AN ANALYSIS OF DIPLOMA OF PUBLIC HEALTH PROGRAM (TECHNICAL PHARMACY) BASED ON PROFESSIONAL COMPETENCE

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A Thesis Submitted in Partial Fulfillment of the Requirements

for the Degree of Master of Science in Pharmacy Program in Social and Administrative Pharmacy

Department of Social and Administrative Pharmacy

Faculty of Pharmaceutical Sciences

Chulalongkorn University

Academic Year 2009

การวิเคราะห์หลักสูตรประกาศนียบัตรวิชาชีพชั้นสูงสาธารณสุขศาสตร์
(เทคนิคเภสัชกรรม) โดยใช้สมรรถนะเชิงวิชาชีพ

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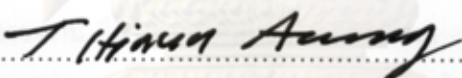
Thesis Title   AN ANALYSIS OF DIPLOMA OF PUBLIC HEALTH PROGRAM

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COMPETENCE

By   Miss Korrakot Puanpune

Field of Study   Social and Administrative Pharmacy

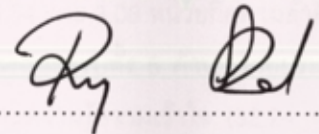Thesis Advisor   Assistant Professor Rungpetch Sakulbumrungsil, Ph.D.

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กรกฎ เผื่อนผัน : การวิเคราะห์หลักสูตรประกาศนียบัตรวิชาชีพสาธารณสุขศาสตร์ (เทคนิคเภสัชกรรม) โดยใช้สมรรถนะเชิงวิชาชีพ. (AN ANALYSIS OF DIPLOMA OF PUBLIC HEALTH PROGRAM (TECHNICAL PHARMACY) BASED ON PROFESSIONAL COMPETENCE) อ.ที่ปรึกษาวิทยานิพนธ์หลัก : ผศ. ดร. รุ่งเพ็ชร สกุลบำรุงศิลป์, 102 หน้า.

การศึกษาครั้งนี้มีวัตถุประสงค์หลักเพื่อวิเคราะห์หลักสูตรประกาศนียบัตรวิชาชีพชั้นสูงสาธารณสุขศาสตร์ (เทคนิคเภสัชกรรม) ตามเกณฑ์สมรรถนะเชิงวิชาชีพ และประเมินระดับสมรรถนะเชิงวิชาชีพของหลักสูตรฯ เป็นการศึกษาเชิงพรรณนา โดยเก็บข้อมูลจากเอกสารประมวลรายวิชาของหลักสูตร ข้อมูลที่นำมาใช้ในการวิเคราะห์หลักสูตรประกอบด้วย วัตถุประสงค์เชิงพฤติกรรมของรายวิชา และจำนวนหน่วยกิต เก็บรวบรวมข้อมูลโดยใช้ตารางแม่แบบ 2 ตาราง ได้แก่ ตาราง 2 มิติ ใช้วิเคราะห์ความสอดคล้องระหว่างวัตถุประสงค์เชิงพฤติกรรม และหัวข้อเนื้อหาของแต่ละรายวิชา และตาราง 4 มิติ ใช้วิเคราะห์ความสอดคล้องของวัตถุประสงค์เชิงพฤติกรรมกับสมรรถนะ 3 มิติ ได้แก่ สมรรถนะของเจ้าพนักงานเภสัชกรรม สมรรถนะเชิงวิชาชีพ และระดับของสมรรถนะ ผลการวิเคราะห์พบว่าหลักสูตรฯ มีจำนวนวิชาบังคับทั้งหมด 31 รายวิชา คิดเป็น 80 หน่วยกิต และเนื้อหามีความสอดคล้องกับวัตถุประสงค์เชิงพฤติกรรมของทุกรายวิชารวมทั้งหมด 220 ข้อ แบ่งเป็นการจัดการเรียนการสอนภาคบรรยาย ฝึกทดลอง และฝึกงาน คิดเป็นร้อยละ 62.5, 25.0 และ 12.5 ของจำนวนหน่วยกิตวิชาบังคับทั้งหมดตามลำดับ เมื่อพิจารณาเฉพาะรายวิชาในหมวดวิชาชีพสาขางาน ซึ่งประกอบด้วย 15 รายวิชา รวม 38 หน่วยกิต สามารถแบ่งออกเป็น 4 สมรรถนะงาน ได้แก่ เภสัชกรรมบริการ เภสัชสาธารณสุข เภสัชกรรมการผลิต และการบริหารคลังเวชภัณฑ์ จำนวน 15.76, 9.62, 9.54 และ 3.08 หน่วยกิตตามลำดับ เมื่อวิเคราะห์หลักสูตรฯ ตามสมรรถนะเชิงวิชาชีพพบว่าหลักสูตรฯ มีสมรรถนะครบทั้ง 5 ด้าน โดยประมาณร้อยละ 75 ของหน่วยกิตในหลักสูตรเน้น 2 สมรรถนะหลัก ได้แก่ ด้านความรู้ความเข้าใจ (32.24 หน่วยกิต) และด้านการปฏิบัติงาน (27.05 หน่วยกิต) โดยมีสมรรถนะด้านพฤติกรรมและด้านจริยธรรมจรรยาบรรณในสัดส่วนที่น้อยมาก นอกจากนี้การประเมินระดับสมรรถนะของหลักสูตร 4 ระดับ สะท้อนให้เห็นว่าการเรียนการสอนของหลักสูตรให้น้ำหนักกับระดับการนำความรู้ไปใช้มากที่สุดจำนวน 36.58 หน่วยกิต งานวิจัยนี้สรุปว่าหลักสูตรประกาศนียบัตรวิชาชีพชั้นสูงสาธารณสุขศาสตร์ (เทคนิคเภสัชกรรม) มีองค์ประกอบของสมรรถนะในมิติต่างๆ ครบถ้วน แต่ยังต้องการการประเมินความเหมาะสมของสัดส่วนที่เป็นองค์ประกอบ

สาขาวิชา เภสัชศาสตร์สังคมและบริหาร   ลายมือชื่อนิสิต ....กรกฎ เผื่อนผัน..........

ปีการศึกษา 2552 ....   ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก ....

The purposes of this study were to analyze the Diploma of Public Health Program (Technical Pharmacy) based on professional competence and to measure competence level of the curriculum. This was a descriptive study using documentary analysis. The behavioral objectives and credit hours were data collected from the syllabi of the curriculum. The instruments for data collection were 2-dimensional and 4-dimensional matrices. The first matrix was used to map between the behavioral objectives and content topic, while the 4-dimensional matrix mapped objectives with pharmacy technician competence, professional competence, and level of competence. The analysis revealed that the core requirement consisted of 31 subjects with a total of 80 credit hours. All content topics corresponded with 220 objective items classified into 3 teaching methods, lecture, practice, and trainee accounted for 62.5%, 25.0%, and 12.5% of required credit hours respectively. Fifteen subjects under technical pharmacy area with a total of 38 credit hours could be divided into 15.76 credit hours of pharmacy service, 9.62 of public health pharmacy, 9.54 of pharmaceutical production, and 3.08 of pharmaceutical inventory management. The curriculum contained all 5 professional competence domains with 75% of the required credit hours focusing on knowledge/cognitive (32.24 credit hours) and functional competence (27.05 credit hours) but minimum emphasis on both personal/behavioral and values/ethical competences. The assessment on competence level reflected that the curriculum put more weights on "knows how" level with 36.58 credit hours. The study concluded that the Diploma of Public Health Program (Technical Pharmacy) possessed all dimensions of competences, however the share of each element needed further justification.

Field of Study : _Social and Administrative Pharmacy_   Student's Signature _Korrakot Puanpune_

Academic Year : _2009_   Advisor's Signature _Rung_

ACKNOWLEDGEMENTS

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CHAPTER I
INTRODUCTION

The curriculum represents the commonplace of the subject matter in the program. It is what the teachers teach and the students learn. It organizes all subject matters in a particular scope and sequence for learning. In curriculum development, evaluative judgments must be made as to the worth of the subject matter being considered and then organized. Educators at this stage also assess their philosophical views of the curriculum and make judgments as to the political and social climates within which the curriculum is to be developed as well as delivered. They wish to judge the content, materials and the teaching methods used. They wish to know what students are learning and what skills they can demonstrate. They also want to know the cost of new programs and whether they are cost effective. The general public wishes to know the quality of education at the local, state and national levels (Tissana Keammanee, 1994; Ornstein and Hunkins, 2004: 330-331). Therefore, everyone agrees that curriculum evaluation is essential to curriculum development, implementation and maintenance (Ornstein and Hunkins, 2004: 328).

Due to the scope and breadth of a curriculum, particularly as revisions and modifications are made over time to individual courses and sections, it can be easy to lose sight of its structure as a whole. Curriculum mapping is one technique used to diagrammatically demonstrate the core skills and content taught, processes employed and assessments (Abate, Stamatakis and Haggett, 2003; Education World, 2006). Curriculum maps can help in three primary ways (Harden, 2001; Plaza et al., 2007): identify whether the intended material is actually being taught and furthers what students actually learn; demonstrate the links among the different key components of the curriculum, such as learning outcomes, learning opportunities, content and assessment; and examine specific portions of the curriculum, such as learning location, learning resources and timetables, in addition to examining the curriculum from multiple perspectives. This technique also provides a mechanism for visually determining when the curriculum competences are covered as well as areas that are potentially not sufficiently covered.

Several studies in health science education have used curriculum mapping in program assessment and evaluation, for example palliative care education (Wood et al., 2002), medical education (Wong and Roberts, 2007), and pharmacy education (Plaza et al., 2007). These studies demonstrated a curriculum mapping methodology that can be used to understand and evaluate curriculum by using existing data.

Sirindhorn Colleges of Public Health, under Praboromarajchanok Institute for Health Workforce Development, Ministry of Public Health, has upgraded their curriculum from Certificate in Public Health Program (Pharmacy Technique) 2002 to Diploma of Public Health Program (Technical Pharmacy) which accepted its first class of students in academic year 2007. In upgrading the curriculum, the program was revised by including subject details, curriculum planning and design. There were 86 credits over 2 academic years. Integrated and student-centered instruction was used in order to develop student ability to critically think, do, and solve the problem. The graduate, who were prepared not only professional knowledge and skills but ethics and moral principles, were expected to work in communities and serve the public health system (Praboromarajchanok Institute for Health Workforce Development [PI], 2007).

At present, this curriculum has been active. The curriculum mapping was required in this process to identify whether the course offered knowledge and skills needed for the graduation. Therefore, the purposes of this study were to map curriculum with professional competences and to measure competence level of the curriculum. The results of this study will be proposed for curriculum improvement of the Diploma of Public Health Program (Technical Pharmacy).

Objectives

1. To analyze curriculum based on professional competence.
2. To measure competence level of the curriculum.

Expected Benefits

The information on the links between contents taught and professional competences, together with the competence level of the curriculum gained from this study can be used for future development of the Diploma of Public Health Program (Technical Pharmacy). The method used by this study can guide future studies in the area of curriculum content evaluation.

Scope of Study

The analysis of this study is focused on the content indicated in the course syllabi submitted to the technical pharmacy curriculum. Both the objectives and credit hours spent characterized the data of this study. The framework for the data collection and analysis was based on the four-dimensional matrix included curriculum, pharmacy technician competence, professional competence, and level of competence.

Definition of Terms

Curriculum was the Diploma of Public Health Program (Technical Pharmacy), Sirindhorn Colleges of Public Health, Thailand.

Lecture was teaching and learning method which used 18 hours per semester per 1 credit hour for lecture or problem discussion.

Practice was teaching and learning method which used 36 hours per semester per 1 credit hour for practice or experiment.

Trainee was teaching and learning method which used 54 hours per semester per 1 credit hour for training, field work, or project conduction.

Pharmacy technician competence, stated by Office of the Civil Service Commission Thailand, included 4 domains of the pharmacy technician task as followed.

Pharmacy service included tasks about pharmacology, dispensing, and clinical pharmacy.

Public health pharmacy included tasks about consumer protection and the other pharmacy roles in community.

Pharmaceutical production was tasks which consisted of preparation of non-sterile and sterile products.

Pharmaceutical inventory management comprised procurement and purchase of pharmaceuticals as well as control of inventory.

Professional competence was certain qualities of a person identified by a particular profession. The provisional model of professional competence developed by Cheetham and Chivers (1996) was used in this study. The model was composed of five domains as followed.

Meta-competence included communication, self-development, creativity, analysis and problem solving.

Knowledge/cognitive competence was defined as the possession of appropriate work-related knowledge and the ability to put this into effective use.

Functional competence was identified as the ability to perform a range of work-based tasks effectively to produce specific outcomes.

Personal or behavioral competence was defined as the ability to adopt appropriate, observable behaviors in work-related situations.

Values/ethical competence was defined as the possession of appropriate personal and professional values and the ability to make sound judgments based upon these in work-related situations.

Level of competence was a framework for assessing clinical competence proposed by Miller (1990: S63), including four levels as followed.

"Knows" level focused on the recall of facts, principles, and theories.

"Knows how" level emphasized the ability to solve problems and to describe procedures.

"Shows how" level usually involved human, mechanical, or computer simulations that required demonstration of skills in a controlled setting.

"Does" level called for real practice.

CHAPTER II

LITERATURE REVIEW

The purpose of this chapter was to provide the background of and supporting information for the study. The literature review covered four areas. The first section reviewed measuring the content of instruction. The second section reviewed competence. Assessment of competence was described in the third section. Finally, Diploma of Public Health Program (Technical Pharmacy) was reviewed in order to provide support for understanding the context of this study. Empirical literature relating to each topic was discussed.

Measuring the Content of Instruction

To make sure students have a high-quality education, instructional leaders must now more than ever take up the charge to redesign professional development into a bold, substantive use of time for veteran and novice teachers alike (Mills, 2002). They can attest that misalignment with these standards is common. Specifically, some important concepts are not taught long enough, if at all, to ensure depth of learning. Even though the advent of state standards has usurped teachers' latitude to pick and choose the topics they want to teach, unevenness in implementing the mandatory curriculum remains. Professional development practitioners sometimes observe that the complexity and abstractness of some curriculum guides limit the degree to which they direct what actually gets taught. Teachers, therefore, need guidance about how to align what they teach with what the district or state requires of them. And to do that, they need to know what they teach (North Central Regional Educational Laboratory [NCREL], 2003).

Fenwick W. English proposed a way of looking at specific segments of the curriculum through a technique referred to as "curriculum mapping". The concept of curriculum mapping originated in the 1980s with the work of English (Hale, 2006). He suggested that the real genius of mapping is to give a broad picture of the taught curriculum (Harden, 2001: 123). Following this technique, teachers analyze the content they present and the amount of time spent on each topic (Oliva, 2005: 448)

Curriculum mapping is a process for collecting and recording curriculum-related data that identifies core skills and content taught, processes employed, and assessments used for each subject area and grade level (Education World, 2006; McGraw-Hill Education, 2006; Payne, 2006).

Curriculum mapping is one powerful way to sharpen teachers' curriculum-design and teaching skills while promoting collaboration across subjects and grade levels (Mills, 2002). This technique facilitates aligning to standards by providing a visual representation of the taught curriculum. Just as a map provides perspective and orientation, and thereby assists a wayward motorist in finding his ultimate destination, so too does the curriculum map facilitate the process of understanding standards and assessment data (NCREL, 2003).

Harden (2001: 124) detailed the 2 key functions of curriculum maps: to make the curriculum more transparent to all the stakeholders and to demonstrate the links between the different components of the curriculum. Hence, a curriculum map is useful in (Payne, 2006): helping teachers understand what is taught and when in all subject areas and all grades, assisting teachers in creating unified interdisciplinary units that foster students' understanding of concepts, ideas, and activities across many subject areas, assisting arts teachers in scheduling performances and field trips without interfering with state assessments or major testing blocks in the academic subjects, helping coordinate areas of study into larger interdisciplinary units (even if they are assessed separately by subject area), acting as a successful venue for fostering conversation about curriculum and instruction among all faculty members, assisting the students in concentrating on one art form and finding "common threads" of understanding between a specific arts concentration and the other arts areas in the school, and assisting teachers in reflecting and adjusting their own lesson units during the school year.

Harden (2001: 130-134) stated the preparing a curriculum map as nine step as followed. The first step was "assess needs". The others were "scope the task",

establish the links", "population the windows", "think of the past, present and future", "decide on access to the map", "familiarize staff and students with the map", "plan to evaluate and update the map as necessary" and "allocate responsibility for the map".

Curriculum maps are never considered "done" (Hale, 2006). Curriculum mapping does not perceive education as a static environment since learning, and learning about learning, is a continual process. As long as teachers have new students, new classes, and new school years, newly created and revised curriculum maps provide evidence of a school or district's ongoing curriculum. Curriculum maps are designed to provide authentic evidence of what has happened or is being planned within a school or a district. Encouraging individual and collaborative renewing and re-visiting of data through curricular dialogues is essential to mapping and becoming a thriving educational environment that continually improves student learning.

In the development of a new curriculum at Cornell, concept maps of the curriculum content were used for planning purposes only (Harden, 2001: 135). However, a key factor in educational research is the context or situation in which the research is conducted. The curriculum map assists the educational researcher by providing this background and information about the educational context in which the intervention is being studied. The map may also help to plan how the approach or area studied can be evaluated by relating it to the expected learning outcomes.

Consequently, curriculum mapping has been instigated at many Canadian and UK medical school as part of curriculum evaluation, management and quality assurance strategies (Willett, 2008: 786). There have been several curriculum mapping studies to examine a specific component of the medical education curriculum (Plaza et al., 2007).

A curriculum map was used to explore to what extent if any medical students were exposed to disease prevention and health promotion in the first 3 years of a medical school curriculum (Litaker et al., 2004). Competences in disease prevention and health promotion served as the guide for assessing the scope of coverage for the content of interest in the curriculum map. They determined that the clinical prevention

and the quantitative skills domains were well represented across all 3 years, while the community aspect of practice was the least represented domain.

Meekin et al. (2000: 986) developed an instrument to facilitate curriculum mapping of palliative care education. A follow-up study (Wood et al., 2002) used this instrument to develop strategic plans at 13 of the 14 participating medical schools in New York with the intent of increasing coverage of palliative care within each respective curriculum. These studies showed that a curriculum mapping tool could be used both as part of curricular self-assessment and to incorporate a desired topic into a curriculum by guiding strategic planning (Meekin et al., 2000; Wood et al., 2002).

Wachtler and Troein (2003) used curriculum mapping to examine cultural competence in a medical school curriculum. A triangulation method was used to examine the intended, taught, and received curriculum, to provide a transparent and complete picture of the curriculum. Mapping consisted mainly of listing specific instances where cultural competence had been included in the curriculum and comparing the relative number of occurrences qualitatively. Cultural competence was found in the curriculum, however, it was mostly absent or hidden and teachers reported a greater extent of coverage than did students.

Moreover, Porter (2002) described a method of measuring the content of instruction, the content of instructional materials, and the alignment between these. He suggested that good measures of instructional content could be used to describe the taught curriculum or to measure the degree to which a new curriculum has been implemented. He presented 3 tools for measuring content and alignment including surveys of teachers on the content of their instruction, content analyses of instructional materials, and alignment indices describing the degree of overlap in content between standards and assessment. To measure content and alignment, a uniform language for describing content must be developed and used as a measure of alignment. A uniform language can include measuring the level of coverage and the relative emphasis in terms of time demands of total instructional time spent on each topic or category to form

a matrix. Porter suggested that content analysis of instructional materials such as course syllabi could be used to examine the intended curriculum as a means of improving teaching. In addition, he recommended the use of topographical maps to display what content is emphasized relative to the standards used in the curriculum. Emphasis is depicted by the intensity of shading, with darker shading indicating greater emphasis and lighter shading indicating less emphasis. This graphical representation of a curriculum allows a mapping which can be visually compared to other measures of content coverage.

Plaza et al. (2007) evaluated the pharmacy education program, at the University of Arizona College of Pharmacy (UACOP), based on curriculum mapping and Porter's measuring method. Competences in pharmaceutical science served as the guide for assessing the scope of coverage. They determined that the health promotion and disease prevention domain appeared to receive less relative emphasis at the course level than the other domains. The patient care, dispensing medications and devices, and professionalism domains had greater emphasis relative to the others. The health systems management domain appeared to have greater emphasis relative to the health promotion and disease prevention domain, but less than the other domains.

Not only that, Nattiya Kapol et al. (2008) evaluated the curricula content of Thai pharmacy schools based on the Thai pharmacy competence standards. They used questionnaire that was distributed to course coordinators. They found that the ratio of patient-oriented, product-oriented, and social and administrative pharmacy-oriented content areas in bachelor of sciences in pharmacy degree was 2:3:1. However, the ratio differed from ratio recommended by the Thai pharmacy competence standard (3:2:1). For doctor of pharmacy degree program, the largest content area was patient-oriented material, which was in agreement with the standard.

Summary, this study analyzed the data based on curriculum mapping concept in order to know details of the curriculum. Particularly, the researcher used the adaptation of Porter's tools for measuring content of instruction.

Competence

Competence is a topic of great interest to educators and administrators in practice disciplines, particularly health care disciplines (Scott Tilley, 2008: 58).

Definitions of Competence

The concept of human competence reached the forefront of human resource development with the concurrent work of the psychologists Robert White and David C. McClelland. White (1959 cited in Dubois et al., 2004:17) identified a human trait that he called "competence". McClelland (1973 cited in Trotter and Ellison, 1997: 39-40), who is often credited with coining the term "competency", defined it as a characteristic that underlies successful performance. He originated an approach for predicting competence that was notably different from widely accepted intelligence tests of the time and suggested that although intelligence influences performance, personal characteristics, such as an individual's motivation and self-image, differentiate successful from unsuccessful performance and can be noted in a number of life roles that include job roles.

McMullan et al. (2003) distinguished between competence and competency, stating that competence is focused on the description of the action or behavior, while competency is focused on the individual's behavior that underpins the competent performance. Competences are about outputs to specified minimum standards while competencies are about inputs that a person brings to a job, resulting in superior performance.

Therefore, this study used the word "competence" because it focused on student outputs as minimum standards. In many cases, the term competence is used interchangeably with skills, learning objectives, or expected learning outcomes (Banta, 2001: 2). Over the years, many have attempted to define the word "competence".

Wheeler and Haertel (1993: 30 cited in Banta, 2001: 1) define an area of competence as a knowledge, skill, ability, personal quality, experience or other characteristic that is applicable to learning and success in school or in work.

Barnett (1994 cited in Kirschner et al., 1997: 154-155) defines competence as something that is not concerned with predictable behaviors in predictable situations. The unexpected may require the use of new configurations of existing skills—or the development of completely new skills. Coping with the unexpected and unpredictable in a creative way is a critical part of the concept of competence.

Otter (1995: 45) notes in her discussion of student assessment in England that competence statements define "what learners are intended to achieve" rather than the courses or programs of learning that are used to develop them. She points out that statement of competence also are used to describe "the underlying skills, qualities and ways of working which characterize people who are good at it" (Otter, 1995: 49).

Kirschner et al. (1997: 154-155) define competence as the ability to make satisfactory and effective decisions in a specific setting or situation. The ability to access can be viewed as a necessary precondition for competence. They could conceive of competence as a function of knowledge, skill and situation.

Heneman and Ledford (1998: 104) define competences as demonstrable characteristic of the person—including knowledge, skills and behaviors—that enable performance. Furthermore, other characteristics represent competences may include motives, general disposition, attitudes, values and self-image (Spencer and Spencer, 1993 cited in Heneman and Ledford, 1998: 105).

Professional Competence

When the word "professional" is used along with "competence" the meaning of profession characterized as having a specialized body of knowledge and extensive period of formal education is attached to the meaning of competence. Thus, professional competence is certain qualities of a person identified by a particular

profession (Julaluk Baramee, 2002: 13). Which the word competence might have a various and divided type in the different career path.

Epstein and Hundert (2002: 226) proposed that professional competence of physicians and trainees is the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and community being served. Also in 1999, the Accreditation Council for Graduate Medical Education (ACGME) endorsed general competences for residents. This was the first step in the council's process of incorporating these competences into its requirements (Scott Tilley, 2008: 59). ACGME (ACGME Board, 2007) defined 6 areas of competence: patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism and system-based practice.

The National Council for State Boards of Nursing (NCSBN, 2005: 81 cited in Scott Tilley, 2008: 59) defined competence as "the application of knowledge and the interpersonal, decision-making and psychomotor skills expected for the practice role, within the context of public health". In 1999, Lenberg (2001) described the Competence Outcomes and Performance Assessment (COPA) model, which was applicable in the practice setting but viewed as equally applicable in the practice setting. Eight core competences were identified as assessment and intervention, communication, critical thinking, teaching, human caring relationships, management, leadership, and knowledge integration skills.

The American Council on Pharmaceutical Education (ACPE), initiative importance for the assessment effort, was the formulation of educational outcomes for pharmacy education by the Center for the Advancement of Pharmaceutical Education (CAPE) Advisory Panel on Educational Outcomes. This broad-based group from pharmacy education and practice studied the findings of the commission, the focus group, and a scope of practice project survey in order to propose six general and six

professional ability outcomes required for the practice of pharmaceutical care (Zlatic, 2001: 53):

General: (1) Thinking, (2) communication, (3) valuing and ethical decision making, (4) social awareness and social responsibility, (5) self-learning and (6) social interaction and citizenship

Professional: (1) Provide pharmaceutical care, (2) develop and manage medication distribution and control systems, (3) manage the pharmacy, (4) manage medication use systems, (5) promote public health and (6) provide drug information and education

In 2002, the Thai Pharmacy Council established their first competence standards with the goal that new pharmacy graduates will know how to apply the knowledge and skills they have attained during pharmacy school. These standards (Thai Pharmacy Council, 2002) contain 8 domains were (1) knowledge in the pharmaceutical manufacturing process and quality assurance, (2) conduct a health problem and community drug needs assessment, drug selection and procurement of pharmaceutical products to serve patients appropriately, (3) prepare an appropriate pharmaceutical product by extemporaneous preparation, (4) conduct a basic health evaluation for appropriate counseling to patients, including referral if necessary, (5) provide rational drug use planning for each patient, including drug usage evaluation by focusing on patient involvement, (6) follow up, prevent, solve drug related problems in a patient and a community, and report to related organizations, (7) provide up-to-date and reliable pharmaceutical and health product information to patients, communities, and health practitioners and (8) knowledge in pharmaceutical related laws.

For pharmacy technicians, an individual working in a pharmacy who, under the supervision of a licensed pharmacist, assists in pharmacy activities that do not require the professional judgment of a pharmacist (Rouse, 2003: 38), there are rarely studies about competence. Basic competences have not been articulated. Standards for

technician training programs are not widely adopted. Board regulations governing technicians vary substantially from state to state (Rouse, 2003: 37).

Pharmacy Technician Competence

An important study, The Eastern Iowa Community College District convened a Developing a Curriculum (1990: abstract) workshop in December 1989. To validate the competences defined for entry-level pharmacy technicians, a survey was conducted of 333 pharmacy-related businesses in Iowa and the Illinois Quad Cities area, identified through a previous survey as employers of pharmacy technician's. The survey listed specific job skills, grouped into the following categories: basic skills; operating computer; filling orders; chemo procedures; filling outpatient prescriptions; maintaining inventory; recordkeeping; and professionalism. Study findings, most skills identified as entry-level were also considered important.

The National Association of Pharmacy Regulatory Authorities (NAPRA, 2007: 12-28) proposed 9 categories of competence for Canadian pharmacy technicians as following:

1. legal, ethical, and professional responsibilities are pharmacy technicians meet legal, ethical, and professional responsibilities in the performance of their practice;

2. professional collaboration and teamwork are pharmacy technicians worked in collaborative relationships within health care teams to optimize patient safety and improve health outcomes;

3. drug distribution: prescription and patient information is pharmacy technicians promote safe and effective drug distribution by receiving, gathering, entering, and storing prescription and patient information so that this information can be accessed and retrieved readily;

4. drug distribution: product preparation is pharmacy technicians promote safe and effective drug distribution by preparing products in a manner that ensures patient safety through the accuracy and quality of the product;

5. drug distribution: product release is pharmacy technicians promote safe and effective drug distribution by releasing and distributing products in a manner that ensures patient safety;

6. drug distribution: system and inventory controls is pharmacy technicians collaborate in the management of systems for drug distribution and inventory control to ensure patient safety and the safety, accuracy, quality, integrity, and timeliness of the products;

7. communication and education are pharmacy technicians communicate effectively with patients, pharmacists, and other health care team members, and educate, where appropriate, in order to promote and support optimal patient care and well-being;

8. management knowledge and skills are pharmacy technicians apply management knowledge, principles, and skills;

9. quality assurance is pharmacy technicians collaborate in developing, implementing, and evaluating quality assurance and risk management policies, procedures, and activities.

Furthermore, there is a need to develop standards for the educational and training programs of pharmacy technicians. The absence of national training standards and the resultant variations in program content, length, and quality are barriers to the regulation and certification of pharmacy technicians (College of Pharmacists of British Columbia, 2006: 9). The American Society of Health-System Pharmacists [ASHP] collaborated with several other pharmacy associations to develop the Model Curriculum for Pharmacy Technician Training. The first edition, released in 1996, was based on the 1994 task analysis of pharmacy technicians conducted as part of the Scope of Pharmacy Practice Project (ASHP, 2001: iv). In the second edition, released in 2001, was based on 2000 update of task analysis by the Pharmacy Technician Certification Board [PTCB]. The model curriculum provides a starting point for identifying core competences for pharmacy technicians.

In Thailand, Office of the Civil Service Commission [OCSC] (2008) stated the role of Thai pharmacy technician as operating and expert worker in area of pharmacy service, pharmaceutical production, pharmaceutical inventory management, and public health pharmacy. In addition, 1990, The Ministry of Public Health assigned role of Thai pharmacy technician according to knowledge ability (Winai Sayorwan, 2004: 12-16) including 7 domains of pharmacy service, pharmaceutical production, pharmaceutical inventory management, public health pharmacy, pharmaceutical information service, primary health care support, and other assignment.

Therefore, this study used dimension of pharmacy technician competence based on the last update task of pharmacy technician from OCSC, Thailand.

The Model of Professional Competence

The holistic model of professional competence was developed by Cheetham and Chivers (1996). This model has also been tested empirically through a series of 80 in-depth interviews with practitioners from 20 different professions (Cheetham and Chivers, 1998: 270). The key influences on the model were as followed: the model of competence implicit within UK occupational standards and UK National Vocational Qualifications ; the associated "job competence model" described by Mansfield and Mathews; the work on behavioral competence (mainly within management) by a number of American researchers, including Boyatzis, Klemp, and Schroder; the new epistemology of professional practice suggested by Schon which has resulted in the "reflective practitioner" approach; the concept of meta-competences (meta-qualities or meta-skills) associated with a number of authors, including Reynolds and Snell, Linstead, Hall, and Nordhaug; the concept of core skills promoted by the UK Government and the National Council for Vocational Qualifications; and various works on ethics and values in professions and within occupational standards, including Eraut et al. and Ozar (Cheetham and Chivers, 1996: 20).

The model draws to some extent on each of the concepts mentioned above as well as making use of more general analytical tools. It attempts to combine their

individual strengths within a coherent framework which, it is hoped, offers a more complete model of professional competence than do any of the individual models described. The resulting model is shown in Figure 2-1.
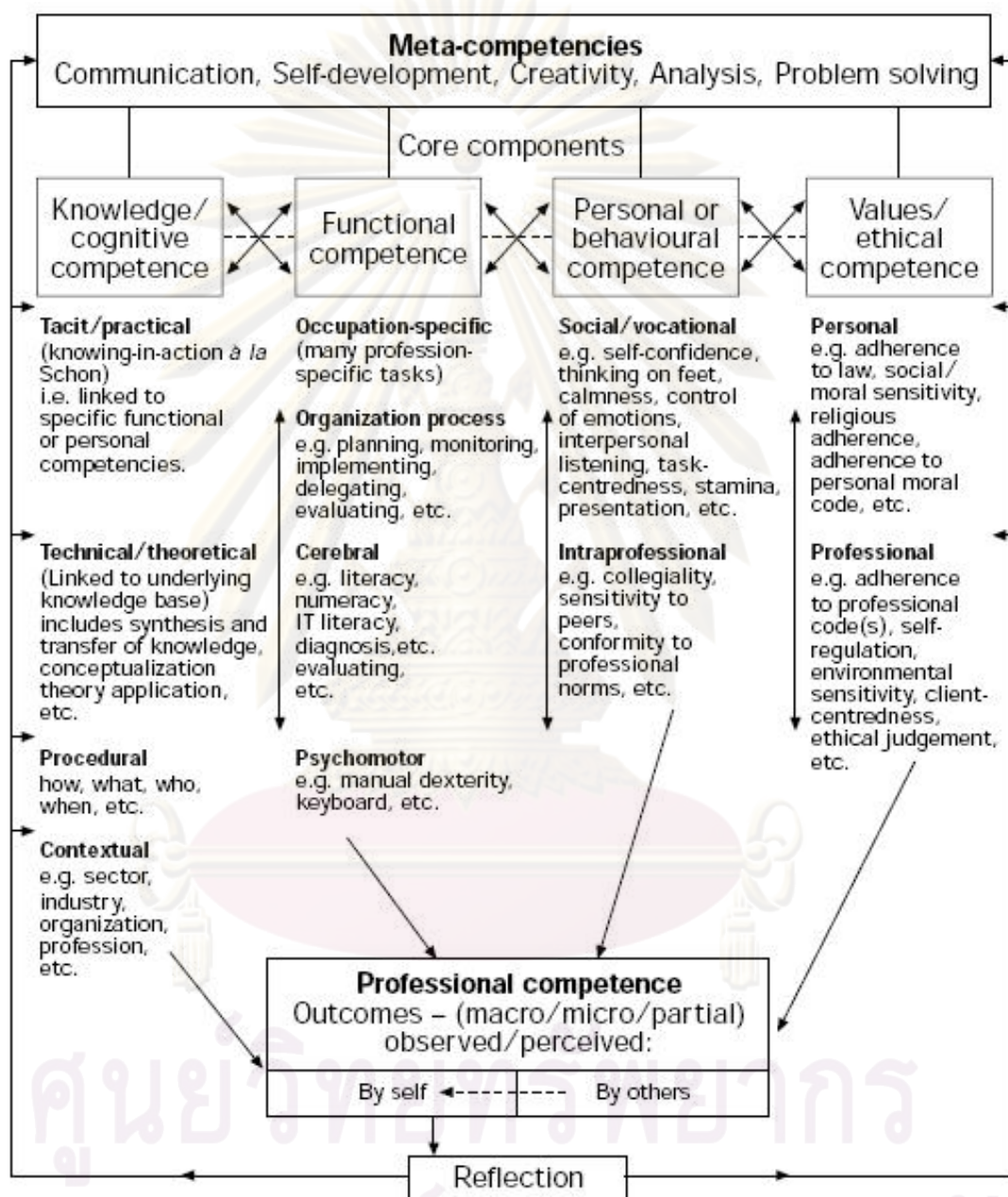
Figure 2-1 Provisional Model of professional competence
(Cheetham and Chivers, 1996: 27)

At the heart of the model had four core components of professional competence (Cheetham and Chivers, 1998: 268). Each of these is made up of a number of

constituents. Constituents are sub-groups of individual competences which are of a similar nature to one another (Cheetham and Chivers, 1996: 24-26).

Knowledge/cognitive competence defined as the possession of appropriate work-related knowledge and the ability to put this to effective use. The component is seen as consisting of four constituents. These are tacit/practical (this is knowledge linked to, and embedded within, specific functional or personal competences); technical/theoretical (this relates to the underlying knowledge base of the professions, including principles, theories, etc. but also includes their application, transfer, synthesis, extrapolation, etc.); procedural (this consists of the how, what, when, etc. of the more routine tasks within professional activity); and contextual (this is general background knowledge which is specific to an organization, industry, sector, etc.).

Functional competence is defined as the ability to perform a range of work-based tasks effectively to produce specific outcomes. This component has been broken down into four groups of constituent competences. There are occupation-specific (this consists of the numerous tasks which relate to a particular profession); organizational/process (this contains tasks of a generic nature e.g. planning, delegating, evaluating, etc.); cerebral (these are skills which involve primarily mental activity—literacy, numeracy, etc.); and psychomotor (these are skills of a more physical nature—manual dexterity, keyboard, etc.).

The definition of personal or behavioral competence is the ability to adopt appropriate, observable behaviors in work-related situations. In the model, this competence component has two constituents: social/vocational (these are behaviors which relate to the performance of the main body of professional tasks—self-confidence, task-centredness, stamina, etc.); and intraprofessional (these are behaviors which relate mainly to interaction with other professionals—collegiality, adherence to professional norms, etc.).

Values/ethical competence is defined as the possession of appropriate personal and professional values and the ability to make sound judgments based upon these in

work-related situations.   The different types of values used by professionals are grouped under two constituent headings: personal (e.g. adherence to personal moral/religious codes, etc.); and professional (e.g. adherence to professional codes, client-centredness, environmental sensitivity, etc.).

Overarching of the model is a number of meta-competences, which stress the importance of competences that enable individuals to monitor and develop other competences, or that span other competences, enhancing or mediating them (Cheetham and Chivers, 2000: 374). These include communication, self-development, creativity, analysis and problem solving.

The meta-competences, the four core components and their various constituents all interact together to produce a range of outcomes of various kinds (Cheetham and Chivers, 1998: 269): macro-outcomes (the board, overall results of professional activity); micro-outcomes (these were the outcomes of more specific activities); and partial outcomes (the result of a partially-completed activity).   Outcomes were considered capable of being observed or otherwise perceived by oneself and by others.

The main purpose of reflection is to improve professional competence. Therefore, in the fully assembled model, the results of reflection are shown as having the potential to feed back into any of the core components and their various constituents, or into any of the meta-competences, thus completing the cycle of continuous improvement.

The model allows for the possibility that different professions will require a different mix of the core components. Similarly, a different mix of the core components may be necessary for different branches within the same profession.

In this study, the model of professional competence, conducted by Cheetham and Chivers, was used to analyze the curriculum in dimension of professional competence.

Assessment of Competence

George E. Miller (1990: S63), psychologist, proposed a framework for assessing clinical competence. The pyramid of competence (Figure 2-2) is a simple conceptual model. At the lowest level of the pyramid is "knows" (knowledge), followed by "knows how" (competence), "shows how" (performance), and "does" (action). In this framework, Miller distinguished between "action" and the lower levels (Norcini, 2003: 753).

Does
(Action)

Shows how
(Performance)

Knows how
(Competence)
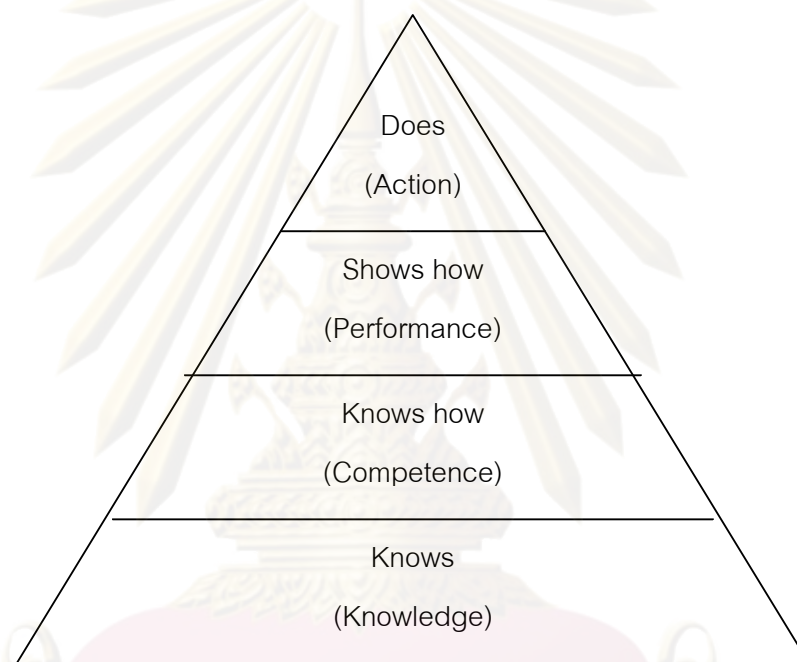
Knows
(Knowledge)

Figure 2-2 Miller's pyramid of competence (Miller, 1990: S63)

"Knows" level refers to the recall of facts, principles and theories. "Knows how" level involves the ability to solve problems and describe procedures. "Shows how" level usually involves human, mechanical or computer stimulations that involve demonstration of skills in a controlled setting. "Does" level refers to observations of real practice. For each of these levels, the student can demonstrate the ability to imitate or replicate a protocol, apply principles in a familiar situation, adapt principles to new situations, and associate new knowledge with previously learned principles (Epstein and Hundert, 2002: 229).

Many articles about an assessment of clinical competence used Miller's model as the principle of their assessment especially in medical education (Friedenberg, 2000; Van der Vleuten, 2000; Wass et al., 2001; Epstein and Hundert, 2002; Norcini, 2003; Batmangelich and Adamowski, 2004; Griffiths, 2004). Therefore, this study was using Miller's model in order to measure competence level of the curriculum, too.

Diploma of Public Health Program (Technical Pharmacy)

Sirindhorn Colleges of Public Health, under Praboromarajchanok Institute for Health Workforce Development, Ministry of Public Health, constructed the Diploma of Public Health Program (Technical Pharmacy) which was beginning used in academic year 2007. There are 86 credits, 2 academic years. Integrated and child-centered instruction were used in order to develop students be able to think, does and solve the problem. The graduation would work in community and had ethic and moral principles, professional knowledge and skills, which serve the public health system (PI, 2007).

Curriculum Structure

1. General Education Course   20 credits
2. Professional Course   60 credits
   2.1. Professional Foundation Course   22 credits
   2.2. Technical Pharmacy Course   28 credits
   2.3. Trainee   6 credits
   2.4. Project   4 credits
3. Elective Course   6 credits
4. Activity   3 hours/week

Courses

1. General Education Course
   Theme 1: Language and Communication
   ▪ Thai for Communication   3 (2-2-5)
   ▪ Basic in English   3 (2-2-5)

Theme 2: Living in Society

- Life, Society, and Environment 3 (3-0-6)
- Science and Mathematics for Daily Life 3 (3-0-6)

Theme 3: Moral and Professional Ethics

- Professional Behavioral Ethics Development 3 (1-4-4)

Theme 4: Information Technology

- Computer for Working 2 (1-2-3)
- Information Technology 3 (2-2-5)

2. Professional Course

2.1. Professional foundation course

- Anatomy and Physiology 3 (2-2-5)
- Microbiology and Parasitology 3 (2-2-5)
- Psychology 2 (2-0-4)
- Epidemiology 3 (2-2-5)
- Biostatistics 3 (2-2-5)
- Health Education and Behavioral Sciences 2 (1-2-3)
- Systems Thinking Process Development 2 (1-2-3)
- Public Health Administration 2 (1-2-3)
- First Aid 2 (1-2-3)

2.2. Technical pharmacy course

Theme 1: Pharmaceutical Production

- Pharmaceutical Technology 1 .... 3 (2-2-5)
- Pharmaceutical Technology 2 .... 3 (2-2-5)
- Pharmaceutical Technology 3 .... 2 (1-2-3)

Theme 2: Pharmaceutical Service

- Pharmacology 1 .... 2 (2-0-4)
- Pharmacology 2 .... 2 (2-0-4)
- Pharmacology 3 .... 3 (3-0-6)
- Pharmaceutical Inventory Management 2 (1-2-3)
- Pharmacy Service 3 (2-2-5)

- Introduction to Clinical Pharmacy   2 (2-0-4)

Theme 3: Community Pharmacy

- Disease Control and Prevention   2 (2-0-4)
- Holistic Thai Traditional Medicine   2 (1-2-3)
- Law and Consumer Protection   2 (2-0-4)

2.3. Trainee

Theme 1: Technical Pharmacy Practice

- Field Work 1 (Technical Pharmacy)   3 (0-9-0)
- Field Work 2 (Technical Pharmacy)   3 (0-9-0)

2.4. Project

Theme 1: Pharmaceutical Development in Community Project

- Pharmaceutical Development in Community Project   4 (0-12-0)

3. Elective course

The student chooses subjects as follow about 6 credits.

- Contemporary Public Health Seminar   2 (1-2-3)
- Community Participatory Technique   2 (2-0-4)
- Thai Massage   2 (1-2-3)
- Crude Drugs   2 (2-0-4)
- Natural Therapy   2 (2-0-4)
- Aerobic Dance for Health   2 (1-2-3)
- Rhythmic Activity   2 (1-2-3)
- Personality Development   2 (2-0-4)
- Small and Medium Enterprise Management   2 (2-0-4)
- Japanese for Daily Life   2 (1-2-3)
- Chinese for Daily Life   2 (1-2-3)
- Mind Development   2 (1-2-3)
- Project Evaluation   2 (1-2-3)
- Fundamental Research   2 (2-0-4)
- Utilization of Data Analyzation Application Computer   2 (1-2-3)
- Utilization of Graphic Application Computer   2 (1-2-3)

- Independent Study   2 (1-2-3)

- Field Observation   2 (1-2-3)

- English for Daily Life   2 (1-2-3)

- Leadership and Team Working   2 (2-0-4)

- English for Professional Public Health   2 (1-2-3)

- Holistic Health Promotion Approach   2 (2-0-4)

Educational Plan

1. First Year (53 credits)

    1.1. First Semester (22 credits)

    - Basic in English   3 (2-2-5)

    - Science and Mathematics for Daily Life   3 (3-0-6)

    - Computer for Working   2 (1-2-3)

    - Anatomy and Physiology   3 (2-2-5)

    - Systems Thinking Process Development   2 (1-2-3)

    - Pharmaceutical Technology 1   3 (2-2-5)

    - Pharmacology 1   2 (2-0-4)

    - Disease Control and Prevention   2 (2-0-4)

    - Elective Subject   2 (2-0-4) or 2 (1-2-3)

    1.2. Second Semester (22 credits)

    - Thai for Communication   3 (2-2-5)

    - Microbiology and Parasitology   3 (2-2-5)

    - Psychology   2 (2-0-4)

    - Biostatistics   3 (2-2-5)

    - Health Education and Behavioral Sciences   2 (1-2-3)

    - Pharmaceutical Technology 2   3 (2-2-5)

    - Pharmacology 2   2 (2-0-4)

    - Pharmaceutical Inventory Management   2 (1-2-3)

    - Law and Consumer Protection   2 (2-0-4)

1.3. Summer Semester (9 credits)

- Information Technology 3 (2-2-5)
- Pharmaceutical Development in Community Project 4 (0-12-0)
- Elective Subject 2 (2-0-4) or 2 (1-2-3)

2. Second Year (33 credits)

2.1. First Semester (22 credits)

- Life, Society, and Environment 3 (3-0-6)
- Professional Behavioral Ethics Development 3 (1-4-4)
- Epidemiology 3 (2-2-5)
- Public Health Administration 2 (1-2-3)
- First Aid 2 (1-2-3)
- Pharmaceutical Technology 3 2 (1-2-3)
- Pharmacology 3 3 (3-0-6)
- Holistic Thai Traditional Medicine 2 (1-2-3)
- Elective Subject 2 (2-0-4) or 2 (1-2-3)

2.2. Second Semester (11 credits)

- Pharmacy Service 3 (2-2-5)
- Introduction to Clinical Pharmacy 2 (2-0-4)
- Field Work 1 (Technical Pharmacy) 3 (0-9-0)
- Field Work 2 (Technical Pharmacy) 3 (0-9-0)

CHAPTER III

METHODOLOGY

This study was a descriptive study, documentary analysis. The purpose of this study were 2 folds, first to map the studied curriculum, the Diploma of Public Health Program 2007, with 2 competence criteria, pharmacy technician competence and professional competences and secondly to measure competence level of the curriculum according to Miller's pyramid of competence.

Design for Data Collection

Out of 53 courses of the technical pharmacy curriculum under the Diploma of Public Health Program, 31 courses were required as core knowledge and skills for technical pharmacy students. The study thus included only these 31 core courses and excluded elective courses since they were not common to all students.

Thirty-one course syllabi were retrieved from documentary collection of course syllabi of the Diploma of Public Health Program (Technical Pharmacy). Behavioral objectives of selected courses were used to represent the course contents and the number of hours spent on each topic represents the concentration of each content topic. Both the behavioral objectives and time spent characterized the data of this study.

The data collection started with the researcher reviewed all course syllabi, and then two instruments were developed. The data collection tools included the alignment matrix between objectives and content of each subject and the alignment matrix between objectives and pharmacy technician competence, professional competence and level of competence.

The verification of data alignment analysis was conducted by expert opinion. The study had invited five pharmacists who had been instructors of technical pharmacy curriculum at least ten years to serve as experts of the study. Three-fifths of the same agreement among experts was consideration an end. The data collection had been conducted from June to August 2009.

Instrument

Due the documentary nature of the data source and to facilitate the data analysis, the two content matrices were created and used as the data collection instruments. The first instrument was the two-dimensional matrix for mapping behavioral objectives and contents of a course. One matrix was required for each subject. A total of 31 matrices were prepared for the two-dimensional objective-content map. The second instrument was the four-dimensional matrix, which represented the operational definitions of the major concepts of the study objectives including curriculum, pharmacy technician competence, professional competence, and level of competence. The curriculum was operationalized into 245 behavioral objective items of 31 subjects. Pharmacy technician competence included four tasks as pharmacy service, public health pharmacy, pharmaceutical production, and pharmaceutical inventory management. The provisional model of professional competence, including five domains as knowledge/cognitive, functional, personal or behavioral, values/ethical, and meta-competences, represented professional competence. The level of competence was defined by Miller's pyramid of competence, namely, knows, knows how, shows how and does.

Data Mapping

The first mapping was conducted onto the two-dimensional objective-content matrix of each subject. On each matrix, each content topic listed in the syllabus was aligned with the matching behavioral objective. The alignment was conducted both qualitatively and quantitatively. The researcher qualitatively judged the matching between the objective and content. The number of hours assigned to each topic represented the quantitative portion of the subject. The number of hours of each content topic had been transformed and standardized into the number of credit hours for the purpose of comparison across different dimensions. The number of credit hours of each content topic was then allocated to the corresponding behavioral objective. In case that a content topic served more than one behavioral objective, the credit hours were equally divided and distributed to all behavioral objectives sharing the same

content. The output table of this mapping showed the credit hours assigned to each behavioral objective item.

The second mapping used 4-dimensional matrix as the instrument to align behavioral objective items with 3 other dimensions including pharmacy technician competence, professional competence, and level of competence. These competences were theoretical defined as followed.

1. Pharmacy technician competence was matched with behavioral objectives by characteristics of tasks of pharmacy technicians, encompassing 4 major tasks.

   1.1 Pharmacy service included pharmacology, dispensing, and clinical pharmacy. An example of behavioral objective classified under this competence was "to explain the therapeutic effects of medicines".

   1.2 Public health pharmacy included consumer protection and the other pharmacy roles in community. An example of behavioral objective corresponding with this competence was "to publicize the knowledge of consumer protection".

   1.3 Pharmaceutical production consisted of preparation of non-sterile and sterile products. The behavioral objective like "to explain the good manufacturing practice (GMP)" was an example matched with this competence.

   1.4 Pharmaceutical inventory management comprised procurement and purchase of pharmaceuticals as well as control of inventory. One example of behavioral objective identified as this competence was " to concern the role of pharmacy technician about inventory control task based on values and ethical basis".

2. Professional competence extended over 5 domains according to the theoretical definition by Cheetham and Chivers (1996).

   2.1 Meta-competence included communication, self-development, creativity, analysis and problem solving. The behavioral objectives "to understand the

basic of communication in Thai" and "to explain the principle of system thinking" were among those corresponding to this competence.

2.2 Knowledge/cognitive competence was defined as the possession of appropriate work-related knowledge and the ability to put this into effective use. Examples of behavioral objectives under this competence included " to explain the good manufacturing practice (GMP)" and "to explain the therapeutic effects of medicines".

2.3 Functional competence was identified as the ability to perform a range of work-based tasks effectively to produce specific outcomes. Some behavioral objectives that were characterized under this competence were "to read the prescription orders" and "to diagnose symptoms using Thai traditional medicine theory".

2.4 Personal or behavioral competence was defined as the ability to adopt appropriate, observable behaviors in work-related situations. An example of behavioral objective matched with this competence was "to recognize the importance of the professional behavior development".

2.5 Values/ethical competence was defined as the possession of appropriate personal and professional values and the ability to make sound judgments based upon these in work-related situations. An example of behavioral objective categorized under this competence was "to recognize the importance of the technician's roles on the inventory control task based on values and ethical basis".

3. Level of competence dimension was different from the other two competences of which the content to be taught was the main concern. This dimension was more focused on the level of knowledge and skills the particular subject delivered. Thus, the keyword of each behavioral objective was identified and then categorized as one of the 4 levels of competence.

3.1 "Knows" level focused on the recall of facts, principles, and theories. The examples of keywords were "understand" and "state".

3.2 "Knows how" level emphasized the ability to solve problems and to describe procedures. The example of keyword was "explain".

3.3 "Shows how" level usually involved human, mechanical, or computer simulations that required demonstration of skills in a controlled setting. The keywords included "introduce" or "interpret", etc.

3.4 "Does" level called for real practice. The keywords thus covered "problem solving", "present", and others of the same nature, which were mostly found among trainee hours.

Similar to the first map, this mapping was also conducted quantitatively and qualitatively. The quantitative amount was identified using the number of hours, which had been standardized into the number of credit hours. Some behavioral objectives that could be mapped with more than one aspect of each competence dimension would be equally divided and allocated to all aspects under that competence. Three dimensions were independently mapped with the behavioral objective dimension.

Expert Review

Five experts were designed for data verification. Those who had been instructors at Sirindhorn Colleges of Public Health for at least ten years were purposively selected. Four pharmacists from Chonburi campus and one pharmacist from Yala campus had accepted the invitation to serve on the expert panel. The roles of the expert panel were to review the list of keywords and to verify the two data mapping matrices.

The list of keywords corresponding to 4 levels of competence was developed and used in mapping between the behavioral objectives and the level of competence during the second mapping. The keyword list was prepared by the researcher and

verified by the experts before the mapping started. If disagreement was experienced, three-fifths agreement among the expert panel was used to finalize the list.

To validate all classifications of the mapping conducted by the researcher, the expert panel reviewed both mappings, two-dimensional and 4-demensional matrices. In case that disagreement between the researcher and the experts was identified, the revision of the mapping was made using the criterion of three-fifths agreement .

Data Analysis

A Microsoft Excel spreadsheet was developed to summarize the data collection. The 2 maps were finally combined into one spreadsheet by matching all dimensions from both instruments, which consisted of objective items, credit hours, pharmacy technician competence, professional competence, and level of competence.

As mentioned in the data mapping section, the concentration of curriculum was identified by hours spent for each topic. To be able to compare across several variables and aspects, the credit hours were used in the data analysis for this study. The transformation from number of hours into number of credit hours followed the criteria of this curriculum (PI, 2007: 7). The credit hour calculation method was stipulated as 1 credit hour of lecture for 18 hours per semester, 1 credit hour of practice for 36 hours per semester, and 1 credit hour of trainee for 54 hours per semester.

Descriptive statistics including frequency and percentage were used to describe general characteristics of the curriculum. Comparison of credit hours across dimensions was conducted to demonstrate the competence of the curriculum.

CHAPTER IV
RESULTS

The Result section of the study was structured into five parts. The first part detailed general characteristics of the curriculum; the second part presented detailed analysis pharmacy technician competence across 4 major tasks; the third part included analysis of the curriculum content across 5 domains of professional competence; the fourth part showed level of competence taught by the curriculum, and the last part analyzed the level of competence across professional competence.

1. General Characteristics of the Curriculum

Sirindhorn Colleges of Public Health has offered the Diploma of Public Health Program (Technical Pharmacy) since the academic year 2007. This 2-year program had 3 required areas including general education, professional foundation, and technical pharmacy areas.

The curriculum consisted of 31 subjects encompassing 245 objective items, and accounted for 80 credit hours. Of 245 behavioral objectives, only 220 items could be matched with at least one content topic. The rest of behavioral objectives, 25 items from 15 subjects, could not be directly identified with any content of the curriculum. They were thus excluded from the data mapping. On the contrary, no content topic was taken out since every topic could be matched with at least one behavioral objective.

The first year of the curriculum required higher course load than the second year study. The first year courses covered 61.3% of subjects, 60.5% of objective items, and 61.3% of credit hours and were accounted for about 70% of general education and professional foundation required areas. The requirement on technical pharmacy course load which was equally distributed between 2 years shared almost half of the curriculum as calculated by subjects (48.4%), or objective items (48.6%), or credit hours (47.5%). The details were shown in Table 4-1.

Table 4-1 Number and percentage of subjects, objective items and credit hours
categorized by subject area and year

Subject area	Year		
	First	Second	Total
Subjects			
General education	5 (71.4)	2 (28.6)	7 (100.0)
Professional foundation	6 (66.7)	3 (33.3)	9 (100.0)
Technical pharmacy	8 (53.3)	7 (46.7)	15 (100.0)
Total	19 (61.3)	12 (38.7)	31 (100.0)
Objective Items			
General education	29 (69.0)	13 (31.0)	42 (100.0)
Professional foundation	51 (71.8)	20 (28.2)	71 (100.0)
Technical pharmacy	53 (49.5)	54 (50.5)	107 (100.0)
Total	133 (60.5)	87 (39.5)	220 (100.0)
Credit hours			
General education	14 (70.0)	6 (30.0)	20 (100.0)
Professional foundation	15 (68.2)	7 (31.8)	22 (100.0)
Technical pharmacy	20 (52.6)	18 (47.4)	38 (100.0)
Total	49 (61.3)	31 (38.7)	80 (100.0)

When each subject area was categorized by teaching and learning methods,
namely, lecture, practice, and trainee, the curriculum consisted of 62.5% lecture, 25.0%
practice and 12.5% trainee. Table 4-2 illustrated that every subject area had relied on
lecture as its main teaching and learning method to deliver knowledge. While both
general education and professional foundation areas utilized only practice as their way
to add skills to students, courses under technical pharmacy area used more trainee than
practice as its method to develop student skills.

Table 4-2 Credit hours and percentage of each subject area categorized by teaching
and learning method

Subject area	Lecture	Practice	Trainee	Total
General education	14 (70.0)	6 (30.0)	0 (0.0)	20 (100.0)
Professional foundation	14 (63.6)	8 (36.4)	0 (0.0)	22 (100.0)
Technical pharmacy	22 (57.9)	6 (15.8)	10 (26.3)	38 (100.0)
Total	50 (62.5)	20 (25.0)	10 (12.5)	80 (100.0)

While the practice was almost equally utilized between the first and the second years of the program (24.5% and 25.8% of credit hours respectively), the lecture was used more during the first year courses (67.3% first year VS 54.8% second year). On the contrary the trainee was focused more on the second year (8.2% of the first year credit hours VS 19.4% of those in the second year) as shown in Table 4-3.

Table 4-3 Credit hours and percentage of each subject area on the first and the second
years categorized by teaching and learning method

Subject area	Lecture	Practice	Trainee	Total
First year				
General education	10 (71.4)	4 (28.6)	0 (0.0)	14 (100.0)
Professional foundation	10 (66.7)	5 (33.3)	0 (0.0)	15 (100.0)
Technical pharmacy	13 (65.0)	3 (15.0)	4 (20.0)	20 (100.0)
Total	33 (67.3)	12 (24.5)	4 (8.2)	49 (100.0)
Second year				
General education	4 (66.7)	2 (33.3)	0 (0.0)	6 (100.0)
Professional foundation	4 (57.1)	3 (42.9)	0 (0.0)	7 (100.0)
Technical pharmacy	9 (50.0)	3 (16.7)	6 (33.3)	18 (100.0)
Total	17 (54.8)	8 (25.8)	6 (19.4)	31 (100.0)

2. Pharmacy Technician Competence

When taking into consideration only courses under technical pharmacy competence, 38 credit hours were categorized into 4 main tasks according to pharmacy technician competence. The curriculum consisted of 15.76 credit hours of pharmacy service, 9.62 of public health pharmacy, 9.54 of pharmaceutical production, and 3.08 credit hours of pharmaceutical inventory management. The majority of credit hours of every task, except for pharmacy service, were taught during the first year. Eleven point seven six out of 15.76 credit hours of pharmacy service domain were studied during the second year. See Table 4-4.

Table 4-4 Credit hours of the first and the second years categorized by pharmacy technician competence

Year	Pharmacy service	Public health pharmacy	Pharmaceutical production	Pharmaceutical inventory management	Total
First	4.00	8.00	6.00	2.00	20.00
Second	11.76	1.62	3.54	1.08	18.00
Total	15.76	9.62	9.54	3.08	38.00

There were 15 subjects under technical pharmacy subject area, of which 8 were required for the first year students and 7 were for the second year students. All of 15 except 3 subjects for the second year contained only one task of pharmacy technician competence. Of the 3 subjects that covered more than one task, the subject on Holistic Thai Traditional Medicine incorporated 3 tasks without the pharmaceutical inventory management, while Field Work I (Technical Pharmacy) and Field Work II (Technical Pharmacy) integrated all 4 tasks of pharmacy technician competence. The details were shown in Table 4-5.

Table 4-5 Credit hours of each subject in technical pharmacy area categorized by
pharmacy technician competence

Subjects	Pharmacy service	Public health pharmacy	Pharmaceutical production	Pharmaceutical inventory management
First year				
Pharmaceutical Technology 1	0.00	0.00	3.00	0.00
Pharmaceutical Technology 2	0.00	0.00	3.00	0.00
Pharmacology 1	2.00	0.00	0.00	0.00
Pharmacology 2	2.00	0.00	0.00	0.00
Pharmaceutical Inventory Management	0.00	0.00	0.00	2.00
Disease Control and Prevention for Individual, Family, and Community	0.00	2.00	0.00	0.00
Law and Consumer Protection	0.00	2.00	0.00	0.00
Pharmaceutical Development in Community Project	0.00	4.00	0.00	0.00
Total	4.00	8.00	6.00	2.00
Second year				
Pharmaceutical Technology 3	0.00	0.00	2.00	0.00
Pharmacology 3	3.00	0.00	0.00	0.00
Pharmacy Service	3.00	0.00	0.00	0.00
Introduction to Clinical Pharmacy	2.00	0.00	0.00	0.00
Holistic Thai Traditional Medicine	1.01	0.53	0.46	0.00
Field Work I (Technical Pharmacy)	1.50	0.50	0.50	0.50
Field Work II (Technical Pharmacy)	1.25	0.59	0.58	0.58
Total	11.76	1.62	3.54	1.08

3. Professional Competence

Professional competence was composed of meta-competence and 4 core domains, namely, knowledge/cognitive, functional, personal or behavioral and values/ethical competences.

The curriculum contained all domains under professional competences. Every subject area except technical pharmacy included all domains. The meta-competence was the missing piece from the technical pharmacy area. About 60 out of 80 credit hours or 75% were knowledge/cognitive and functional competences (32.24 and 27.05 credit hours respectively). While the majority of credit hours in general education area were meta-competence (8.34), both professional foundation and technical pharmacy areas mainly covered knowledge/cognitive (10.96 and 17.95 respectively), and functional (7.04 and 15.34 respectively) competences. See Table 4-6.

Table 4-6 Credit hours of each subject area categorized by professional competence

Subject area	Meta-competence	Knowledge/cognitive	Functional	Personal or behavioral	Values/ethical
General education	8.34	3.33	4.67	1.43	2.23
Professional foundation	2.33	10.96	7.04	1.56	0.11
Technical pharmacy	0.00	17.95	15.34	3.19	1.52
Total	10.67	32.24	27.05	6.18	3.86

When each subject area was categorized by year, it was found that the majority of credit hours during the first year were oriented toward knowledge/cognitive, functional and meta-competence domains (22.63, 15.65 and 8.31 credit hours, respectively). The majority of credit hours for the second year involved functional, knowledge/cognitive, and personal or behavioral competences (11.40, 9.61 and 4.43, respectively).

While knowledge/cognitive, functional, and meta-competence domains gained more emphasis during the first year study, personal or behavioral and value/ethical competences with fewer total credit hours were more focused during the final year as illustrated in Table 4-7.

Table 4-7 Credit hours of each subject area on the first and the second years categorized by professional competence

Subject area	Meta-competence	Knowledge/ cognitive	Functional	Personal or behavioral	Values/ ethical
First year					
General education	5.98	3.33	4.67	0.00	0.02
Professional foundation	2.33	8.58	2.42	1.56	0.11
Technical pharmacy	0.00	10.72	8.56	0.19	0.53
Total	8.31	22.63	15.65	1.75	0.66
Second year					
General education	2.36	0.00	0.00	1.43	2.21
Professional foundation	0.00	2.38	4.62	0.00	0.00
Technical pharmacy	0.00	7.23	6.78	3.00	0.99
Total	2.36	9.61	11.40	4.43	3.20

3.1 General Education Area

While general education area had included all five domains of professional competence, each domain gained different attention across studied years. The majority of credit hours taught during the first year were centered on meta-competence, functional, and knowledge/cognitive competences with 5.98, 4.67 and 3.33 credit hours respectively. The second year subjects focused on 3 domains, i.e., meta-competence, value/ethical, and personal or behavioral competences with less total credit hours than what was taught during the first year (2.36, 2.21 and 1.43 respectively). Out of seven subjects under general education area, 2 subjects contained 1 domain, 3 subjects focused on 2 domains, and 2 subjects comprised of 3 domains. The details were shown in Table 4-8.

Table 4-8 Credit hours of each subject in general education area categorized by
professional competence

Subjects	Meta-competence	Knowledge/cognitive	Functional	Personal or behavioral	Values/ethical
First year					
Thai for Communication	2.98	0.00	0.00	0.00	0.02
Basic in English	3.00	0.00	0.00	0.00	0.00
Science and Mathematics for Daily Life	0.00	3.00	0.00	0.00	0.00
Computer for Working	0.00	0.11	1.89	0.00	0.00
Information Technology	0.00	0.22	2.78	0.00	0.00
Total	5.98	3.33	4.67	0.00	0.02
Second year					
Life, Society, and Environment	1.64	0.00	0.00	0.35	1.01
Professional Behavioral Ethics Development	0.72	0.00	0.00	1.08	1.20
Total	2.36	0.00	0.00	1.43	2.21

3.2 Professional Foundation Area

For professional foundation area, the first year credit hours covered all 5 professional competence domains with knowledge/cognitive competence (8.58 credit hours) as the main focal point. The subjects taught during the second year contained only 2 domains of professional competence, functional and knowledge/cognitive competences (4.62 and 2.38 respectively). The functional domain involving skill practice for students was of course emphasized more during the second year. Of nine subjects in this area, majority covered at least 2 domains (2 domains by 5 subjects, and 3 domains by 1 subject). There were 3 subjects focusing on only 1 domain. The details were shown in Table 4-9.

Table 4-9 Credit hours of each subject in professional foundation area categorized by professional competence

Subjects	Meta-competence	Knowledge/ cognitive	Functional	Personal or behavioral	Values/ ethical
First year					
Anatomy and Physiology	0.00	3.00	0.00	0.00	0.00
Microbiology and Parasitology	0.00	1.93	1.07	0.00	0.00
Psychology	0.33	0.00	0.00	1.56	0.11
Biostatistics	0.00	3.00	0.00	0.00	0.00
Health Education and Behavioral Science	0.00	0.65	1.35	0.00	0.00
Systems Thinking Process Development	2.00	0.00	0.00	0.00	0.00
Total	2.33	8.58	2.42	1.56	0.11
Second year					
Epidemiology	0.00	1.36	1.64	0.00	0.00
Public Health Administration	0.00	0.89	1.11	0.00	0.00
First Aid	0.00	0.13	1.87	0.00	0.00
Total	0.00	2.38	4.62	0.00	0.00

3.3 Technical Pharmacy Area

Technical pharmacy area could be classified into 4 major tasks under pharmacy technician competence, namely, pharmacy service, public health pharmacy, pharmaceutical production, and pharmaceutical inventory management. The pharmacy service task delivered knowledge/cognitive competence with the most credit hours of 10.09 whereas other tasks emphasized more on functional competence with the knowledge/cognitive competence as the second most credit hours. The details were shown in Table 4-10.

Table 4-10 Credit hours of each pharmacy technician competence task in technical pharmacy area categorized by professional competence

Pharmacy technician competence task	Knowledge/ cognitive	Functional	Personal or behavioral	Values/ ethical
Pharmacy service	10.09	4.34	0.79	0.54
Public health pharmacy	3.95	4.36	0.82	0.49
Pharmaceutical production	3.07	5.37	0.79	0.31
Pharmaceutical inventory management	0.84	1.27	0.79	0.18
Total	17.95	15.34	3.19	1.52

3.3.1   Pharmacy Service Task

For 8 subjects under pharmacy service tasks, 2 subjects were taught during the first year covering only 2 professional competence domains, knowledge/cognitive and functional competences (3.58 and 0.42 credit hours, respectively).   Students studied 6 more subjects during the second year and learned all 4 professional domains with 6.51 credit hours of knowledge/cognitive and 3.92 credit hours of functional competences as their emphasis.   Half or four of eight subjects under this task covered 3 domains each and the other 3 subjects contained 2 domains. Only pharmacology subject emphasized just 1 domain on knowledge/cognitive competence.   The details were demonstrated in Table 4-11.

Table 4-11 Credit hours of each subject in pharmacy service task categorized by professional competence

Subjects	Knowledge/ cognitive	Functional	Personal or behavioral	Values/ ethical
First year				
Pharmacology 1	2.00	0.00	0.00	0.00
Pharmacology 2	1.58	0.42	0.00	0.00
Total	3.58	0.42	0.00	0.00
Second year				
Pharmacology 3	1.54	1.03	0.00	0.43
Pharmacy Service	0.78	2.11	0.00	0.11
Introduction to Clinical Pharmacy	1.67	0.33	0.00	0.00
Holistic Thai Traditional Medicine	0.86	0.15	0.00	0.00
Field Work I (Technical Pharmacy)	1.00	0.13	0.37	0.00
Field Work II (Technical Pharmacy)	0.66	0.17	0.42	0.00
Total	6.51	3.92	0.79	0.54

3.3.2 Public Health Pharmacy Task

For public health pharmacy task, every professional domain was taught during both years with minimum time or credits hours spent during the second year. Majority of time were spent on functional and knowledge/cognitive competences with almost equal distribution (3.88 and 3.78 credit hours, respectively). The personal or behavioral competence with 0.63 credit hours was the most time spent for professional competence under the public health pharmacy task. Of six subjects under this task, all except one subject encompassed more than one domain with half of the subjects covering 2 domains, and 2 subjects covering 3 domains. The details were shown in Table 4-12.

Table 4-12 Credit hours of each subject in public health pharmacy task categorized by professional competence

Subjects	Knowledge/ cognitive	Functional	Personal or behavioral	Values/ ethical
First year				
Disease Control and Prevention for Individual, Family, and Community	2.00	0.00	0.00	0.00
Law and Consumer Protection	1.78	0.07	0.00	0.15
Pharmaceutical Development in Community Project	0.00	3.81	0.19	0.00
Total	3.78	3.88	0.19	0.15
Second year				
Holistic Thai Traditional Medicine	0.00	0.36	0.00	0.17
Field Work I (Technical Pharmacy)	0.00	0.12	0.38	0.00
Field Work II (Technical Pharmacy)	0.17	0.00	0.25	0.17
Total	0.17	0.48	0.63	0.34

3.3.3 Pharmaceutical Production Task

There were 6 subjects containing contents related to pharmaceutical production task. Two subjects were taught during the first year covering all professional competence but personal or behavioral competence. Four subjects encompassing all professional domains were studied during the second year. Most time was spent on functional competence with 3.28 credit hours for the first year and 2.09 credit hours for the second year. Half of the subjects carried 3 domains of professional competence and two subjects taught 2 domains, the other subject covered only one domain. See Table 4-13.

Table 4-13 Credit hours of each subject in pharmaceutical production task categorized by professional competence

Subjects	Knowledge/ cognitive	Functional	Personal or behavioral	Values/ ethical
First year				
Pharmaceutical Technology 1	0.58	2.28	0.00	0.14
Pharmaceutical Technology 2	1.94	1.00	0.00	0.06
Total	2.52	3.28	0.00	0.20
Second year				
Pharmaceutical Technology 3	0.55	1.34	0.00	0.11
Holistic Thai Traditional Medicine	0.00	0.46	0.00	0.00
Field Work I (Technical Pharmacy)	0.00	0.12	0.38	0.00
Field Work II (Technical Pharmacy)	0.00	0.17	0.41	0.00
Total	0.55	2.09	0.79	0.11

3.3.4 Pharmaceutical Inventory Management Task

Only one subject during the first year had the content on pharmaceutical inventory management. The professional competence that gained the most time was functional with 0.98 credit hours, knowledge/cognitive with 0.84 credit hours. The valued/ethical domain got the least time during this first year. While personal or behavioral competence domain gained the most attention for the second year subjects at 0.79 credit hours, the functional domain was the other competence with only 0.29 credit hours. Both subjects taught during the second year had the same characteristics covering same domains since they were both field work subjects. The details were shown in Table 4-14.

Table 4-14 Credit hours of each subject in pharmaceutical inventory management task categorized by professional competence

Subjects	Knowledge/ cognitive	Functional	Personal or behavioral	Values/ ethical
First year				
Pharmaceutical Inventory Management	0.84	0.98	0.00	0.18
Total	0.84	0.98	0.00	0.18
Second year				
Field Work I (Technical Pharmacy)	0.00	0.13	0.37	0.00
Field Work II (Technical Pharmacy)	0.00	0.16	0.42	0.00
Total	0.00	0.29	0.79	0.00

4   Level of Competence

Each subject area of the curriculum was analyzed according to 4 levels of competence including "knows", "knows how", "shows how", and "does". Even the curriculum possessed all 4 levels of competence; only technical pharmacy area used all 4 levels, the rest of subject areas had all except the highest level of "does". The most of total credit hours were focused on the levels of "knows how" and "shows how" levels (36.58 and 23.04, respectively). When analysis was conducted across subject areas, the technical pharmacy subject area emphasized most on "knows how" level, so did the general education and the professional foundation areas. The time spent by general education, professional foundation, and technical pharmacy areas on "knows how" level were 12.68, 9.61, and 14.29 credit hours respectively as shown in Table 4-15.

Table 4-15 Credit hours of each subject area categorized by level of competence

Subject area	Knows	Knows how	Shows how	Does
General education	1.16	12.68	6.16	0.00
Professional foundation	3.41	9.61	8.98	0.00
Technical pharmacy	7.81	14.29	7.90	8.00
Total	12.38	36.58	23.04	8.00

When each subject area was categorized across years of study, it was found that students spent equal time on the "does" level of competence between 2 years of study. The rest of the levels were more emphasized by the first year subjects than those taught during the second year. The most credit hours of all areas in both years were spent on the "knows how" level, except professional foundation area that spent more credit hours on the "shows how" level (3.36) during the second year. See Table 4-16.

Table 4-16 Credit hours of each subject area on the first and the second years categorized by level of competence

Subject area	Knows	Knows how	Shows how	Does
First year				
General education	0.66	9.17	4.17	0.00
Professional foundation	2.17	7.21	5.62	0.00
Technical pharmacy	5.17	7.59	3.24	4.00
Total	8.00	23.97	13.03	4.00
Second year				
General education	0.50	3.51	1.99	0.00
Professional foundation	1.24	2.40	3.36	0.00
Technical pharmacy	2.64	6.70	4.66	4.00
Total	4.38	12.61	10.01	4.00

4.1 General Education Area

For general education area, all subjects but 2 used "knows how" level of competency. Two subjects including Computer for Working and Professional Behavioral Ethics Development focused more on "shows how" level. Of seven subjects in this area, most of them bended 3 levels of competence in teaching, the rests used either 1 or 2 levels (2 and 1 subjects, respectively). See Table 4-17.

Table 4-17 Credit hours of each subject in general education area categorized by level of competence

Subjects	Knows	Knows how	Shows how	Does
First year				
Thai for Communication	0.33	1.67	1.00	0.00
Basic in English	0.00	2.00	1.00	0.00
Science and Mathematics for Daily Life	0.00	3.00	0.00	0.00
Computer for Working	0.11	0.89	1.00	0.00
Information Technology	0.22	1.61	1.17	0.00
Total	0.66	9.17	4.17	0.00
Second year				
Life, Society, and Environment	0.00	3.00	0.00	0.00
Professional Behavioral Ethics Development	0.50	0.51	1.99	0.00
Total	0.50	3.51	1.99	0.00

4.2 Professional Foundation Area

Considering professional foundation area, the majority of time spent in teaching of all subjects relied on "knows how" (4 subjects) and "shows how" (4 subjects) levels. Only one subject, Public Health Administration, had equal balance between "knows how" and "shows how" levels. Of nine subjects of this area, there were 4 subjects using 2 levels of competence and the rests relied on 3 levels as shown in Table 4-18.

Table 4-18 Credit hours of each subject in professional foundation area categorized by
level of competence

Subjects	Knows	Knows how	Shows how	Does
First year				
Anatomy and Physiology	0.77	1.23	1.00	0.00
Microbiology and Parasitology	0.69	1.31	1.00	0.00
Psychology	0.00	2.00	0.00	0.00
Biostatistics	0.71	1.33	0.96	0.00
Health Education and Behavioral Science	0.00	0.56	1.44	0.00
Systems Thinking Process Development	0.00	0.78	1.22	0.00
Total	2.17	7.21	5.62	0.00
Second year				
Epidemiology	1.11	0.53	1.36	0.00
Public Health Administration	0.00	1.00	1.00	0.00
First Aid	0.13	0.87	1.00	0.00
Total	1.24	2.40	3.36	0.00

4.3 Technical Pharmacy Area

The most time of technical pharmacy area were spent on "knows how" level with 14.29 credit hours. Overall time spent on "knows", "shows how", and "does" levels were nearly equal (7.81, 7.90 and 8.00 credit hours, respectively). When focusing on each pharmacy technician competence, there were differences in levels of competence used for each task. While the majority of credit hours for pharmacy service was spent on "knows how" level (8.07), pharmaceutical production was mostly relied on "shows how" level (3.26), and the most credit hours of both public health pharmacy and pharmaceutical inventory management emphasized "does" level of competence (4.75 and 1.08, respectively) as shown in Table 4-19.

Table 4-19 Credit hours of each pharmacy technician competence task in technical pharmacy area categorized by level of competence

Pharmacy technician competence task	Knows	Knows how	Shows how	Does
Pharmacy service	3.28	8.07	3.32	1.09
Public health pharmacy	2.24	2.25	0.38	4.75
Pharmaceutical production	2.18	3.02	3.26	1.08
Pharmaceutical inventory management	0.11	0.95	0.94	1.08
Total	7.81	14.29	7.90	8.00

4.3.1 Pharmacy Service Task

For pharmacy service task, all levels of competency were employed. However "does" level was not used during the first year subjects. The most credit hours of both years were spent on "knows how" level (2.64 and 5.43, respectively). All except 3 subjects spent most of their time teaching using "knows how" level of competence. The Pharmacy Service subject relied more on higher skill using "shows how" level (1.33 credit hours), and both Pharmacology 2 and 3 used lower skill by focusing on "knows" level (0.94 and 1.25 credit hours, respectively). Of eight subjects teaching for this task, all but one used more than one level of competence. Where as half of the subjects used 3 levels, 3 subjects employed 2 levels. The details were shown in Table 4-20.

Table 4-20 Credit hours of each subject in pharmacy service task categorized by level of competence

Subjects	Knows	Knows how	Shows how	Does
First year				
Pharmacology 1	0.00	2.00	0.00	0.00
Pharmacology 2	0.94	0.64	0.42	0.00
Total	0.94	2.64	0.42	0.00
Second year				
Pharmacology 3	1.25	0.55	1.20	0.00
Pharmacy Service	0.78	0.89	1.33	0.00
Introduction to Clinical Pharmacy	0.00	1.78	0.22	0.00
Holistic Thai Traditional Medicine	0.31	0.55	0.15	0.00
Field Work I (Technical Pharmacy)	0.00	1.00	0.00	0.50
Field Work II (Technical Pharmacy)	0.00	0.66	0.00	0.59
Total	2.34	5.43	2.90	1.09

4.3.2 Public Health Pharmacy Task

Subjects under public health pharmacy task were also taught using all levels of competency with "does" level gaining the most time (4.00 credit hours for the first year and 0.75 for the second year, respectively). Of six subjects in this task, two subjects with one level used "does" level of competency, 2 subjects employed 2 levels and the other two subjects used 3 levels. The details were shown in Table 4-21.

Table 4-21 Credit hours of each subject in public health pharmacy task categorized by level of competence

Subjects	Knows	Knows how	Shows how	Does
First year				
Disease Control and Prevention for Individual, Family, and Community	1.44	0.56	0.00	0.00
Law and Consumer Protection	0.63	1.30	0.07	0.00
Pharmaceutical Development in Community Project	0.00	0.00	0.00	4.00
Total	2.07	1.86	0.07	4.00
Second year				
Holistic Thai Traditional Medicine	0.17	0.05	0.31	0.00
Field Work I (Technical Pharmacy)	0.00	0.00	0.00	0.50
Field Work II (Technical Pharmacy)	0.00	0.34	0.00	0.25
Total	0.17	0.39	0.31	0.75

4.3.3 Pharmaceutical Production Task

For pharmaceutical production task, even all levels were taught, "does" level was not used during the first year. The majority of credit hours of the first year subjects were spent on "knows how" and "knows" levels almost equally (2.14 and 2.05 credit hours, respectively). Subjects taught during the second year relied more on "shows how" and "does" levels with 1.45 and 1.08 credit hours, respectively. Of six subjects teaching pharmaceutical production, 3 subjects used 3 levels, and the other 3 subjects used only 1 level. Those that used one level tended to use higher skill competence. See Table 4-22.

Table 4-22 Credit hours of each subject in pharmaceutical production task categorized by level of competence

Subjects	Knows	Knows how	Shows how	Does
First year				
Pharmaceutical Technology 1	0.11	2.03	0.86	0.00
Pharmaceutical Technology 2	1.94	0.11	0.95	0.00
Total	2.05	2.14	1.81	0.00
Second year				
Pharmaceutical Technology 3	0.13	0.88	0.99	0.00
Holistic Thai Traditional Medicine	0.00	0.00	0.46	0.00
Field Work I (Technical Pharmacy)	0.00	0.00	0.00	0.50
Field Work II (Technical Pharmacy)	0.00	0.00	0.00	0.58
Total	0.13	0.88	1.45	1.08

4.3.4 Pharmaceutical Inventory Management Task

The pharmaceutical inventory management task had only one subject during the first year and this task was included as a part of 2 fieldwork subjects in the second year. The first year subject used all levels except "does". On the other hand, credit hours in the second year were spent with "does" level of competence only. The "does" level gained the most credit hours under this task, while "knows how" and "shows how" levels were used almost equally (0.95 and 0.94 credit hours, respectively) in the Pharmaceutical Inventory Management subject. The details were shown in Table 4-23.

Table 4-23 Credit hours of each subject in pharmaceutical inventory management task categorized by level of competence

Subjects	Knows	Knows how	Shows how	Does
First year				
Pharmaceutical Inventory Management	0.11	0.95	0.94	0.00
Total	0.11	0.95	0.94	0.00
Second year				
Field Work I (Technical Pharmacy)	0.00	0.00	0.00	0.50
Field Work II (Technical Pharmacy)	0.00	0.00	0.00	0.58
Total	0.00	0.00	0.00	1.08

5   The Level of Each Professional Competence

When each professional competence was analyzed across 4 levels of competence, it revealed that some domains were not delivered at all levels.   The majority of time teaching knowledge/cognitive, meta-competence, and value/ethical competences used "knows how" level (19.21, 6.59 and 1.46, respectively).   It appeared that "does" level was not applied for these three domains of professional competence.   Differently, the majority of credit hours spent on functional competence emphasized the "shows how" level (15.00), but no "knows" level.   Only personal or behavioral competence had all levels and the majority of credit hours spent on "does" level (3.19).

When analyzing across subject areas and professional competence, the majority of credit hours of general education subject area used "knows how" level to deliver meta-competence (5.48). The professional foundation area used more "shows how" level on functional competence and "knows how" level on knowledge/cognitive competence (5.48 and 5.27 credit hours, respectively).   High use of "knows how" level of competence was also found under technical pharmacy area with more credit hours, 10.94 credit hours for knowledge/cognitive competence and 7.35 credit hours for functional competence.   The details were shown in Table 4-24.

When each subject area was categorized across years of study, the most of credit hours in the first year were spent on "knows how" level to teach knowledge/cognitive competence (13.13).   The other year spent most of its credit hours on "shows how" level to teach functional competence and "knows how" level to deliver knowledge/cognitive competence (7.55 and 6.08, respectively).   The details were shown in Table 4-25.

Table 4-24 Credit hours of each subject area categorized by professional competence domains and level of competence

Subject area	Meta-competence				Knowledge/cognitive competence				Functional competence				Personal or behavioral competence				Values/ethical competence			
	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does
General education	0.31	5.48	2.55	0.00	0.33	3.00	0.00	0.00	0.00	2.50	2.17	0.00	0.19	0.52	0.72	0.00	0.33	1.18	0.72	0.00
Professional foundation	0.00	1.11	1.22	0.00	3.41	5.27	2.28	0.00	0.00	1.56	5.48	0.00	0.00	1.56	0.00	0.00	0.00	0.11	0.00	0.00
Technical pharmacy	0.00	0.00	0.00	0.00	6.84	10.94	0.17	0.00	0.00	3.18	7.35	4.81	0.00	0.00	0.00	3.19	0.97	0.17	0.38	0.00
Total	0.31	6.59	3.77	0.00	10.58	19.21	2.45	0.00	0.00	7.24	15.00	4.81	0.19	2.08	0.72	3.19	1.30	1.46	1.10	0.00

Table 4-25 Credit hours of each subject area on the first and the second years categorized by professional competence domains and level of competence

Subject area	Meta-competence				Knowledge/cognitive competence				Functional competence				Personal or behavioral competence				Values/ethical competence			
	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does
First year																				
General education	0.31	3.67	2.00	0.00	0.33	3.00	0.00	0.00	0.00	2.50	2.17	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
Professional foundation	0.00	1.11	1.22	0.00	2.17	4.21	2.20	0.00	0.00	0.22	2.20	0.00	0.00	1.56	0.00	0.00	0.00	0.11	0.00	0.00
Technical pharmacy	0.00	0.00	0.00	0.00	4.8	5.92	0.00	0.00	0.00	1.67	3.08	3.81	0.00	0.00	0.00	0.19	0.37	0.00	0.16	0.00
Total	0.31	4.78	3.22	0.00	7.3	13.13	2.20	0.00	0.00	4.39	7.45	3.81	0.00	1.56	0.00	0.19	0.39	0.11	0.16	0.00
Second year																				
General education	0.00	1.81	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.52	0.72	0.00	0.31	1.18	0.72	0.00
Professional foundation	0.00	0.00	0.00	0.00	1.24	1.06	0.08	0.00	0.00	1.34	3.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Technical pharmacy	0.00	0.00	0.00	0.00	2.04	5.02	0.17	0.00	0.00	1.51	4.27	1.00	0.00	0.00	0.00	3.00	0.60	0.17	0.22	0.00
Total	0.00	1.81	0.55	0.00	3.28	6.08	0.25	0.00	0.00	2.85	7.55	1.00	0.19	0.52	0.72	3.00	0.91	1.35	0.94	0.00

5.1 General Education Area

Considering general education area, both years used "knows how" as the major level of competence to teach meta-competence (3.67 credit hours for the first year and 1.81 for the second year, respectively). Three out of 5 subjects of the first year, Basic in English, Thai for Communication, and Life, Society, and Environment, contributed to this high use of "knows how" level in teaching meta-competence (2.00, 1.67, and 1.64 credit hours, respectively). The details were shown in Table 4-26.

5.2 Professional Foundation Area

According to professional foundation area, the most of credit hours in first year were spent on "knows how" level for knowledge/cognitive competence (4.21). Major contribution came from 3 subjects, namely, Biostatistics, Anatomy and Physiology, and Microbiology and Parasitology (1.33, 1.23 and 1.11 credit hours, respectively). The other year used "shows how" as its main level to teach functional competence (3.28 credit hours). Moreover, all 3 subjects in the second year focused on functional competence and relied on this level as their main method of teaching. See Table 4-27.

5.3 Technical Pharmacy Area

The most credit hours of technical pharmacy area were spent on "knows how" level to teach knowledge/cognitive competence (10.94). When focusing on each pharmacy technician competence task, only pharmacy service that had its most credit hours spent on "knows how" level to teach knowledge/cognitive competence as well (7.07). However, the most credit hours of public health pharmacy task were depended on "does" level to deliver functional competence (3.93). Both pharmaceutical production and pharmaceutical inventory management tasks put their most credit hours on "shows how" level to teach functional competence (3.06 and 0.87, respectively). The details were shown in Table 4-28.

Table 4-26 Credit hours of each subject in general education area categorized by professional competence domains and level of competence

Subjects	Meta-competence				Knowledge/cognitive competence				Functional competence				Personal or behavioral competence				Values/ethical competence			
	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does
First year																				
Thai for Communication	0.31	1.67	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
Basic in English	0.00	2.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Science and Mathematics for Daily Life	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Computer for Working	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.89	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Information Technology	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.00	0.00	1.61	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.31	3.67	2.00	0.00	0.33	3.00	0.00	0.00	0.00	2.50	2.17	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
Second year																				
Life, Society, and Environment	0.00	1.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.00	1.01	0.00	0.00
Professional Behavioral Ethics Development	0.00	0.17	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.17	0.72	0.00	0.31	0.17	0.72	0.00
Total	0.00	1.81	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.52	0.72	0.00	0.31	1.18	0.72	0.00

Table 4-27 Credit hours of each subject in professional foundation area categorized by professional competence domains and level of competence

Subjects	Meta-competence				Knowledge/cognitive competence				Functional competence				Personal or behavioral competence				Values/ethical competence			
	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does
First year																				
Anatomy and Physiology	0.00	0.00	0.00	0.00	0.77	1.23	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Microbiology and Parasitology	0.00	0.00	0.00	0.00	0.69	1.11	0.13	0.00	0.00	0.20	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Psychology	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.56	0.00	0.00	0.00	0.11	0.00	0.00
Biostatistics	0.00	0.00	0.00	0.00	0.71	1.33	0.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Health Education and Behavioral Science	0.00	0.00	0.00	0.00	0.00	0.54	0.11	0.00	0.00	0.02	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Systems Thinking Process Development	0.00	0.78	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	1.11	1.22	0.00	2.17	4.21	2.20	0.00	0.00	0.22	2.20	0.00	0.00	1.56	0.00	0.00	0.00	0.11	0.00	0.00
Second year																				
Epidemiology	0.00	0.00	0.00	0.00	1.11	0.17	0.08	0.00	0.00	0.36	1.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Public Health Administration	0.00	0.00	0.00	0.00	0.00	0.89	0.00	0.00	0.00	0.11	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
First Aid	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.87	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	0.00	1.24	1.06	0.08	0.00	0.00	1.34	3.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 4-28 Credit hours of each pharmacy technician competence task under technical pharmacy area categorized by professional competence

domains and level of competence

Pharmacy technician competence task	Knowledge/cognitive competence				Functional competence				Personal or behavioral competence				Values/ethical competence			
	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does
Pharmacy service	2.85	7.07	0.17	0.00	0.00	1.00	3.04	0.30	0.00	0.00	0.00	0.79	0.43	0.00	0.11	0.00
Public health pharmacy	1.92	2.03	0.00	0.00	0.00	0.05	0.38	3.93	0.00	0.00	0.00	0.82	0.32	0.17	0.00	0.00
Pharmaceutical production	2.07	1.00	0.00	0.00	0.00	2.02	3.06	0.29	0.00	0.00	0.00	0.79	0.11	0.00	0.20	0.00
Pharmaceutical inventory management	0.00	0.84	0.00	0.00	0.00	0.11	0.87	0.29	0.00	0.00	0.00	0.79	0.11	0.00	0.07	0.00
Total	6.84	10.94	0.17	0.00	0.00	3.18	7.35	4.81	0.00	0.00	0.00	3.19	0.97	0.17	0.38	0.00

5.3.1   Pharmacy Service Task

While pharmacy service task emphasized the knowledge/cognitive competence, its subjects mostly relied on "knows how" level with 2.64 credit hours during the first year and 4.43 credit hours during the second year. Those subjects included Pharmacology 1, Introduction to Clinical Pharmacy, Field Work I (Technical Pharmacy), Field Work II (Technical Pharmacy), and Holistic Thai Traditional Medicine (2.00, 1.67, 1.00, 0.66 and 0.55 credit hours, respectively) as shown in Table 4-29.

5.3.2   Public Health Pharmacy Task

Public health pharmacy emphasized its first year credit hours on functional competence and its second year credit hours on personal or behavioral competence. Under both emphases, "does" level of competence was the main method of teaching for both years (3.81 and 0.63 credit hours, respectively) as shown in Table 4-30.

5.3.3   Pharmaceutical Production Task

The most credit hours of subjects under pharmaceutical production task in the first year were spent on "knows" level for knowledge/cognitive competence (1.94), the other year were on "shows how" level for functional competence (1.34). However, credit hours of "shows how" level for functional competence in the first year, even they were not the highest were more than those spent during the second year (1.72 and 1.34, respectively). The details were shown in Table 4-31.

5.3.4   Pharmaceutical Inventory Management Task

Finally, the most credit hours of subjects under pharmaceutical inventory management task in the first year were spent on "shows how" level for functional competence and on "knows how" level for knowledge/cognitive competence (0.87 and 0.84, respectively). The most credit hours of the second year were "does" level for personal or behavioral competence (0.79). See Table 4-32.

Table 4-29 Credit hours of each subject in pharmacy service task categorized by professional competence domains and level of competence

Subjects	Knowledge/cognitive competence				Functional competence				Personal or behavioral competence				Values/ethical competence			
	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does
First year																
Pharmacology 1	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pharmacology 2	0.94	0.64	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.94	2.64	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Second year																
Pharmacology 3	0.82	0.55	0.17	0.00	0.00	0.00	1.03	0.00	0.00	0.00	0.00	0.00	0.43	0.00	0.00	0.00
Pharmacy Service	0.78	0.00	0.00	0.00	0.00	0.89	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00
Introduction to Clinical Pharmacy	0.00	1.67	0.00	0.00	0.00	0.11	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Holistic Thai Traditional Medicine	0.31	0.55	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Field Work I (Technical Pharmacy)	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.37	0.00	0.00	0.00	0.00
Field Work II (Technical Pharmacy)	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.42	0.00	0.00	0.00	0.00
Total	1.91	4.43	0.17	0.00	0.00	1.00	2.62	0.30	0.00	0.00	0.00	0.79	0.43	0.00	0.11	0.00

Table 4-30 Credit hours of each subject in public health pharmacy task categorized by professional competence domains and level of competence

Subjects	Knowledge/cognitive competence				Functional competence				Personal or behavioral competence				Values/ethical competence			
	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does
First year																
Disease Control and Prevention for Individual, Family, and Community	1.44	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Law and Consumer Protection	0.48	1.30	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00
Pharmaceutical Development in Community Project	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.81	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.00
Total	1.92	1.86	0.00	0.00	0.00	0.00	0.07	3.81	0.00	0.00	0.00	0.19	0.15	0.00	0.00	0.00
Second year																
Holistic Thai Traditional Medicine	0.00	0.00	0.00	0.00	0.00	0.05	0.31	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00
Field Work I (Technical Pharmacy)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00
Field Work II (Technical Pharmacy)	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.17	0.00	0.00
Total	0.00	0.17	0.00	0.00	0.00	0.05	0.31	0.12	0.00	0.00	0.00	0.63	0.17	0.17	0.00	0.00

Table 4-31 Credit hours of each subject in pharmaceutical production task categorized by professional competence domains and level of competence

Subjects	Knowledge/cognitive competence				Functional competence				Personal or behavioral competence				Values/ethical competence			
	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does
First year																
Pharmaceutical Technology 1	0.00	0.58	0.00	0.00	0.00	1.45	0.83	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.03	0.00
Pharmaceutical Technology 2	1.94	0.00	0.00	0.00	0.00	0.11	0.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00
Total	1.94	0.58	0.00	0.00	0.00	1.56	1.72	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.09	0.00
Second year																
Pharmaceutical Technology 3	0.13	0.42	0.00	0.00	0.00	0.46	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00
Holistic Thai Traditional Medicine	0.00	0.00	0.00	0.00	0.00	0.00	0.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Field Work I (Technical Pharmacy)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00
Field Work II (Technical Pharmacy)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.41	0.00	0.00	0.00	0.00
Total	0.13	0.42	0.00	0.00	0.00	0.46	1.34	0.29	0.00	0.00	0.00	0.79	0.00	0.00	0.11	0.00

Table 4-32 Credit hours of each subject in pharmaceutical inventory management task categorized by professional competence domains and level of competence

Subjects	Knowledge/cognitive competence				Functional competence				Personal or behavioral competence				Values/ethical competence			
	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does	Knows	Knows how	Shows how	Does
First year																
Pharmaceutical Inventory Management	0.00	0.84	0.00	0.00	0.00	0.11	0.87	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.07	0.00
Total	0.00	0.84	0.00	0.00	0.00	0.11	0.87	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.07	0.00
Second year																
Field Work I (Technical Pharmacy)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.37	0.00	0.00	0.00	0.00
Field Work II (Technical Pharmacy)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.00	0.42	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.79	0.00	0.00	0.00	0.00

CHAPTER V

DISCUSSION AND CONCLUSION

This chapter was divided into three parts: discussion, conclusion, and limitation and future study.

Discussion

1. General Characteristics of the Curriculum

Eighty credit hours of the Diploma of Public Health Program (Technical Pharmacy) consisted of 3 teaching and learning methods including 50 credit hours of lecture, 20 credit hours of practice, and 10 credit hours of trainee. Actual hours spent on content topics were transformed and standardized into credit hours by stipulation as 1 credit hour of lecture for 18 hours, 1 credit hour of practice for 36 hours, and 1 credit hour of trainee for 54 hours. Therefore, 80 credit hours were equivalent to 2160 actual hours of core courses in this curriculum.

Considering the American Society of Health-System Pharmacists (ASHP), which accredited technician training programs, required that programs had a minimum of 600 hours and a minimum duration of 15 weeks (Rouse, 2003: 41). The directory of the Accrediting Commission of Career Schools and Colleges of Technology (ACCSCT, 2009) listed 129 "pharmacy" programs. Most of them were Diploma degree and the others were Certificate, and Associate of Science degrees. These programs varied in length from 640 to 1790 hours (24-117 credit hours), with a median of 720 hours.

Confidently, this curriculum supported the ASHP minimum requirements. However, the curriculum had almost 400 more hours than the largest program in the United States. This comparison was made at the total hours spent by students without taken into account the breakdown of teaching elements. Beside the total time, whether students spent more time on theory, practice, or trainee would also be an important factor affecting student competence. Likewise, some educators deplored a move within

the education system to get people into the work force quickly. They believed rapid-training strategies did not seem appropriate for health care personnel whose activities directly affected the safe and effective use of medications (Rouse, 2003: 41).

2. Pharmacy Technician Competence

The curriculum included 4 pharmacy technician competences. The largest content area was pharmacy service. The ratio of credit hours among pharmacy service, public health pharmacy, pharmaceutical production and pharmaceutical inventory management were about 5: 3: 3: 1 or 41.47%, 25.32%, 25.10% and 8.11%, respectively. It was difficult to compare with those in the United States because of difference tasks of pharmacy technician were defined. For example, Thailand had public health pharmacy, whereas the United States did not define this role under their pharmacy technician function. Only one similar competence as pharmaceutical inventory management was the common task between the two countries. The emphasis put on this competence in the United States was 3 folds higher than in Thailand. The United States situation was shown below.

The ASHP cooperated with several other pharmacy associations to develop the model of the curriculum for pharmacy technician training (ASHP, 2001). The ASHP did not expect that every program would follow every goal and objective recommended. The model did not include recommendations regarding the relative amount of time that should be allotted to each module, but such guidelines are under consideration. However, the Pharmacy Technician Certification Board (PTCB, 2009) examination was based on a task analysis that defined the work of pharmacy technicians nationwide. The content of exam was characterized under three function areas: 66% of exam was based on knowledge required to assist the pharmacist in serving patients, 22% on maintaining medication and inventory control system and 12% on participating in the administration and management of pharmacy practice. These content areas reflected the different service orientation between countries.

Even analysis was conducted based on different environments, the curriculum mapping method that was use to evaluate the curriculum by functional competence was also used by several professional education including nursing (Zydziunaite, 2004), medicine (Wood et al., 2002; Wong and Roberts, 2007) and pharmacy (Plaza et al., 2007; Nattiya Kapol et al., 2008). This method also provided a mechanism for visually determining when the curriculum competences were covered as well as areas that were potentially not covered (Harden, 2001: 135-136; Plaza et al., 2007; Wong and Roberts, 2007: abstract).

3. Professional Competence

The curriculum contained all domains of professional competences. The credit hours of knowledge/cognitive competence were shown in the lead and functional competence in second position. Diagram of competence mix for technical pharmacy curriculum was shown in Figure 5-1.
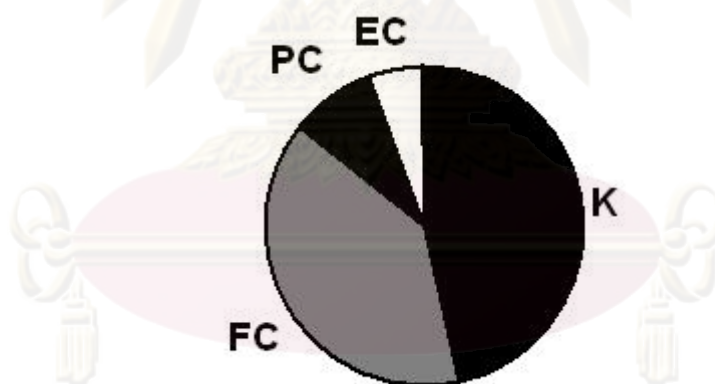
Key/Legend: K = knowledge/cognitive competence, FC = functional competence, PC = personal or behavioral competence, and EC = values/ethical competence

Figure 5-1 The diagram of competence mix for technical pharmacy curriculum

Considering the nature of professional practice based on research conducted by Cheetham and Chivers (2005: 127-129), both interviewees and survey respondents were invited to produce an occupational competence mix diagram for their profession. Only six respondents, out of more than 400, failed to produce diagrams. However,

these six professions represented six functional groups of professions (Cheetham and Chivers, 2000: 375-376), namely, (1) pastoral/spiritual care (anglican clergy), (2) teaching/training (trainers), (3) legal and financial (accountants), (4) policy, administrative and business support (civil servants), (5) technical and scientific (surveyors) and (6) medical and health care (dentists). A diagram was then drawn for each profession as shown in Figure 5-2. They displayed significant differences between professions in the perceived importance of the four different types of competence.
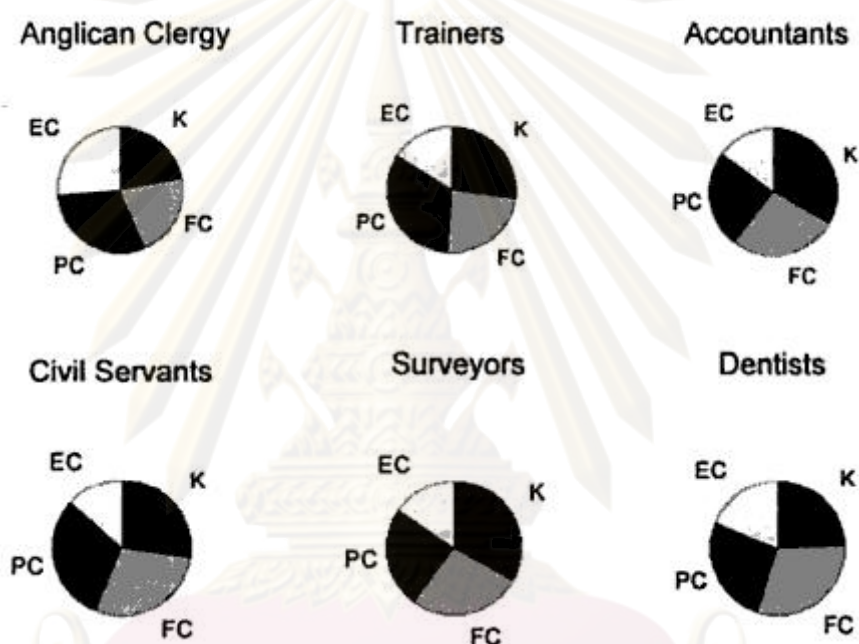
Key/Legend: K = knowledge/cognitive competence, FC = functional competence, PC = personal or behavioral competence, and EC = values/ethical competence

Figure 5-2 Occupational competence mix diagrams for different professions
(Cheetham and Chivers, 2005: 128)

The pharmacy technician was considered both technical/scientific and medical/health care profession groups as compared to surveyors and dentists in the diagram of figure 5-2. Both groups were different on the largest competence, which surveyors contained high knowledge/cognitive competence and dentists more emphasized on functional competence. The other 2 competences had nearly equal share between both profession groups. Importantly, total of knowledge/cognitive and

functional competences in both groups were more than half of diagram, but the same 2 competences of the curriculum in this study shared more than four-fifths of diagram. Even the environments were different, the above comparison suggested reconsideration on proportions of professional competence domains might be essential. The convincing evidents were the imbalance of these components especially under professional foundation and technical pharmacy areas.

4. Level of Competence

The content of instruction was an essential variable in research on factors affecting student achievement (Porter, 2002: 3) and few studies showed associations between results of assessment and actual clinical performance (Epstein and Hundert, 2002: 228-229).

Therefore, the model of the curriculum for pharmacy technician training by the ASHP was developed as a nationwide project to provide educators with a prototype for training pharmacy technicians for service in all practice settings and in all geographical locations (ASHP, 2001: user's guide). A design team analyzed the outcome of their task analysis to determine the knowledge, skills, attitudes, and abilities. They used a system called Bloom's taxonomy to identify objectives and instructional objectives for training. These became objectives of modules for instruction. Out of 456 objectives and instructional objectives (ASHP, 2001: 21-49), the largest area was "comprehension" level, followed with "knowledge" and "application" levels, respectively. There were only a few objectives contributed to other levels.

As an alternative, this study assessed the content of curriculum using Miller's pyramid of competence. The model required that each level was a firm base on which to build the next one (Hodges, 2007: 54). The pyramid reminded that the largest area was "knows" level and the others near the apex were smaller area respectively. Nevertheless, the finding presented the largest area of this curriculum was "knows how" level, followed respectively with "shows how", "knows" and "does" levels. Indicatively, "knows" level might not be as suggested by Miller's model. In addition, the comparison

between this curriculum and the ASHP model presented differently. If the "knowledge" and "comprehension" levels of Bloom's taxonomy were equivalent to "knows" level of Miller's model, and "application" level was comparable to "knows how" level (Miller, 1990: S64), the curriculum was presented at a higher level of competence than the ASHP model. The possible reasons that the curriculum contained less "knows" level included the "knows" level was not written or absent from instructional or behavioral objectives. Also, the "knows" level was embedded in "knows how" and "shows how" levels. To be able to achieve "knows how" and "shows how", students had to "knows".

5. The Level of Each Professional Competence

The curriculum had all professional competence domains but not every domain contained all levels of competence, likewise the ASHP model. Curriculum mapping between professional competence and level of competence demonstrated the characteristics of the curriculum including areas, subjects, and objectives. Especially, the finding found that all of professional competences did not agree with level pattern of Miller's model not only the curriculum but also areas and subjects. These showed the process of the curriculum development, even was well planned, could be improved. The pharmacy technician competence requirements should be analyzed in advance. Then, identifying goals, objectives and instructional objectives for training should base on these competences (ASHP, 2001: user's guide). These would help developing modules and subjects of instruction, while using the curriculum mapping to support both constructing and sequencing the curriculum. These processes would also facilitate the curriculum evaluation by aligning what would be taught with competence requirements. Hale (2006) suggested that curriculum mapping did not perceive education as a static environment since learning, and learning about learning, is a continual process. As long as teachers have new students, new classes and new school years, newly created and revised curriculum maps would provide evidence of a school or district's ongoing curriculum development.

Conclusion

The Diploma of Public Health Program (Technical Pharmacy) supported the ASHP minimum requirements and had more hours than the largest program in the United States. The curriculum included 4 tasks of pharmacy technician competence. The largest content area was pharmacy service and the smallest was pharmaceutical inventory management. When compared with the United States, the curriculum had only one similar competence as pharmaceutical inventory management. The competence involving the inventory management in the United States had more emphasis than this curriculum about three times. Moreover, this curriculum contained all domains of professional competence. There was higher proportion of knowledge/cognitive and functional competences than personal or behavioral and values/ethical competences and this was also higher than recommended proportions by occupational competence mix diagrams. Considering the level of competence, the curriculum was higher level than the model of the curriculum for pharmacy technician training suggested by the ASHP. The largest content area was "knows how" level, followed with "shows how", "knows" and "does" level, respectively. However, when compared with the ASHP model, this curriculum contained less "knows" level. Finally, the curriculum map between professional competence and level of competence presented the characteristics of the curriculum. Deplorably, all domains of professional competence did not agree with level pattern of Miller's model.

Limitation and Future Study

This study measured the curriculum based on professional competence, so the finding reflected the curriculum characteristics and competence of graduate. Nevertheless, it could not place any ranking on quality standard of the curriculum because no standard had been established for comparison wihin Thailand. Although this study used the model of the curriculum for pharmacy technician training recommended by the ASHP, the pharmacy technician tasks in the United States were different from Thailand. Future studies of Thai pharmacy technician competence

standard should be conducted to expand the curriculum quality and provide other benefit for pharmacy technician profession.

Since the study was documentary analysis, so the finding was image of the curriculum. However, actual practice may be different from the document curriculum. Therefore, the real practice should be measured in the future.

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APPENDICES
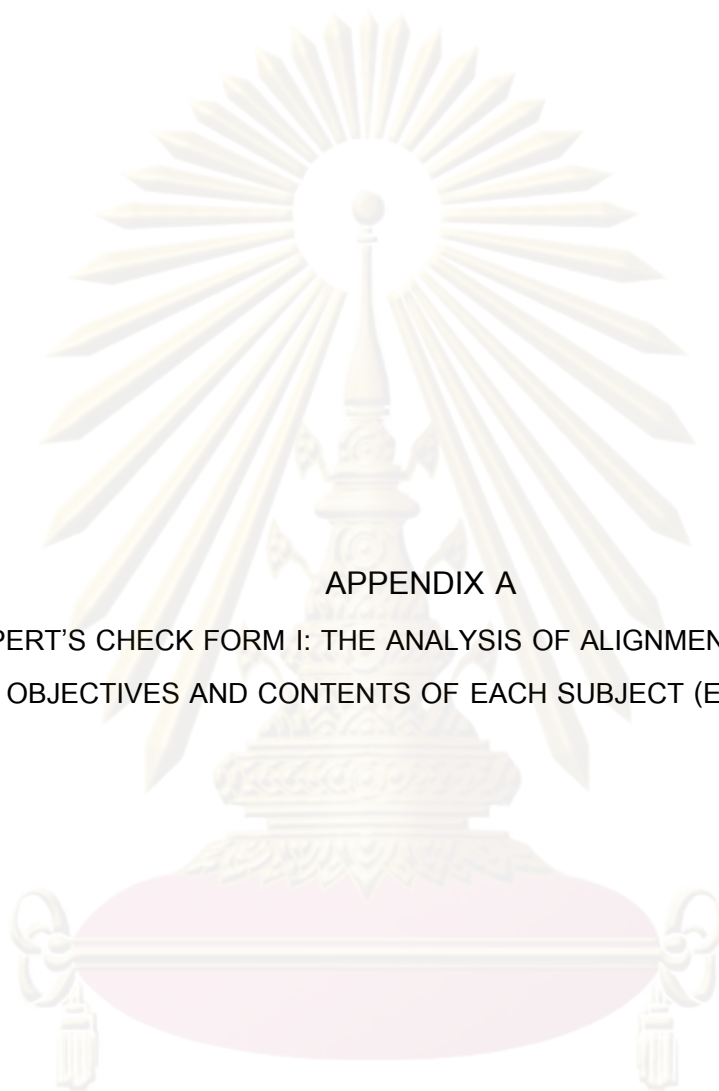
APPENDIX A

EXPERT'S CHECK FORM I: THE ANALYSIS OF ALIGNMENT BETWEEN
OBJECTIVES AND CONTENTS OF EACH SUBJECT (ENGLISH)

(Example)

EXPERT'S CHECK FORM I

The Analysis of Alignment between Objectives and Contents of Each Subject

Topic: An Analysis of Diploma of Public Health Program (Technical Pharmacy)

Based on Professional Competence

Notice:

Please check ✔ in check results block that represent your correct about there analysis

01 Thai for Communication

Chapter	Objectives / Contents	Understand ... 1	Explain 2	.... :	.... n	Check Results Correct	Incorrect	Suggestion
Lecture								
1	Foundation Principles							
	1.1 ……	✔						
	………...	✔						
	1.n ……		✔					
2	………...							
	2.1 ……..		✔					
	…………			✔				
Practice								
…..	…………				✔			
n	…………				✔			

02 Basic in English

Chapter	Contents / Objectives	Understand ... (1)	Explain .... (2)	⋮ (:)	.... (n)	Check Results		
						Correct	Incorrect	Suggestion
Lecture								
1	Introduction							
	1.1	✓						
.....	....		✓					
n	....			✓				

… ……………………….

… ……………………….

… ……………………….

31 Pharmaceutical Development in Community Project

Chapter	Contents / Objectives	Understand ... (1)	Explain .... (2)	⋮ (:)	.... (n)	Check Results		
						Correct	Incorrect	Suggestion
Trainee								
1	Introduction							
	1.1	✓						
	....	✓						
.....	....		✓					
n	....			✓				

APPENDIX B

EXPERT'S CHECK FORM II: THE ANALYSIS OF ALIGNMENT BETWEEN
OBJECTIVES AND LEVEL OF COMPETENCE, PROFESSIONAL COMPETENCE AND
PHARMACY TECHNICIAN COMPETENCE (ENGLISH)

(Example)

EXPERT'S CHECK FORM II

The Analysis of Alignment between Objectives and Level of Competence,

Professional Competence and Pharmacy Technician Competence

Topic: An Analysis of Diploma of Public Health Program (Technical Pharmacy)

Based on Professional Competence

Definition of Terms:

1. Level of competence was a framework for assessing clinical competence including four levels as followed.

- "Knows" level (K) focused on the recall of facts, principles, and theories.

- "Knows how" level (KH) emphasized the ability to solve problems and to describe procedures.

- "Shows how" level (SH) usually involved human, mechanical, or computer simulations that required demonstration of skills in a controlled setting.

- "Does" level (D) called for real practice.

2. Professional competence composed of five domains as followed.

- Meta-competence (M) included communication, self-development, creativity, analysis and problem solving.

- Knowledge/cognitive competence (KC) was defined as the possession of appropriate work-related knowledge and the ability to put this into effective use.

- Functional competence (F) was identified as the ability to perform a range of work-based tasks effectively to produce specific outcomes.

- Personal or behavioral competence (P) was defined as the ability to adopt appropriate, observable behaviors in work-related situations.

- Values/ethical competence (VE) was defined as the possession of appropriate personal and professional values and the ability to make sound judgments based upon these in work-related situations.

3. Pharmacy technician competence included 4 domains of the pharmacy technician task as followed.

- Pharmacy service (S) included tasks about pharmacology, dispensing, and clinical pharmacy.

- Pharmaceutical production (P) was tasks which consisted of preparation of non-sterile and sterile products.

- Pharmaceutical inventory management (I) comprised procurement and purchase of pharmaceuticals as well as control of inventory.

- Public health pharmacy (H) included tasks about consumer protection and the other pharmacy roles in community.

Notice: Please check ✔ or ✖ in check results block that represent your correct about there analysis

No.	Objectives	Level of Competence												✔ or ✖	Correct	Professional Competence					✔ or ✖	Correct	Pharmacy Technician Competence				✔ or ✖	Correct
		Lecture				Practice				Trainee						M	KC	F	P	VE			S	P	I	H		
		K	KH	SH	D	K	KH	SH	D	K	KH	SH	D															
01 Thai for Communication																												
1	Understand …….	✔						✔								✔												
2	Explain …………		✔					✔								✔												
3	…………………		✔					✔								✔												
….	…………………		✔					✔								✔												
….	…………………	✔						✔								✔												
02 Basic in English																												
….	…………………		✔					✔								✔												
….	…………………		✔					✔								✔												
03 Life, Society and Environment																												
….	…………………		✔															✔										
….	…………………		✔															✔										
04 Science and Mathematics for Daily Life																												
…	…………………																											
…	…………………																											
30 Field Work II (Technical Pharmacy)																												
….	…………………										✔							✔					✔					
….	…………………												✔					✔	✔					✔	✔	✔	✔		
31 Pharmaceutical Development in Community Project																												
….	…………………												✔					✔									✔		
….	…………………												✔						✔								✔		
219	…………………												✔							✔							✔		
220	…………………												✔					✔									✔		

APPENDIX C

EXPERT'S CHECK FORM I: THE ANALYSIS OF ALIGNMENT BETWEEN
OBJECTIVES AND CONTENTS OF EACH SUBJECT (THAI)

(ตัวอย่าง)

แบบตรวจสำหรับผู้เชี่ยวชาญ ชุดที่ 1
การวิเคราะห์ความสอดคล้องระหว่างวัตถุประสงค์กับเนื้อหาของแต่ละรายวิชา

เรื่อง การวิเคราะห์หลักสูตรประกาศนียบัตรวิชาชีพชั้นสูงสาธารณสุขศาสตร์
(เทคนิคเภสัชกรรม) โดยใช้สมรรถนะเชิงวิชาชีพ

คำชี้แจง กรุณาทำเครื่องหมาย ✔ ในช่องผลการตรวจสอบว่าถูกต้องหรือไม่ถูกต้อง

01 วิชาภาษาไทยเพื่อการสื่อสาร

บทที่	วัตถุประสงค์ / เนื้อหา	เข้าใจ 1	อธิบาย 2	...... ⋮	...... n	ผลการตรวจสอบ ถูกต้อง	ไม่ถูกต้อง	ข้อเสนอแนะ
ภาคทฤษฎี								
1	หลักการเบื้องต้น							
	1.1	✔						
	....	✔						
	1.n		✔					
2	....							
	2.1		✔					
	....			✔				
ฝึกทดลอง								
.....	....				✔			
n	....				✔			

02 วิชาภาษาอังกฤษพื้นฐาน

บทที่	วัตถุประสงค์ / เนื้อหา	เข้าใจ	อธิบาย	....	....	ผลการตรวจสอบ		
		1	2	:	n	ถูกต้อง	ไม่ถูกต้อง	ข้อเสนอแนะ
ภาคทฤษฎี								
1	บทนำ							
	1.1 ……	✓						
…..	…………		✓					
n	…………			✓				

… ……………………….

… …………………….

… ……………………..

31 วิชาโครงการพัฒนาด้านเภสัชกรรมในชุมชน

บทที่	วัตถุประสงค์ / เนื้อหา	เข้าใจ	อธิบาย	....	....	ผลการตรวจสอบ		
		1	2	:	n	ถูกต้อง	ไม่ถูกต้อง	ข้อเสนอแนะ
ฝึกงาน								
1	บทนำ							
	1.1 ……	✓						
	…………	✓						
…..	…………		✓					
n	…………			✓				

APPENDIX D

EXPERT'S CHECK FORM II: THE ANALYSIS OF ALIGNMENT BETWEEN
OBJECTIVES AND LEVEL OF COMPETENCE, PROFESSIONAL COMPETENCE AND
PHARMACY TECHNICIAN COMPETENCE (THAI)

(ตัวอย่าง)

แบบตรวจสำหรับผู้เชี่ยวชาญ ชุดที่ 2
การวิเคราะห์ความสอดคล้องระหว่างวัตถุประสงค์กับระดับของสมรรถนะ
สมรรถนะเชิงวิชาชีพ และสมรรถนะของเจ้าพนักงานเภสัชกรรม

เรื่อง การวิเคราะห์หลักสูตรประกาศนียบัตรวิชาชีพชั้นสูงสาธารณสุขศาสตร์
(เทคนิคเภสัชกรรม) โดยใช้สมรรถนะเชิงวิชาชีพ

นิยามศัพท์

1. Level of competence was a framework for assessing clinical competence including four levels as followed.

- "Knows" level (K) focused on the recall of facts, principles, and theories.

- "Knows how" level (KH) emphasized the ability to solve problems and to describe procedures.

- "Shows how" level (SH) usually involved human, mechanical, or computer simulations that required demonstration of skills in a controlled setting.

- "Does" level (D) called for real practice.

2. Professional competence composed of five domains as followed.

- Meta-competence (M) included communication, self-development, creativity, analysis and problem solving.

- Knowledge/cognitive competence (KC) was defined as the possession of appropriate work-related knowledge and the ability to put this into effective use.

- Functional competence (F) was identified as the ability to perform a range of work-based tasks effectively to produce specific outcomes.

- Personal or behavioral competence (P) was defined as the ability to adopt appropriate, observable behaviors in work-related situations.

- Values/ethical competence (VE) was defined as the possession of appropriate personal and professional values and the ability to make sound judgments based upon these in work-related situations.

3. Pharmacy technician competence included 4 domains of the pharmacy technician task as followed.

- Pharmacy service (S) included tasks about pharmacology, dispensing, and clinical pharmacy.

- Pharmaceutical production (P) was tasks which consisted of preparation of non-sterile and sterile products.

- Pharmaceutical inventory management (I) comprised procurement and purchase of pharmaceuticals as well as control of inventory.

- Public health pharmacy (H) included tasks about consumer protection and the other pharmacy roles in community.

คำชี้แจง กรุณาทำเครื่องหมาย ✓ หรือ ✗ ลงในช่องผลการตรวจสอบ

ข้อ	วัตถุประสงค์	ระดับของสมรรถนะ												✓ หรือ ✗	แก้ เป็น	สมรรถนะเชิงวิชาชีพ					✓ หรือ ✗	แก้ เป็น	สมรรถนะของ เจ้าพนักงานเภสัชกรรม				✓ หรือ ✗	แก้ เป็น
		ภาคทฤษฎี				ฝึกทดลอง				ฝึกงาน																			
		K	KH	SH	D	K	KH	SH	D	K	KH	SH	D			M	KC	F	P	VE			S	P	I	H		
01 วิชาภาษาไทยเพื่อการสื่อสาร																												
1	เข้าใจ	✓		✓												✓												
2	อธิบาย		✓	✓												✓												
3	....		✓	✓												✓												
....	....		✓	✓												✓												
....	....	✓		✓												✓												
02 วิชาภาษาอังกฤษพื้นฐาน																												
....	....		✓	✓												✓												
....	....		✓	✓												✓												
03 วิชาชีวิต สังคม และสิ่งแวดล้อม																												
....	....		✓														✓											
....	....		✓														✓											
04 วิชาวิทยาศาสตร์และคณิตศาสตร์ในชีวิตประจำวัน																												
...	....																											
...	....																											
30 วิชาการฝึกปฏิบัติงานภาคสนาม 2 (เทคนิคเภสัชกรรม)																												
....	....						✓											✓					✓					
....	....								✓									✓	✓					✓	✓	✓	✓	
31 วิชาโครงการพัฒนาด้านเภสัชกรรมในชุมชน																												
....	....											✓						✓									✓	
....	....											✓							✓								✓	
219	....											✓								✓							✓	
220	....											✓						✓									✓	

APPENDIX E

CATEGORY INDEX OF COMPETENCE LEVEL

Category Index of Competence Level

Level of Competence	Lecture	Lab	Practice
Knows	เข้าใจ, ตระหนัก, บอก, มีจรรยาบรรณ, ระบุ, เห็นความสำคัญ	เข้าใจ, บอก	-
Knows How	กำหนด, เก็บรักษา, เขียน, ควบคุม, คำนวณ, จัดทำ, จัดและจ่าย, จัดหมวดหมู่, จำแนก, ใช้, ดำเนินการ, ตรวจหา, เตรียมการเพื่อการผลิต, เตรียมยา, นำความรู้..มาใช้, บันทึก, บำรุงรักษา, ปฏิบัติ, ผลิต, พูด, ฟัง, สร้าง, สรุป, สอบสวนโรค, สืบค้น, สื่อสาร, แสดงความสัมพันธ์, ให้บริการ, อธิบาย, ออกแบบ, อ่าน	อธิบาย	อธิบาย
Shows How	แก้ปัญหา, นำเสนอ, แนะนำ, ประเมินผล, แปลผล, เผยแพร่, เลือก, วางแผน, วิเคราะห์, วินิจฉัยโรค	เก็บรักษา, เขียน, ควบคุม, คำนวณ, จัดทำ, จัดและจ่าย, จำแนก, ใช้, ดำเนินการ, ตรวจสอบ, ตรวจหา, ตระหนัก, เตรียมการเพื่อการผลิต, เตรียมยา, นำความรู้..มาใช้, แนะนำ, บันทึก, บำรุงรักษา, ปฏิบัติ, ประเมินผล, ผลิต, พูด, ฟัง, มีการพัฒนาพฤติกรรม, เลือก, วางแผน, วิเคราะห์, วินิจฉัยโรค, สร้าง, สรุป, สอบสวนโรค, สืบค้น, สื่อสาร, แสดงความสัมพันธ์, เห็นความสำคัญ, ออกแบบ, อ่าน	-
Does	-	-	แก้ปัญหา, เขียน, ใช้, ดำเนินการ, นำเสนอ, ปฏิบัติ, ประเมินผล, วางแผน, สรุป, แสดงพฤติกรรม
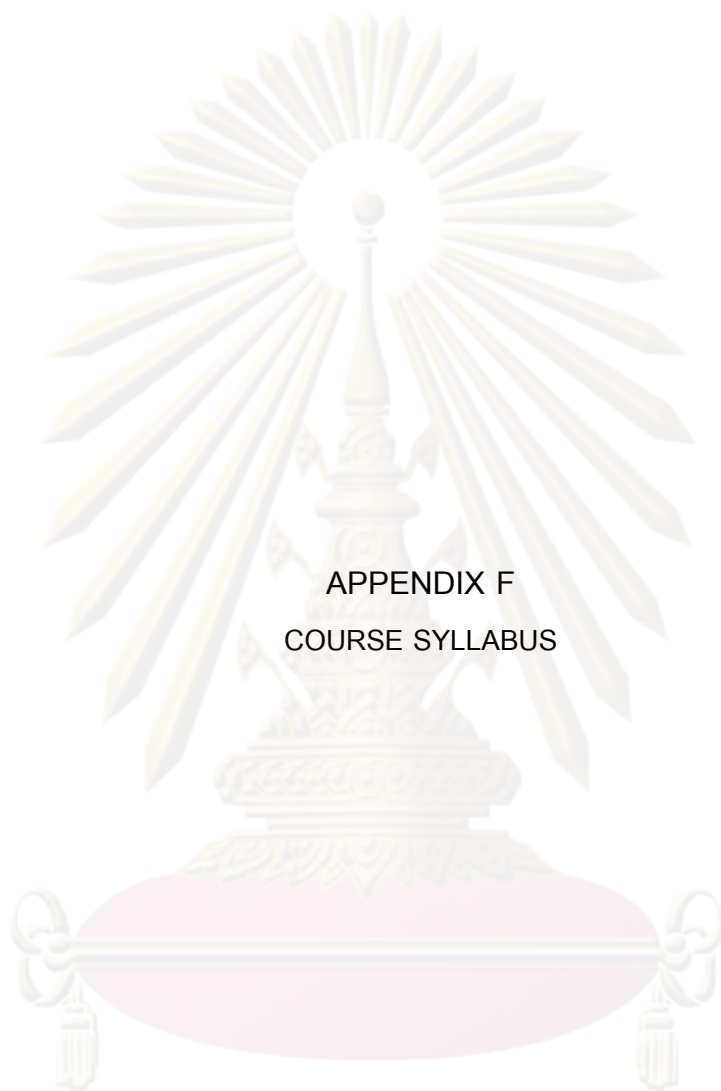
APPENDIX F

COURSE SYLLABUS

(ตัวอย่าง)

หมวดวิชา	**วิชาชีพสาขางาน**
	(Technical Pharmacy Course)
หน่วยบูรณาการ (Theme) 2	**เภสัชกรรมบริการ**
	(Pharmaceutical Service)
รหัสวิชา	0513 224
ชุดวิชา (Module) 5	**งานบริการเภสัชกรรม**
	(Pharmacy Service)
หน่วยกิต	3(2-2-5)

ลักษณะวิชา

       ศึกษาระบบบริการเภสัชกรรมของโรงพยาบาล การอ่านใบสั่งยา การจำแนกยาและเวชภัณฑ์ที่มิใช่ยา การจัดและจ่ายยาตามใบสั่งยา การคำนวณขนาดและปริมาณยาตามใบสั่งยา การเขียนฉลากยา และการเลือกใช้ฉลากยา การให้คำแนะนำเบื้องต้นในการใช้ยาและยาเทคนิคพิเศษ องค์ประกอบที่มีผลต่อความผิดพลาดในการจัดและจ่ายยาตามใบสั่งยาและแนวทางแก้ไข

       ฝึกทดลองเกี่ยวกับการอ่านใบสั่งยา คำนวณขนาดยาและปริมาณยาตามใบสั่งยา เขียนฉลากยา การให้คำแนะนำเบื้องต้นในการใช้ยา ตลอดจนการให้คำแนะนำการใช้ยารูปแบบพิเศษตามใบสั่งยา

วัตถุประสงค์การเรียนรู้ เมื่อเสร็จสิ้นการศึกษาในวิชานี้แล้วผู้เรียนสามารถ

1. เข้าใจระบบบริการเภสัชกรรมของโรงพยาบาล

2. จำแนกยา วัสดุทางการแพทย์ และเวชภัณฑ์ที่มิใช่ยาได้

3. ระบุองค์ประกอบที่มีผลต่อความผิดพลาดในการจัดและจ่ายยาตามใบสั่งแพทย์และแนวทางแก้ไขได้

4. ตระหนักถึงความสำคัญของงานบริการเภสัชกรรมเพื่อให้เกิดประโยชน์สูงสุดต่อผู้ป่วย

5. ตระหนักถึงความสำคัญของการพัฒนาและรับรองคุณภาพโรงพยาบาล

6. อ่านใบสั่งยา คำนวณขนาดยา และปริมาณตามใบสั่งยาได้

7. เขียนฉลากยา และเลือกใช้ฉลากช่วยได้

8. จัดและจ่ายยา วัสดุการแพทย์ และเวชภัณฑ์ที่มิใช่ยาได้

9. ให้คำแนะนำเบื้องต้นในการใช้ยา และยาเทคนิคพิเศษได้

สมรรถนะ เมื่อเสร็จสิ้นการศึกษาในวิชานี้ ผู้เรียนจะเกิดสมรรถนะ

1. มีความรู้และเข้าใจในรายวิชางานบริการเภสัชกรรม
2. นำองค์ความรู้ที่ได้รับจากการศึกษาและปฏิบัติในรายวิชามาใช้ในการปฏิบัติงานในห้องยาได้

เนื้อหา

บทที่ 1 งานบริการผู้ป่วยนอกและงานบริการผู้ป่วยใน   6 ชั่วโมง

      1.1 ขอบเขต ความสำคัญ และขั้นตอนของงานบริการเภสัชกรรม

      1.2 บทบาทหน้าที่เจ้าพนักงานเภสัชกรรมในงานบริการเภสัชกรรม

      1.3 ระบบการกระจายยาภายในโรงพยาบาล

      1.4 ตัวบ่งชี้คุณภาพงานบริการเภสัชกรรม

บทที่ 2 ใบสั่งยา   8 ชั่วโมง

    ความหมายของใบสั่งยา

    ส่วนประกอบของใบสั่งยา

    คำย่อ และภาษาละตินที่ใช้ในใบสั่งยา

    มาตราของน้ำหนักและปริมาตรที่ใช้ในการเขียนใบสั่งยา

    การอ่านและการแปลใบสั่งยา

    การคำนวณขนาดยา และปริมาณยาตามใบสั่งยา

บทที่ 3 การเขียนฉลากยา   4 ชั่วโมง

      3.1 ความหมายของฉลากยา

      3.2 ส่วนประกอบของฉลากยา

      3.3 ความหมายของฉลากช่วย

      3.4 การเลือกใช้ฉลากช่วย

บทที่ 4 การจำแนกยา วัสดุทางการแพทย์ และเวชภัณฑ์ที่มิใช่ยา   4 ชั่วโมง

      4.1 ความหมายของยา วัสดุทางการแพทย์ และเวชภัณฑ์ที่มิใช่ยา

      4.2 ประโยชน์ของวัสดุทางการแพทย์ และเวชภัณฑ์ที่มิใช่ยา

      4.3 วัสดุทางการแพทย์ และเวชภัณฑ์ที่มิใช่ยาที่มีในห้องยา

      4.4 การจำแนกยา วัสดุทางการแพทย์ และเวชภัณฑ์ที่มิใช่ยา

บทที่ 5 การให้คำแนะนำ ณ จุดจ่ายยา   2 ชั่วโมง

    ขั้นตอนการจ่ายยา

    เทคนิคที่ใช้ในการจ่ายยา

บทที่ 6 การให้คำแนะนำการใช้ยาเทคนิคพิเศษ   **4 ชั่วโมง**

บทที่ 7 การพัฒนาและรับรองคุณภาพโรงพยาบาล   **4 ชั่วโมง**

     7.1 ความหมายของการพัฒนาและรับรองคุณภาพโรงพยาบาล

     7.2 วัตถุประสงค์ของการพัฒนาและรับรองคุณภาพโรงพยาบาล

     7.3 หลักการสำคัญในการพัฒนาและรับรองคุณภาพโรงพยาบาล

     7.4 เป้าหมายของการพัฒนาและรับรองคุณภาพโรงพยาบาล

     7.5 ความเกี่ยวข้องของการพัฒนารับรองคุณภาพโรงพยาบาลกับงานบริการเภสัชกรรม

     7.6 ประโยชน์ของการพัฒนาและรับรองคุณภาพโรงพยาบาล

บทที่ 8 ความคลาดเคลื่อนทางยา   **4 ชั่วโมง**

     8.1 ความหมายของความคลาดเคลื่อนทางยา

     8.2 ประเภทและสาเหตุของความคลาดเคลื่อนด้านการจ่ายยา

     8.3 แนวทางการแก้ไขความคลาดเคลื่อนด้านการจ่ายยา

     8.4 การบันทึกความคลาดเคลื่อนด้านการจ่ายยา

     8.5 ประโยชน์ของการบันทึกความคลาดเคลื่อนด้านการจ่ายยา

ฝึกทดลอง   **36 ชั่วโมง**

1-2   การอ่านใบสั่งยา การคำนวณขนาดยา และปริมาณยาตามใบสั่งยา

3   การเขียนฉลากยา

4-5   การจำแนกยา

6-7   การจำแนกวัสดุทางการแพทย์ และเวชภัณฑ์ที่มิใช่ยา

8   การจัดยา

9-14   การให้คำแนะนำการใช้ยาและการปฏิบัติตัว

15-16   คำแนะนำในการใช้ยาเทคนิคพิเศษ

17-18   เสริมสร้างทักษะด้านงานบริการเภสัชกรรม

การจัดการเรียนรู้ การวัดและประเมินผล

มโนทัศน์หลัก	กิจกรรมการเรียนรู้	การวัดและประเมินผล
บทที่ 1 งานบริการผู้ป่วยนอกและงานบริการผู้ป่วยใน	- บรรยายแบบมีส่วนร่วม - กิจกรรมกลุ่ม บทบาทสมมติ (Role play)	- การมีส่วนร่วมจัดกิจกรรมการเรียนการสอน - ประเมิลผลจากใบงาน - ทดสอบ

มโนทัศน์หลัก	กิจกรรมการเรียนรู้	การวัดและประเมินผล
บทที่ 2 ใบสั่งยา	- บรรยายแบบมีส่วนร่วม - ฝึกทดลอง	- การมีส่วนร่วมจัดกิจกรรม การเรียนการสอน - ทดสอบ
บทที่ 3 การเขียนฉลากยา	- บรรยายแบบมีส่วนร่วม - ฝึกทดลอง	- การมีส่วนร่วมจัดกิจกรรม การเรียนการสอน - ประเมิลผลจากใบงาน - ทดสอบ
บทที่ 4 การจำแนกยา วัสดุทางการแพทย์ และเวชภัณฑ์ที่มิใช่ยา	- บรรยายแบบมีส่วนร่วม - ฝึกทดลอง	- การมีส่วนร่วมจัดกิจกรรม การเรียนการสอน - ทดสอบ
บทที่ 5 การให้คำแนะนำ ณ จุดจ่ายยา	- บรรยายแบบมีส่วนร่วม - ฝึกทดลอง	- การมีส่วนร่วมจัดกิจกรรม การเรียนการสอน - ทดสอบ
บทที่ 6 การให้คำแนะนำการใช้ยาเทคนิคพิเศษ	- บรรยายแบบมีส่วนร่วม - ฝึกทดลอง	- การมีส่วนร่วมจัดกิจกรรม การเรียนการสอน - ทดสอบ
บทที่ 7 การพัฒนาและรับรองคุณภาพโรงพยาบาล	- บรรยายแบบมีส่วนร่วม	- การมีส่วนร่วมจัดกิจกรรม การเรียนการสอน - ทดสอบ
บทที่ 8 ความคลาดเคลื่อนทางยา	- บรรยายแบบมีส่วนร่วม	- การมีส่วนร่วมจัดกิจกรรม การเรียนการสอน - ทดสอบ

แหล่งการเรียนรู้

1. ห้องสมุด/สื่อสืบค้น
2. Websites
3. โรงพยาบาลชุมชน โรงพยาบาลทั่วไป และโรงพยาบาลศูนย์

สื่อการเรียนการสอน

1. เอกสารประกอบการสอน ตำรา วารสาร
2. วีดีทัศน์ ภาพประกอบ
3. ใบสั่งยา สำเนาใบสั่งยาที่มีลายมือแพทย์ ฉลากยา ซองยา เม็ดยา ยาเทคนิคพิเศษ ชนิดต่างๆ วัสดุทางการแพทย์ และเวชภัณฑ์ที่มิใช่ยา

การวัดและประเมินผล

1. ภาคทฤษฎี   50%
    1) คะแนนเก็บระหว่างภาค
        - การมีส่วนร่วมในชั้นเรียน
        - การประเมินใบงาน
    2) การสอบกลางภาคและปลายภาค
2. ภาคทดลอง   50%
    1) คะแนนเก็บระหว่างภาค
        - การมีส่วนร่วมในชั้นเรียน
        - การฝึกปฏิบัติ
        - ทดสอบก่อน-หลังเรียน
    2) การสอบปฏิบัติการปลายภาค

เอกสาร/หนังสืออ่านประกอบ

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