conduct the evaluation of pharmaceuticals qualities of pharmaceutical, cosmecuticals and neutraceuticals
70	5.4.2. Demonstrate quality control of pharmaceutical products, cosmetics, herbal medicines, food and alternative medicines (herbal medicines, dietary supplement)
71	5.4.3. Demonstrate quality control of Sterilized products
72	**Domain 6. Pharmaceutical Organization and Management Competencies**
73	**6.1. Human resources management**
74	6.1.1 Identify and manage human resources and staffing issues and demonstrate organizational and management skill
75	6.1.2. Recognize the potential of each member and the value of pharmacy team
76	**6.2. Procurement**
77	6.2.1. Understand the development of efficient inventory system Management
78	6.2.2. Demonstrate the procurement of, raw material, medicines, pharmaceutical products and devices
79	**6.3. Supply chain management**
80	6.3.1.. Understand how to supply medicines safely and efficiently, consistently within legal requirements and best professional practice.
81	6.3.2.. Demonstrate knowledge in store medicines to minimize errors and maximize accuracy
82	6.3.3. Ensure accurate rolling stocks, effective stock management, logistics of delivery and storage
83	**6.4. Work place management**
84	6.4..1.. Understand the roles in the organizational structure and works effectively within the organization's management structure
85	6.4.2. Demonstrate the ability to make accurate and timely decisions and to make appropriate judgments
86	**6.5. Financial management**
87	6.5.1.. Demonstrate the management of Finance
88	**Domain 7. Professional and personal competencies**
89	**7.1. Communication**
90	7.1.1. Understand the behavior, beliefs and cultural practices of patients and public for their health and wellness plans

No	Domain, Competency and Sub-competency Statements
91	7.7.2.. Communicate effectively with patients and their caregivers, with other healthcare professionals, other support staff, and other relevant third parties
92	**7.2. Collaboration**
80	7.2.1. Perform collaboratively with patients and intra- and inter-professional teams to provide safe, effective, efficient health care, thus fulfilling the needs of the community and society at large
93	**7.3. Continuing professional development**
94	7.3.1. Participate the continuing Professional development
96	7.3.2. Engage with students/ interns/ residents
97	**7.4. Research and Education**
98	7.4.1. Review literatures and apply to research
99	7.4.2. Demonstrate research performance and professional judgment to the decision-making process
100	7.4.3. Educate all audiences by determining the most effective and enduring ways to impart information and assess learning.
101	**7.5. Professionalism and Ethic**
102	7.5.1. Take responsibility and accountability for pharmaceutical business, pharmaceutical manufacturing & quality control test , delivering pharmacy care to patients, communities and society through ethical practice
103	7.5.2. Demonstrate awareness of local/national codes of ethics and recognize own professional limitation
104	**7.6. Pharmaceutical marketing**
105	7.6.1. Apply and understand regulatory affairs and the key aspects of pharmaceutical registration and legislation
106	7.6.2. Be aware of and identify the new medicines coming to the market
107	7.6.3. Demonstrate knowledge in marketing and sale
108	**7.7. Self-management**
109	7.7.1. Demonstrate self-awareness, leadership, Language skill, IT, innovation, entrepreneurship, assertive skill, risk management and problem solving skill

Appendix 13. Suggestion and comments of stakeholders on the draft competency standards in the second round

No	Domain, Competency and Sub- competency Statements	Suggestion	Comments	Number of stakeholders
1	**Domain 1. Fundamental Knowledges**	Should write with the action verbs for competencies and sub-competencies under Fundamental knowledges		(No 1 Employer)
2	**1.1. Understand languages** 1.1.1. English 1.1.2. Myanmar	Add Language skill (English and Myanmar in 7.7.1. statement	7.7.1. Demonstrate self-awareness, leadership, Language skills, IT, innovation, entrepreneurship, assertive skill, risk management and problem solving skill	**(2 stakeholders)** No 2 employer No 1 academic staff
3	**1.2. Understand basics sciences** 2.1.1.. Chemistry, 2.1.2. Physics, 2.1.3..Biophysics, 2.1.4. Botany, 2.1.5. Zoology, 2.1.6. Traditional medicines	Edit Traditional Medicines to Alternative medicines or Complementary medicines.		**(16 stakeholders)** No 1 to No 6 the academic staff and No 1. to No 6. pharmacists(Two from industry, two from the hospital and one company and one from community a No 2 to No 5 employers
4	**1.3. Understand biomedical sciences** 1.3.1. Biochemistry, 1.3.2. Anatomy, 1.3.3. Physiology, 1.3.4. Pharmacology, 1.3.5. Microbiology and 1.3.6. Pathology,			
5	**Domain 2. Pharmaceutical Public Health Competencies**			
6	**2.1. Health education**			

No	Domain, Competency and Sub- competency Statements	Suggestion	Comments	Number of stakeholders
	and promotion			
7	2.1.1. Actively participates and demonstrate in health prevention and promotion issue			
8	**2.2. Pharmaceutical information and advice**			
9	2.2.1.Counsel population on the safe and rational use of medicines and devices	- Change devices to medical devices in 2.2.1. -Change medical devices house hold use only in 2.2.1.		**(3 stakeholders)** No 1 and No 7 academic staffs No 6. employer
10	2.2.2. Responds to questions using appropriate strategies	*Should Add Understand the beliefs and cultural practices of patients and public into health and wellness plans		
11	**Domain 3. Health System, Policy and Outcome Competencies**	*Four year curriculum is not enough to develop for Domain 3		**(4 stakeholders)** No 2 and No 7 academic staff No 7 and No 8 Pharmacists (Regulatory pharmacists)
12	**3.1. Health system and policy**			
13	3.1.1. Evaluate mechanisms and needs of the health system in Myanmar for the implementation (e.g. health policy, health reimbursement and healthcare management)			
14	**3.2. Pharmaceutical Law and policy**			
15	3.2.1. Apply Law, policy and regulation related to pharmaceuticals and pharmacy practice			

No	Domain, Competency and Sub- competency Statements	Suggestion	Comments	Number of stakeholders
16	**3.3. Health economic and outcomes**			
17	3.3.1. Evaluate the needs of individual health status and medication safety and pharmaceutical product development			
18	3.3.2. Evaluate costs and outcome			
19	3.3.3. Recommend care plans that are cost-effective			
20	**3.4. Improvement of health services**			
21	3.4.1. Identify and evaluate the needs of health services and good pharmacy services and implement new services			
22	3.4.2. Resolve, follow up and prevent drug-related problems			
23	**3.5. Quality assurance**	*QA is required from selection of raw material to finished products for the user		**(5 stakeholders)** No 5,6 and 7 academic staff No 9 and No 10 Pharmacists (Industrial Pharmacists)
24	3.5.1.. Implement, conduct and maintain a reporting system of pharmacovigilance	* It is not only Pharmacovigilence but also include -Checks whether all of the production department are following their SOP, and whether the production is in accordance with GMP. -Prepare the documentation required by the factory.		**(5 stakeholders)** No 5,6 and 7 academic staff No 9 and No 10 Pharmacists (Industrial Pharmacists)

No	Domain, Competency and Sub- competency Statements	Suggestion	Comments	Number of stakeholders
		-Contacted the Myanmar FDA to get Drug Registration Certificates and Manufacturer License. *Safety is efficacy standards before they enter the market. *Understand the importance of QA for ensuring that pharmaceutical products meet safety is efficacy standards before they enter the market. *QA is required for selection of raw material to finished products for the user		
25	**Domain 4. Pharmaceutical care competencies**			
26	**4.1. Assessment of medicines**			
27	4.1.1. Assess medicines and rational use of medicines and devices according to the patients, hospitals and government policy and medication interaction of the patients			
28	**4.2. Dispensing medicines**			
29	4.2.1. Dispense a product safely and accurately that is appropriate for the patient	Prepare the anticancer drugs in biosafety cabinets of pharmacy department		**(2 stakeholders)** No 6 academic staff No 11 pharmacist (industry)
30	**4.3. Monitors medicines use.**			

No	Domain, Competency and Sub- competency Statements	Suggestion	Comments	Number of stakeholders
31	4.3.1. Develop accurate, efficient patient therapeutic and monitoring plans that incorporate best practice and respect the autonomy of the patient			
32	4.3.2. Monitor the patient's progress and assess therapeutic outcomes			
33	**4.4. Monitors medication safety**			
34	4.4.1. Prioritizes medication safety and acts accordingly			
35	**4.5. Patient consultation and diagnosis**			
36	4.5.1. Discuss with the patients the appropriate use of medicines, taking into account patient's preference			
37	4.5.2. Document any intervention			
38	4.5.3. Obtain, reconcile, review, maintain and update relevant patient medication and disease history			
39	**Domain 5. Pharmaceutical Sciences Competencies**			
40	**5.1. Drug discovery**			
41	5.1.1. Understand the process of active ingredients discovery from the natural substances synthetic and semi synthetic substances			
42	**5.2. Compounding**			
43	5.2.1. Compound extemporaneous and cytotoxic medicines, pharmaceutical medicines, cosmetics, herbal medicines and		5.2.2 -Understand different types of dosage forms and their advantages -Understand the	**(2 stakeholders)** N0 6 and No 7 academic staffs)

No	Domain, Competency and Sub- competency Statements	Suggestion	Comments	Number of stakeholders
	food		new drug delivery system in pharmaceutical formulations 5.3.3. Understand the principles of physical pharmacy, pharmaceutical calculations and bio-pharmaceutics that underpin drug formulation into acceptable dosage forms and their therapeutic outcomes. 5.4.2. Conduct the evaluation of pharmaceuticals qualities of pharmaceutical, cosmecuticals and neutraceuticals	
44	**5.4. Performs efficiently various tasks in pharmaceutical manufacturing**		5..3.3. Understand biotechnology and biotechnological products	**(2 stakeholders)** No 2. And 3 Academic staffs
45	7.4.1. Demonstrate the production of pharmaceutical products, cosmetics herbal medicines and food			
46	**7.5. Performs testing the products in quality control units**			
47	7.5.1. Demonstrate quality control of pharmaceutical products, cosmetics, herbal medicines, food		5.4.2. Demonstrate quality control of sterilized products	**(2 stakeholders)** (N0 2 and 3 Academic staffs)

No	Domain, Competency and Sub- competency Statements	Suggestion	Comments	Number of stakeholders
	and traditional medicines			
48	**Domain 6. Pharmaceutical Organization and Management Competencies**			
49	**6.1. Human resources management**			
50	6.1.1. Identify and manage human resources and staffing issues and demonstrate organizational and management skill			
51	6.1.2. Recognize the potential of each member and the value of pharmacy team			
52	**6.2. Procurement**			
53	6.2.1.Demonstrate the procurement of, raw material, medicines, pharmaceutical products and devices	*Should add Understand the procurement process of raw materials (API 7 Excipients), chemicals, consumables, packaging materials.		**(2 stakeholders)** No 12 Pharmacist (Industrial Pharmacist No 6 academic staff
54	6.2.2. Understand the development of efficient inventory system management			
55	**6.3. Supply chain management**			
56	6.3.1.. Understand how to supply medicines safely and efficiently, consistently within legal requirements and best professional practice.			
57	6.3.2.. Demonstrate knowledge in store medicines to			

No	Domain, Competency and Sub- competency Statements	Suggestion	Comments	Number of stakeholders
	minimize errors and maximize accuracy			
58	6.3.3. Ensure accurate rolling stocks, effective stock management, logistics of delivery and storage			
59	**6.4. Work place management**			
60	6.4..1.. Understand the roles in the organizational structure and works effectively within the organization's management structure			
61	6.4.2. Demonstrate the ability to make accurate and timely decisions and to make appropriate judgments			
62	**6.5. Financial management**			
63	6.5.1.. Demonstrate the management of finance			
64	**Domain 7. Professional and personal competencies**			
65	**7.1. Communication**			
66	7.1.1.. Communicate effectively with patients and their caregivers, with other healthcare professionals, other support staff, and other relevant third parties	*Should add -Understand the beliefs and cultural practices of patients and public for their health and wellness plans		**(Two stakeholders)** No 6 employer No 13 Pharmacist(community pharmacist)
67	**7.2. Collaboration**			
68	7.2.1. Perform collaboratively with patients and intra- and inter- professional teams			

No	Domain, Competency and Sub- competency Statements	Suggestion	Comments	Number of stakeholders
	to provide safe, effective, efficient health care, thus fulfilling the needs of the community and society at large			
69	**7.3. Continuing professional development**			
70	7.3.1. Participate the Continuing Professional Development			
71	7.3.2. Engage with students/interns/ Residents			
72	**7.4. Research and Education**			
73	7.5.2. Review literatures and apply to research			
74	7.5.3. Demonstrate research performance and professional judgment to the decision-making process			
75	7.5.4. Educate all audiences by determining the most effective and enduring ways to impart information and assess learning.			
76	**7.5. Professionalism and Ethic**			
77	7.5.3. Take responsibility and accountability for delivering pharmacy care to patients, communities and society through ethical practice			
78	7.5.4. Demonstrate awareness of			

No	Domain, Competency and Sub- competency Statements	Suggestion	Comments	Number of stakeholders
	local/national codes of ethics and recognize own professional limitation			
79	**7.6. Pharmaceutical marketing**			
80	7.6.1. Apply and understand regulatory affairs and the key aspects of pharmaceutical registration and legislation			
81	7.6.2. Be aware of and identify the new medicines coming to the market			
82	7.6.3. Demonstrate knowledge in marketing and sale			
83	**7.7. Self-management**			
84	7.7.1. Demonstrate self-awareness, leadership, IT, innovation, entrepreneurship, assertive skill, risk management and problem solving skill			

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Appendix 14. Editing or rewording, suggestion and comments of stakeholders on the draft competency standards in the third round

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
1	**Domain 1. Fundamental Knowledges**		Change all action verb (Understand to measurable verbs like know) **No. 1. Policymaker**
2	**1.1. Understand Basic Sciences**	Understand Basis Sciences **(No.2 policymaker)**	Such basic subjects should prepare a compact lecture to fit the basic need of a pharmacist **(No. 1. academic staff)**
3	1.1.1. **Botany and zoology** Understand the basics of plant and animal biology,	Know the basics of medicinal plant and animal biology, **(No.1 employer)**	Botany and zoology should be deleted **(No.1 academic staff)**
4	**Chemistry** 1.1.2. Understand the basics of organic and inorganic chemistry	Know the basics of organic and inorganic chemistry (No 1 policy maker)	They need more practical experiences. In Chemistry subject **(No.1. pharmacists and No. 2. employer)**
5	**Physic and Bio physic** 1.1.3. Understand the basics of physics and biophysics	Know the basics of physics **No.3. employer)**	Physic? Alone will cover the fundamental knowledges. **(No. 3. employer)**

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
			Not include in present curriculum for B.Pharm in Myanmar for Physic and biophysics 1.1.3. **(No 2. academic)**
6	**Mathematics** **1.1.4.** Understand the basics of statistics, calculations and mathematical analysis	Know the basics of Bio-stastics (**No. 3. academic and No.3. employer**)	Bio-stastics is required **(No.1. pharmacist and No 3 employer)**
7	**1.2. Understand biomedical sciences**		Microbiology should be added **(No. 4 academic and No 4 employer)** **Should add** Know basic knowledge of (bacteriology, virology, parasitology) and the relationship between pathogens and the diseases **(No .4. employer)**
8	**Anatomy,** 1.2.2. Understand anatomy of the human body in relation to route of drug administration and drug disposition		Change disposition to suitable word **(No.2. pharmacist and No.5. employer)**
9	**Physiology** 1.2.3. Understand normal physiological functions of the human body and potential dysfunctions	Know normal physiological functions of the human body **(No 5 employer)**	

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
10	**Biochemistry,** 1.2.4. Understand biochemical composition and pathways in the human body	Know biochemical composition and process in the human body **(No.1. HCP)**	
11	**Pathology** 1.2.5. Understand basic knowledge of disease diagnosis	**Pathology** Know etiology of diseases or the pathophysiology of medical conditions **(No. 5. academic staff)**	
12	**Pharmacology** 1.2.6. Understand the mechanisms of pharmacology,	Know the mechanisms of pharmacology **(No 1 policymaker)**	
13	1.2.7. Know pharmacokinetics and Pharmacodynamic	Apply the principal **of** pharmacokinetics and Pharmacodynamic **(No 1 Academic staff)**	
14	1.2.8. Understand about the use of medications in specific populations and pharmacogenetics	Know about the use of medications in specific populations and pharmacogenetics **(No 1 policymaker)**	
15	1.2.9. Understand the basics of toxicology and clinical toxicology	Know the basics of toxicology and clinical toxicology **(No 1 policymaker)**	Should add Know adverse drug effects, untoward effects, drug interaction, precaution and warning **No 1 Academic staff)**
16	**Domain 2. Pharmaceutical Public Health Competencies**		**It is high time to recognize this domain is for the key role of pharmacists in public health care system (No 5 Pharmacist)**

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
17	**2.1. Health education and promotion**		Should be practiced based training **(No.6. academic staff)**
18	2.1.1. Actively participates and demonstrate in health prevention and promotion issue	**Change** Actively participate and demonstrate health promotion and disease prevention and control, and healthy lifestyle **(No. 4. pharmacist)**	2.1.1. Should be more clear sentences to understand easily **(No.3. pharmacist and No.3. employer)** Change May consider "Preventive healthcare and promotion **(No .5. pharmacist)** Add Pharmacists should participate in health Prevention and primary health care program **(No 6. pharmacist).** Pharmacy graduates in community setting are participating in health prevention and promotion **issue (No. 6. academic)** Should be train this competency with close supervision **(No.6. employer**)
19	**2.2. Pharmaceutical information and advice**		Need to let pharmacy students to have a group project, how we can have a role in public health; for

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
			example : antimicrobial campaign project, antihypertension by health checks, quit smoking, pain relief, and so on **(No 2. pharmacist)**
20	2.2.1.Counsel population on the safe and rational use of medicines and medical devices	Provide accurate, reliable and updated medicines information to patients, clients and healthcare providers **(No 2. HCP)** Counsel population for rational use of medicines and medical devices with safety manner **(No.7. pharmacist)**	Should increase practice based learning **(No.5. academic)**
21	2.2.2. Responds to questions using appropriate strategies	2.2.3. Respond to questions using appropriate skills **(No. 5. pharmacist)**	Develop the skills to provide accurate and reliable information to patients and healthcare providers **(No.4. pharmacist)** Participate in drug information center **(No. 8 pharmacists)**
22	**Domain 3. Health System, Policy and Outcome Competencies**	Domain 3. Health Systems, Policy and Outcome Competencies **(No. 2 employer)**	It is necessary to build capacity in health services and policy research focused on improving the health care system Should be practiced based training **(No.5. academic)**
23	**3.1. Health system and policy**		
24	3.1.1. Evaluate mechanisms and needs of the	3.1.1. Evaluate mechanisms and needs	**To add** health insurance in 3.1.1.

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
	health system in Myanmar for the implementation (e.g. health policy, health reimbursement and healthcare management)	of the health systems in Myanmar for the implementation (e.g. health policy, health reimbursement, health insurance and healthcare management) **(No.2. employer)**	**(No 2 employer)** (not only literature but also practical based teaching methods should be used for pharmacy graduates to clearly understand the statement. **(No.9. pharmacist)** Should increase practice based learning **(No.5. academic)**
25	**3.2. Pharmaceutical Law**		
26	3.2.1. Apply Law, policy and regulation related to pharmaceuticals and pharmacy practice	Apply policy, Law and regulation related to pharmaceuticals and pharmacy practice **(No 7. employer)** Apply policy, Law, by Law regulation and guidelines related to pharmaceuticals, drugs and pharmacy practice **(No. 8 employer)** Apply policy, Law, regulation and guidelines related to pharmaceutical products, biotechnological products, cosmetics, herbal medicine, food and health supplements to pharmacy practice **(No.11. Pharmacist)**	If there is the application system for pharmacy license, there should be practice of taking licensing exam for undergraduate students. **(No.10. pharmacist)** We should be familiar with national drug law, regional guideline and international guidelines to apply in regulatory affair and pharmaceutical industry **(No 8.pharmacist)** Should Add Cosmetics, food and biotechnological products **(No. 6. academic)**

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
			Pharmacopoeia standards are important in quality of ingredient and product **(No 8. pharmacist)** Pharmacist should include in establishing national essential drug list to evaluate the need of essential and most cost- effective drug list to set up the proper health insurance and comprehensive public health system for population **(No.12. pharmacist)** Not well developed **(No. 5. academic)**
27	3.2.2. Ensure medicines are not counterfeit and quality standards	Ensure medicines are not counterfeit and quality standards (What do Under QA) Ensure medicines are not counterfeit and quality standards **(No 2 policymaker)** Ensure medicines are not counterfeit **No 2 Employer**	Do you mean not quality standards means Sub standards? **(No 13. pharmacist and No.1. and 2 employers)** I think that "knowing the regulations or procedures what to do about counterfeit or unstandardized drugs" is more sutiable than "ensure" in this title because this meaning seems like

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
			ensuring medicine quality which is the job of QC. Should not only ensure but also know regulations **(No 5. pharmacist)** Should be practiced based training **(No 5. academic)**
28	**3.3. Health economic and outcomes**		
29	3.3.1. Evaluate the needs of individual health status and medication safety and pharmaceutical product development		For pharmacy graduates to comprehend the statement with clarity, both literature and practical-based teaching approaches should be used **(No. 5.pharmacist)**
30	3.3.2. Evaluate costs and outcome		- Add - Pharmacoeconomic **(No.3 employer)** Should be practiced based training **(No 5. academic)**
31	3.3.3. Recommend care plans that are cost-Effective	Recommend cost-effective care plans **(No 6 pharmacist)**	
32	**3.4. Improvement of health services**		
33	3.4.1. Identify and evaluate the needs of health services and good pharmacy services ~~a~~nd implement new services		

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
34	3.4.2. Resolve, follow up and prevent drug-related problems		
35	**3.5. Quality assurance**		The system should be developed **(No.5 academic)**
36	3.5.1. Audit quality of services	How to audit **(No.6. employer)**	Conduct QA Audit quality of services (Whom service?) Check
37	3.5.2. initiate and implement audit activities and quality of pharmacy services		
38	3.5.3.Develop and implement standards operation procedure (SOP)	Develop , implement and follow Standards operation procedure (SOP) **(No 6 academic)**	
39	3.5.4. Ensure quality control tests are performed and managed appropriately and meet quality standards		
40	3.5.5. know the implementation and conducting pharmacovigilance reporting system		As a pharmacist is critical in ADR reporting and monitoring, they need to know ADR processes like observing a report from patients, documenting and issuing this report to a responsible department. Moreover, they need to be trained in recording and reviewing patients' profiles and medication issues like interactions, ADR and

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
			pharmacovigilance and reporting these problems. **(No .5. pharmacist)** Should implement ADR reporting system **(No 6 pharmacist)**
41	**Domain 4. Pharmaceutical Care Competencies**		
42	**4.1. Assessment of medicines**		
43	4.1.1. Assess medicines and rational use of medicines and devices according to the patients, hospitals and government policy and medication interaction of the patients	Assess medicines and rational use of medicines and devices, medication interaction and adverse Drug Reaction in the patients according to the policy and guidelines **(No 2. HCP)** Providing up-to-date drug information for health care workers **(No 2. HCP)**	
44	**4.2. Dispensing medicines**		Should be field based learning (**No.5. academic)**
45	4.2. 1. Dispense a product safely and accurately that is appropriate for the patient	Dispense medicines and medical devices safely and accurately that is appropriate for the patient	Should add Document and act upon dispensing errors and accurately report them to the appropriate authorities **(No 6. pharmacist)**

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
46	**4.3. Monitors medicines use.**	**4.3. Monitor medicines use (No 1. HCP).**	
47	4.3.1. Develop accurate, efficient patient therapeutic and monitoring plans that incorporate best practice and respect the autonomy of the patient	Develop accurate, efficient patient therapeutic and monitoring plans that incorporate best practices and respect the autonomy of the patient **(N.2. academic)** Develop accurate, efficient therapeutics monitoring plans that incorporate best practices and respect the autonomy of the patient **(No.6 academic)**	
48	4.3.2. Monitor the patient's progress and assess therapeutic outcomes		Priorities patients' safety curriculum by WHO
49	**4.4. Monitors medication safety**	**Monitor medication safety (No 2 HCP).**	
50	4.4.1. Prioritize medication safety and acts accordingly	Identify, prioritise and resolve medicines management problems **(No 13. pharmacist)**	
51	**4.5. Patient consultation and diagnosis**		diagnosis should delete **(No.4. employer)**
52	4.5.1. Discuss with the patients the appropriate use of medicines, taking into account patient's preference	Discuss with the patients the appropriate use of medicines, taking into account the patient's preference **(No 1 academic)**	Add Provide arranging follow up and refer appropriately **(No 7 employer)**

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
			Add Providing information of medicines to the patients **(No 1.HCP)**
53	4.5.2. Document any intervention		What document? **(No.1 pharmacist)**
54	4.5.3. Obtain, reconcile, review, maintain and update relevant patient medication and disease history		(should delete disease history) **(No.4. employer)**
55	4.5.3. Understand genetic makeup of a person in relation to disease etiology and response to medicine	Know genetic disorder and response to medicine **(No.2.academic)**	
56	**Domain 5. Pharmaceutical Sciences Competencies**		
57	**5.1. Drug discovery**	5.1. Drug discovery, design and development **(No. 3. academic)**	
58	5.1.1. Understand the process of active ingredients discovery from the natural substances synthetic and semi synthetic substances	Know the process of active ingredients discovered from the natural (plant and animal origin), synthetic and semi synthetic substances **(No.6.academic)** Know the structure activity relationship and chemical properties of drugs **(No.7. academic)**	Need for basic knowledge for pharmacognosy (to authenticate raw materials)

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
59	**5.2. Compounding**		
60	5.2.1. Understand different types of dosage forms and their advantages	And disadvantages? (No 6.employer) 5.2.2. Understand different types of dosage forms and their advantages and disadvantages **(No. 6. academic)**	Add Disadvantages **(No 6 employer)**
61	5.2.2. Understand the new drug delivery system in pharmaceutical formulations	**Should change** Understand the new drug delivery system in pharmaceutical sciences	
62	5.2.3. Compound extemporaneous and cytotoxic medicines, Total Parental Nutrition, pharmaceutical medicines, cosmetics, herbal medicines, food and supplement	**Should delete** Cosmetics, herbal medicines, food and supplement **(No.2. academic)** Compound extemporaneous medicines and follow guidelines (GMP,GDP.GLP) **Check** Compound extemporaneous and cytotoxic medicines, Total Parental Nutrition, pharmaceutical products/formulation, cosmetics, herbal medicines, food and supplement Compound extemporaneous and cytotoxic medicines, Total Parental Nutrition, pharmaceutical medicines, cosmetics, herbal medicines, food and health supplement **(No 5 employer)**	Understand how to use equipment and machines and the process of machine **(No.2. academic)**

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
63	5.2.4. Compound under the good manufacturing practice(GMP) for pharmaceutical medicines		
64	**5.3. Performs efficiently various tasks in pharmaceutical manufacturing**		
65	5.3.1. Understand the principles of physical pharmacy, pharmaceutical calculations and bio-pharmaceutics that underpin drug formulation into acceptable dosage forms and their therapeutic outcomes.	Should include 5.3.2. Understand physical and chemical/physiochemical A properties of AI and excipients **(No. 5. Employer)** Understand preparation of advanced technological products (eg. nano-technological products) **(No . 5 employer)**	
66	5.3.2. Demonstrate the production of pharmaceutical products, cosmetics herbal medicines, food and alternative medicines, (herbal medicines, health supplement)	Demonstrate the production of pharmaceutical products, cosmetics, nutraceuticals herbal medicines, food and alternative medicines, (herbal medicines, dietary supplement) Change Alternative medicines Traditional medicines, herbal medicines , complementary medicines and health supplement **(No 3.employer)**	
67	5..3.3.Understand biotechnology and biotechnological products	Conceptualize biotechnology and biotechnological products **(No.2**	

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
		academic) Pharmaceutical biotechnological biotechnological derived products **(No 5 academic)**	
68	**5.4. Performs testing the products in quality control units**		
69	5.5.1. Conduct the evaluation of pharmaceuticals qualities of pharmaceutical, cosmecuticals and neutraceuticals	Evaluate the pharmaceutical qualities of medicines, cosmeceuticals and nutraceuticals **(No 2 and No4 academic)** Conduct evaluation to assess the qualities of pharmaceutical, cosmecuticals and nutraceuticals	Add Understand Chemical Safety and Biosafety Understand the use of animals in Pharmaceutical Product Development **(No 7 pharmacists)** The scientific knowledge in detail and practical work in student life can perform efficiently in some tasks in pharmaceutical manufacturing and on job training and experience will support to complete the tasks (**No 8 pharmacist)**
70	5.5.2. Demonstrate quality control of pharmaceutical products, cosmetics, herbal medicines, food and alternative medicines (herbal medicines, dietary supplement)	Demonstrate proficiency in quality control procedure for raw materials, pharmaceutical products, cosmetics, food and alternative medicines (herbal medicines, traditional medicines, dietary supplement and etc,) (**No. 8 pharmacist)**	Practical work at laboratory of pharmaceutical chemistry and pharmaceutics can apply in Quality Control and research laboratory. (**No. 8 pharmacist)**

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
		Conduct quality control of raw materials, pharmaceutical products, cosmetics, nutraceuticals, food and alternative medicines (herbal medicines, traditional medicines, health/ dietary supplement) (**No. 8 pharmacist)** Understand quality control of advanced technological products (eg. nanotechology) (**No. 8 pharmacist)** Perform quality control tests physicochemical tests and safety t e s t	
71	5.5.3. Demonstrate quality control of Sterilized products	Demonstrate quality control of sterilized pharmaceutical products	
72	**Domain 6. Pharmaceutical Organization and Management Competencies**		
73	**6.1. Human resources management**		
74	6.1.1 Identify and manage human resources and staffing issues and demonstrate organizational and management skill		Should add Apply HR related Law. **(No. 6 employer)**
75	6.1.2. Recognize the potential of each member the value of pharmacy team		Should add Apply Psychology **(No 6.employer)**

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
76	**6.2. Procurement**		
77	6.2.1. Understand the development of efficient inventory system management	Explain the development of efficient inventory system management **(No 5 pharmacist)** Understand the development of efficient inventory control system and management and establish standard operation procedures, Law and guidelines **(No 1 employer)** Should add export-import law, commercial law, consumer protection law (**No 6 employer)**	6.2.1. It should be moved to Supply chain management **(No .1 employer)**
78	6.2.2. Demonstrate the procurement of, raw material, medicines, pharmaceutical products and devices	Demonstrate the procurement of raw materials, packing materials, medicines, pharmaceutical products and medical devices	Add Understand the procurement planning and process of pharmaceuticals and health products (1E P) **(No.1. pharmacist)** Understand the demand and forecasting of pharmaceuticals and health products requirements for a

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
			specific project or organization **(No.1 . employer)**
79	**6.3. Supply chain management**		
80	6.3.1.. Understand how to supply medicines safely and efficiently, consistently within legal requirements and best professional practice.	Understand the development of efficient inventory control system and management and establish standard operation procedures Law and guidelines	**Should add** export-import law, commercial law, consumer protection law (**No 6 employer)**
81	6.3.2.. Demonstrate knowledge in store medicines to minimize errors and maximize accuracy	Demonstrate knowledge in storage of medicines to minimize errors and maximize accuracy **(No.1 pharmacist)** Demonstrate knowledge in Good Storage Practice (GSP) for the drugs and medical devices to minimize errors and maximize accuracy **(No 1 pharmacist)** Demonstrate knowledge in Good Storage Practice (GSP) and Good distribution practice (GDP) for the drugs and medical devices to minimize errors and maximize accuracy **(No 4 employer)**	
82	6.3.3. Ensure accurate rolling stocks,	6.3.4. Ensure Good Storage Practice	Add

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
	effective stock management, logistics of delivery and storage	(GSP) in the warehouse **(No. 3. pharmacist)** Ensure accurate verification of rolling stocks, effective inventory stock management, logistics of delivery and storage 4.3.5. Implement a system for documentation and record keeping	Ensure Good storage practice in the warehouse **(No.3. pharmacist)**
83	**6.4. Work place management and safety**	**6.4. Work place management and safety**	
84	6.4..1.. Understand the roles in the organizational structure and works effectively within the organization's management structure	Roles and responsibilities of each and everybody **(No.6. employer)** 6.4.5. Recognize and manage pharmacy resources (eg. financial and infrastructure)	Add day to day management (**No.6. employer)** Add 6.4.2.. Address and manage day to day management issues
85	6.4.2. Demonstrate the ability to make accurate and timely decisions and to make appropriate judgments		
86	**6.5. Financial management**		

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
87	6.5.1.. Demonstrate the management of Finance	Demonstrate the financial management **(No. 5. pharmacist)**	Should reconsider only for basic financial knowledge.
88	**Domain 7. Professional and personal competencies**		
89	**7.1. Communication**		
90	7.1.1. Understand the behavior, beliefs and cultural practices of patients and public for their health and wellness plans		
91	7.7.2.. Communicate effectively with patients and their caregivers, with other healthcare professionals, other support staff, and other relevant third parties	Communicate effectively with patients and their caregivers, with other healthcare professionals, other supportive staff, and other relevant third parties **(No. 1. academic).**	
92	**7.2. Collaboration**		
93	7.2.1. Perform collaboratively with patients and intra- and inter-professional teams to provide safe, effective, efficient health care, thus fulfilling the needs of the community and society at large	Collaborate with patients and intra- and inter-professional teams to provide safe, effective and efficient health care, thus fulfilling the needs of the community and society at large **(No. 1. academic)**	
94	**7.3. Continuing professional development**		
95	7.3.1. Participate the continuing	7.3.1. Participate in the Continuing	Need to train future pharmacy

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
	Professional development(CPD)	Professional Development (CPD) **(No.1.employer)**	student how to search continuous professional education from the reliable and update sources and always keeping updates with medicines information. **(No.2. pharmacist)**
96	7.3.2. Engage with students/ interns/ residents	Engage with students/ interns/ residents/ non-residents	Should check interns/ residents should be put or not under CPD Should delete it **(No 1 Academic staff)**
97	**7.4. Research and Education**		
98	7.4.4. Review literatures and apply to research		
99	7.4.5. Demonstrate research performance and professional judgment to the decision-making process	Demonstrate research and development and professional judgment to the decision-making process	
100	7.4.6. Educate all audiences by determining the most effective and enduring ways to impart information and assess learning.		
101	**7.5. Professionalism and Ethic**	**7.5. Professionalism and Ethics (No. 1. employer)**	
102	7.5.1. Take responsibility and accountability for pharmaceutical business, pharmaceutical manufacturing & quality	Reword Take responsibility and accountability for the pharmaceutical business,	

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
	control test , delivering pharmacy care to patients, communities and society through ethical practice	pharmaceutical manufacturing & quality control tests, delivering pharmacy care to patients, communities and society through ethical practice **(No.2. academic)** Take responsibility and accountability for pharmaceutical business, pharmaceutical manufacturing & quality control test , delivering pharmaceutical care to patients, communities and society through ethical practice **(No.2. academic)**	
103	7.5.2. Demonstrate awareness of local/national codes of ethics and recognize own professional limitation		
104	**7.6. Pharmaceutical marketing**		
105	7.6.1. Apply and understand regulatory affairs and the key aspects of pharmaceutical registration and legislation	Apply and understand regulatory affairs and the key aspects of pharmaceutical registration and legislation by following the local regulation as well as standards **(No.1. pharmacist)**	On job training in carrier life will be more understanding on pharmaceutical marketing. In student life, we should know pharmaceutical marketing in line with ethic, not like other business. **(No.8. employer)** **Add** Apply and understand regulatory

No	Domains, Competency and Sub-competency Statements	Please provide judgment on the competencies. (Editing or rewording each statement if needs revision and to provide additional information as appropriate)	Provide suggestion and comments on the competency statements
			affairs and the key aspects of pharmaceutical marketing. **(No.6. employer)**
106	7.6.2. Be aware of and identify the new medicines coming to the market	.	
107	7.6.3. Demonstrate knowledge in marketing and sale	Summarize pharmaceutical marketing skills **(No. 2. academic)**	
108	**7.7. Self-management**		
109	7.7.1. Demonstrate self-awareness, leadership, Language skill, IT, innovation, entrepreneurship, assertive skill, risk management and problem solving skill	Demonstrate self-awareness, leadership, language skills, information technology, innovation, entrepreneurship, assertive skill, risk management and problem solving skill **(No. 2. academic)**	

มหาวิทยาลัยศิลปากร

REFERENCES

1. **Chanakit T, Low BY, Wongpoowarak P, Moolasarn S, Anderson C. Does a transition in education equate to a transition in practice? Thai stakeholder's perceptions of the introduction of the Doctor of Pharmacy programme. BMC medical education. 2015;15:1-36.**
2. Kochaniec M, Drozd M, Szymańska J. Polish pharmacy job market in opinion of pharmacists. Current Issues in Pharmacy and Medical Sciences. 2013;26(2):231-4.
3. Beardsley R, Matzke GR, Rospond R, Williams J, Knapp K, Kradjan W, et al. Factors influencing the pharmacy faculty workforce. American Journal of Pharmaceutical Education. 2008;72(2).
4. Anderson C, Bates I, Beck D, Brock T, Futter B, Mercer H, et al. The WHO UNESCO FIP Pharmacy Education Taskforce: enabling concerted and collective global action. American journal of pharmaceutical education. 2008;72(6).
5. Anderson C, Bates I, Futter B, Gal D, Rouse M, Whitmarsh S. Global perspectives of pharmacy education and practice. World Medical & Health Policy. 2010;2(1):5-18.
6. Chanakit T, Low BY, Wongpoowarak P, Moolasarn S, Anderson C. A survey of pharmacy education in Thailand. American journal of pharmaceutical education. 2014;78(9):161.
7. Bruno A, Bates I. FIPEd global education report. The Hague: International Pharmaceutical Federation. 2013.
8. Brownie S, Bahnisch M, Thomas J. Competency-based education and competency-based career frameworks: informing Australian health workforce development. 2011.
9. Arakawa N, Yamamura S, Duggan C, Bates I. The development of a foundation-level pharmacy competency framework: An analysis of country-level applicability of the Global Competency Framework. Research in Social and Administrative Pharmacy. 2020;16(3):396-404.
10. Stupans I. A Curriculum Challenge—the need for outcome (competence) descriptors. Pharmacy. 2017;5(1):7.
11. McConnell EA. Competence vs. competency. Nursing Management. 2001;32(5):14.
12. Maitreemit P, Pongcharoensuk P, Kapol N, Armstrong EP. Pharmacist perceptions of new competency standards. Pharmacy Practice (Internet). 2008;6(3):113-20.
13. Dobbert DJ. Experiences with, and Assessment of, Competency-Based Curriculum in Disciplines Outside of Pharmacy. 1975.
14. Sánchez-Pozo A. A comparison of competences for healthcare professions in Europe. Pharmacy. 2017;5(1):8.
15. Biggs J, Tang C, Kennedy G. Teaching for quality learning at university 5e: McGraw-hill education (UK); 2022.
16. Katajavuori N, Salminen O, Vuorensola K, Huhtala H, Vuorela P, Hirvonen J. Competence-based pharmacy education in the University of Helsinki. Pharmacy. 2017;5(2):29.
17. Rouse M, Meštrovic A. Quality assurance of pharmacy education: the FIP Global Framework. The Hague, The Netherlands: International Pharmaceutical Federation (FIP). 2014.

18. Bruno A, Bates I, Brock T, Anderson C. Towards a global competency framework. American Journal of Pharmaceutical Education. 2010;74(3).
19. Nash RE, Chalmers L, Brown N, Jackson S, Peterson G. An international review of the use of competency standards in undergraduate pharmacy education. Pharmacy Education. 2015;15.
20. Kapol N, Maitreemit P, Pongcharoensuk P, Armstrong EP. Evaluation of curricula content based on Thai pharmacy competency standards. American Journal of Pharmaceutical Education. 2008;72(1).
21. Worldometer. Myanmar Population 2025 [Available from: https://www.worldometers.info/world-population/myanmarpopulation/#:~:text=The%20current%20population%20of%20Myanmar,54%2C500%2C091%20people%20at%20mid%20year. .
22. University of Pharmacy Mandalay. Courses [Available from: http://www.uopmdy.gov.mm/
23. University of Pharmacy Yangon. Programs [Available from: http://www.uopygn.gov.mm/.
24. Levine E, Patrick S. What Is Competency-Based Education? An Updated Definition. Aurora Institute. 2019.
25. Taskforce PE. A global competency framework (Version 1). The Hague: International Pharmaceutical Federation. 2012.
26. Medina MS. Does competency-based education have a role in academic pharmacy in the United States? Pharmacy. 2017;5(1):13.
27. Aye LN, Anantachoti P. Pharmacy workforce in Myanmar public sector. The Thai Journal of Pharmaceutical Sciences. 2020;44(4):267-73.
28. Schwalje W. What is the difference between a skills shortage and a skills gap? Available at SSRN 1941313. 2011.
29. Rodrigues M, Fernández-Macías E, Sostero M. A unified conceptual framework of tasks, skills and competences. JRC Working Papers Series on Labour, education and Technology; 2021.
30. ASEAN University Network. Guide to AUN-QA Assessment at Programme Level Version 4.0 2020 [Available from: https://www.aunsec.org/application/files/2816/7290/3752/Guide_to_AUN-QA_Assessment_at_Programme_Level_Version_4.0_4.pdf.
31. Anderson C, Bates I, Beck D, Brock TP, Futter B, Mercer H, et al. The WHO UNESCO FIP pharmacy education taskforce. Human Resources for Health. 2009;7:1-8.
32. Singapore Pharmacy Council. Standard for Undergraduate Pharmacy Education and Training in Singapore. Singapore Pharmacy Council; 2018.
33. Supapaan T, Low BY, Wongpoowarak P, Moolasarn S, Anderson C. A transition from the BPharm to the PharmD degree in five selected countries. Pharmacy Practice (Granada). 2019;17(3).
34. Austin Z, Ensom MH. Education of pharmacists in Canada. American journal of pharmaceutical education. 2008;72(6):128.
35. Kawaguchi-Suzuki M, Law MG, Prisco J, Head K, Fu L, Yumoto T, et al. Cultural sensitivity and global pharmacy engagement in Asia: China, Japan, South Korea, and Taiwan. American journal of pharmaceutical education. 2019;83(4):7214.

36. Basak SC, Sathyanarayana D. Pharmacy education in India. American journal of pharmaceutical education. 2010;74(4):68.
37. Sosabowski MH, Gard PR. Pharmacy education in the United Kingdom. American journal of pharmaceutical education. 2008;72(6).
38. Ministry of Health Singapore. Definition of Credit Hour [Available from: https://www.hpp.moh.gov.sg/all-healthcare-professionals/career-practice/CareerNPracticesDetails/pharmacists-professional-training-education.
39. Kawaguchi-Suzuki M, Hogue MD, Khanfar NM, Lahoz MR, Law MG, Parekh J, et al. Cultural sensitivity and global pharmacy engagement in Asia: India, Indonesia, Malaysia, Philippines, and Vietnam. American journal of pharmaceutical education. 2019;83(4):7215.
40. Vo T-H, Bedouch P, Nguyen T-H, Nguyen T-L-H, Hoang T-K-H, Calop J, et al. Pharmacy education in Vietnam. American journal of pharmaceutical education. 2013;77(6):114.
41. Council on Credentialing in Pharmacy. Development of a U.S. National Competency Framework for Pharmacists [Available from: https://jcpp.net/wp-content/uploads/2015/09/Agenda-Item-6-Attachment-A-Competency-Framework-Background-Document-for-JCPP.pdf.
42. Chew L, Singapore WotMoH. Competency standards for pharmacists in advanced practice. Singapore: Ministry of Health. 2017.
43. Council SAP. South African Pharmacy Council. 2018.
44. Council GP. Future pharmacists: Standards for the initial education and training of pharmacists. London: General Pharmaceutical Council. 2011.
45. Accreditation Council for Pharmacy Education. Accreditation standards and key elements for the professional program in pharmacy leading to the doctor of pharmacy degree. Accreditation Council for Pharmacy Education Chicago, IL; 2015.
46. Stupans I, McAllister S, Clifford R, Hughes J, Krass I, March G, et al. Nationwide collaborative development of learning outcomes and exemplar standards for Australian pharmacy programmes. International Journal of Pharmacy Practice. 2015;23(4):283-91.
47. Atkinson J. The production of the PHAR-QA competence framework. Pharmacy. 2017;5(2):19.
48. Canada AoFoPo. Educational outcomes for first professional degree programs in pharmacy in Canada. Association of Faculties of Pharmacy of Canada Ottawa; 2017.
49. Malaysia Pharmacy Board. Standards on Approval and Recognition of Pharmacy programme.: Ministry of Health Malaysia; 2018.
50. Zeenny RM, Akel M, Hajj A, Sacre H, Hallit S, Salameh P. Descriptive assessment of graduates' perceptions of pharmacy-related competencies based on the Lebanese pharmacy core competencies framework. Pharmacy Practice (Granada). 2021;19(2).
51. Prideaux D. ABC of learning and teaching in medicine. BMJ. 2003;326(1):268-70.
52. Nunes-da-Cunha I, Fernandez-Llimos F. Educational contents for a patient-centred undergraduate pharmacy curriculum. Center for Research and Publications in Pharmacy Practice: Centro de Investigaciones y Publicaciones Farmaceuticas. 2017.

53. Boyce EG, Lawson LA. Preprofessional curriculum in preparation for doctor of pharmacy educational programs. American Journal of Pharmaceutical Education. 2009;73(8):155.
54. Ho SS, Kember D, Lau CB, Yeung MYA, Leung DY, Chow MS. An outcomes-based approach to curriculum development in pharmacy. American Journal of Pharmaceutical Education. 2009;73(1):14.
55. International Bureau of Education. Curriculum evaluation [Available from: http://www.ibe.unesco.org/en/glossary-curriculum-terminology/c/curriculum-evaluation.
56. Koster A, Schalekamp T, Meijerman I. Implementation of competency-based pharmacy education (CBPE). Pharmacy. 2017;5(1):10.
57. Doria M. Outcomes-based approach to pharmacy curriculum review and redevelopment. Pharmaceutical Sciences Asia. 2017;44(3):115-33.
58. Pharmacy Council of India. Rules & Syllabus for the Bachelor of Pharmacy (B. Pharm) Course. 2014.
59. World Health Organization. The role of the pharmacists in Health care system. New Delhi, India. 1988. Tokyo,Japan.1993.
60. Sam AT, Parasuraman S. The nine-star pharmacist: an overview. Journal of Young pharmacists. 2015;7(4):281.
61. Medina MS, Plaza CM, Stowe CD, Robinson ET, DeLander G, Beck DE, et al. Center for the Advancement of Pharmacy Education 2013 educational outcomes. American Journal of Pharmaceutical Education. 2013;77(8):162.
62. Latt NN, Cho SM, Htun NMM, Saw YM, Myint MNHA, Aoki F, et al. Healthcare in myanmar. Nagoya Journal of Medical Science. 2016;78(2):123.
63. Ministry of Health Myanmar. Attending and giving speeches at welcoming ceremonies for those who will serve as intern doctors for one year from July 2023 in major teaching hospitals 2023 [Available from: https://www.facebook.com/MinistryOfHealthMyanmar?mibextid=ZbWKwL.
64. Mahidol University. US-Thai Pharmacy Consortium Virtual Meeting 2022 [Available from: https://mahidol.ac.th/th/2022/2022-us-thai-pharmacy/.
65. University of Pharmacy Yangon. Facts and Figure. 2013.
66. University of Pharmacy Yangon. Programs and Departments 2024 [Available from: http://www.uopygn.gov.mm.
67. University of Pharmacy Mandalay. Courses and Departments 2024 [Available from: http://www.uopmdy.gov.mm.
68. University of Pharmacy Mandalay. Courses and Departments [Available from: http://www.uopmdy.gov.mm.
69. University of Pharmacy Yangon. Programs and Departments [Available from: http://www.uopygn.gov.mm.
70. Ministry of Health Myanmar. A meeting to coordinate the course schedule and curriculum for those who passed the university entrance examination under the new education system KG+ 12 [Available from: https://www.facebook.com/MinistryOfHealthMyanmar?mibextid=ZbWKwL.
71. The Global New Light of Myanmar Newspaper. Naypyitaw State Academy (NSA) project. . 2022.
72. Hsu C-C, Sandford BA. The Delphi technique: making sense of consensus. Practical assessment, research, and evaluation. 2007;12(1).

73. Green RA. The Delphi technique in educational research. Sage Open. 2014;4(2):2158244014529773.
74. Skulmoski GJ, Hartman FT, Krahn J. The Delphi method for graduate research. Journal of Information Technology Education: Research. 2007;6(1):1-21.
75. Alizadeh S, Maroufi SS, Sohrabi Z, Norouzi A, Dalooei RJ, Ramezani G. Large or small panel in the Delphi study? Application of bootstrap technique. Journal of Evolution of Medical and Dental Sciences. 2020;9(15):1267-71.
76. Rezaie L, Heydari S, Paschall E, Khazaie H, Sadeghi Bahmani D, Brand S. A mixed-method modified Delphi study toward identifying key elements of psychotherapy in Iran. International journal of environmental research and public health. 2020;17(7):2514.
77. Guion LA, Diehl DC, McDonald D. Triangulation: establishing the validity of qualitative studies: FCS6014/FY394, Rev. 8/2011. Edis. 2011;2011(8):3-.
78. Sacre H, Hallit S, Hajj A, Zeenny RM, Akel M, Raad E, et al. Developing core competencies for pharmacy graduates: The Lebanese Experience. Journal of pharmacy practice. 2022;35(2):332-9.
79. Atkinson J, De Paepe K, Sánchez Pozo A, Rekkas D, Volmer D, Hirvonen J, et al. The PHAR-QA Project: Competency framework for pharmacy practice—First steps, the results of the European network Delphi Round 1. Pharmacy. 2015;3(4):307-29.
80. Saw YM, Than TM, Thaung Y, Aung S, Shiao LW-S, Win EM, et al. Myanmar's human resources for health: current situation and its challenges. Heliyon. 2019;5(3).
81. Royal Pharmaceutical Society. Transforming the Pharmacy Workforce in Great Britain.2017.
82. Bader L, Bates I, Schneider P, Charman W. Transforming pharmacy and pharmaceutical sciences education in the context of workforce development. 2017.
83. Federation IP. The FIP Workforce Transformation Programme (WTP). International Pharmaceutical Federation The Hague; 2019.
84. The Japanese Ministry of Education C, Sports, Science and Technology (MEXT) and Pharmaceutical Society of Japan,. Model core curriculum for pharmacy education -2015 version. Pharmaceutical Society of Japan; 2018.
85. Bates I, Meilianti S, John C, Bader LR. Pharmacy workforce intelligence: global trends report: International Pharmaceutical Federation; 2018.
86. Marriott JL, Nation RL, Roller L, Costelloe M, Galbraith K, Stewart P, et al. Pharmacy education in the context of Australian practice. American journal of pharmaceutical education. 2008;72(6).
87. Ministry of Health Singapore. PROFESSIONAL TRAINING & EDUCATION FOR PHARMACISTS [Available from: https://www.moh.gov.sg/hpp/all-healthcare-professionals/career-practice/CareerNPracticesDetails/pharmacists-professional-training-education.

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