DEEP APPROACH TO LEARNING OF PHARMACY STUDENTS: A MULTILEVEL ANALYSIS

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วิธีการเรียนรู้แบบลุ่มลึกของนิสิตเภสัชศาสตร์ : การวิเคราะห์พหุระดับ

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วิธีการเรียนรู้แบบลุ่มลึกของนิสิตเภสัชศาสตร์เป็นสิ่งที่สำคัญมากเพราะจะช่วยให้นิสิตมีผลการเรียนที่ดีและมีคุณลักษณะที่เหมาะสมต่อวิชาชีพเภสัชกร การวิจัยนี้มีวัตถุประสงค์เพื่อประเมินระดับการเรียนรู้แบบลุ่มลึกของนิสิตเภสัชศาสตร์ หาปัจจัยทั้งระดับนิสิตและระดับวิชาที่ส่งผลต่อการเรียนรู้แบบลุ่มลึกของนิสิตเภสัชศาสตร์ และเพื่อตรวจสอบความตรงของโมเดลสมการเชิงโครงสร้างพหุระดับ กลุ่มตัวอย่างประกอบด้วยนิสิตเภสัชศาสตร์ จำนวน 536 คน จาก 67 วิชาของคณะเภสัชศาสตร์ จุฬาลงกรณ์มหาวิทยาลัยและมหาวิทยาลัยบูรพา โดยสุ่มนิสิต 8-12 คน ทำการประเมินแต่ละวิชา ในภาคต้นของปีการศึกษา 2559

ผลการวิจัยพบว่าค่าเฉลี่ยคะแนนรวมของการเรียนรู้แบบลุ่มลึกของนิสิตเภสัชศาสตร์มีค่าเท่ากับ 31.66 จากคะแนนเต็ม 50 คะแนน สิ่งนี้สามารถบ่งบอกว่าต้องเพิ่มระดับการเรียนรู้แบบลุ่มลึกของนิสิตเภสัชศาสตร์ โมเดลสมการเชิงโครงสร้างพหุระดับวิเคราะห์โดยใช้โปรแกรม M*plus* 7.4 ผลการวิเคราะห์พบว่า โมเดลสมมติฐานมีความสอดคล้องกับข้อมูลเชิงประจักษ์ โดยตัวแปรในระดับนิสิตและระดับวิชาสามารถร่วมกันอธิบายความแปรปรวนของวิธีการเรียนรู้แบบลุ่มลึกของนิสิตเภสัชศาสตร์ได้ร้อยละ 30.90 และ 42.20 ตามลำดับ ปัจจัยที่ส่งผลต่อการเรียนรู้แบบลุ่มลึกของนิสิตเภสัชศาสตร์มากที่สุดในระดับนิสิตคือ เป้าหมายแรงจูงใจที่มุ่งความรู้ ($\beta = .536^{**}$) และในระดับวิชาคือนวัตกรรมการเรียนรู้ภายในห้องเรียน ($\beta = .409^{**}$) ดังนั้นนักการศึกษาควรจะเพิ่มนวัตกรรมการสอน มอบหมายภาระในปริมาณที่เหมาะสม ให้ความชัดเจนเกี่ยวกับงานที่มอบหมาย และกระตุ้นให้นิสิตเป็นคนที่มุ่งมั่นต่อเป้าหมาย เพื่อช่วยเพิ่มการเรียนรู้อย่างลุ่มลึก

ภาควิชา	เภสัชศาสตร์สังคมและบริหาร	ลายมือชื่อนิสิต .....
สาขาวิชา	เภสัชศาสตร์สังคมและบริหาร	ลายมือชื่อ อ.ที่ปรึกษาหลัก .....
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KEYWORDS: DEEP APPROACH TO LEARNING / PHARMACY STUDENTS / MASTERY-APPROACH GOAL / TEACHING INNOVATION

CHAMIPA PHANUDULKITTI: DEEP APPROACH TO LEARNING OF PHARMACY STUDENTS: A MULTILEVEL ANALYSIS. ADVISOR: ASST. PROF. TANATTHA KITTISOPEE, Ph.D., CO-ADVISOR: ASST. PROF. PATTRAWADEE MAKMEE, Ph.D., 198 pp.

Deep approach to learning (DA) of pharmacy students is crucial because it can help to produce the students' academic performance and desirable professional outcomes. The objectives of this study were to assess the extent of students' deep approaches to learning of pharmacy students in Thailand, examine relationship of student-level factors and course-level factors with students' deep approach to learning, and validate the Multilevel Structural Equation Model. The participants consisted of 536 pharmacy students from 67 courses of Faculties of Pharmaceutical Sciences, Chulalongkorn University and Burapha University. Eight to twelve students were randomly selected to evaluate each learning course in the first semester of 2016 academic year. The results found that an average total score of deep approach to learning of the pharmacy students was 31.66 out of 50. This meant that there was a need to improve students' deep approach to learning. The Multilevel Structural Equation Model was analysed by M*plus* 7.4 program. Results indicated that the hypothesized model was consistent with the empirical data. These variables at student- and course-level accounted for variance of pharmacy students' DA about 30.90% and 42.20%, respectively. The highest influencers on the students' deep approach to learning were mastery approach goal (β = .536**) at student-level and innovation (β = .409**) at course-level. Therefore, educators should increase innovative teaching approaches, optimize students' workload, provide task orientation, and encourage students to be goal striving persons to facilitate deep learning.

Department:	Social and Administrative Pharmacy	Student's Signature	.....
		Advisor's Signature	.....
Field of Study:	Social and Administrative Pharmacy	Co-Advisor's Signature	.....
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Abbreviations

SAL	Student Approach to Learning	r	Pearson Product Moment Correlation Coefficient
DA	Deep Approach to Learning	CV	Coefficient of Variation
SA	Surface Approach to Learning	SK	Skewness
DM	Deep Motive	KU	Kurtosis
DS	Deep Strategy	b	Raw Factor Loading
SM	Surface Motive	β	Standardized Factor Loading
SS	Surface Strategy	SE	Standard Error
GEN	Gender	t	t-value
GPAX	Cumulative Grade Point Average	R^2	Coefficient of Determination
ACY	Academic Year	DE	Direct Effect
MAG	Mastery-Approach Goal	IE	Indirect Effect
PAG	Performance-Approach Goal	TE	Total Effect
PVG	Performance-Avoidance Goal	χ^2	Chi-Square
AAS	Appropriate Assessment	p	p-value
AWL	Appropriate Workload	df	degree of freedom
PER	Personalization	CFI	Comparative Fit Index
INN	Innovation	TLI	Tucker-Lewis Index
TOT	Task Orientation	RMSEA	Root Mean Squared Error of Approximation
COP	Cooperation	SRMR	Standardized Root Mean Squared Residual
IND	Individualization	W	Within level
M	Mean	B	Between level
SD	Standard Deviation		

CHAPTER 1 INTRODUCTION

1.1 Rationales and Backgrounds

There are certain reports presented about increasing number of pharmacists that their career markets currently are expanded. The needs of pharmacists in Thailand will increase in many pharmacy fields such as clinical and hospital pharmacy (Leelarasamee, 2012). This would occur in very near future particularly after Asian Economic Community (AEC) which has been in place since 2015. This is because healthcare services in Thailand have been recognized as "Medical Hub" or "Healthy Tour". Moreover, The Pharmacy Education Consortium of Thailand (2014) revealed that National Health Assembly of Thailand has expanded healthcare professionals workforces during 2014-2018. Pharmacists in Thailand, as such, will continuously enlarge.

Increasing of pharmacists in Thailand should come along with their appropriate qualifications, knowledge, and skills to provide good professional services to patients or customers because pharmacists play a vital role in health care system through their responsibilities for patient life, quality of life and well-being. Updating and maintaining knowledge and competencies are necessary for all pharmacists. Thus, pharmacists should pursue lifelong learning attributes by themselves and institution supports.

Nowadays, there are various requirements for pharmacy professional qualifications and standard competencies that have been settled because of updated healthcare knowledge and guidelines from time to time. The Accreditation Council for Pharmacy Education

(ACPE) emphasized on the "importance of the development of the student as a professional and lifelong learner" (Johnson, 2013). Many health disciplines in Australia have focused on reflective practice and lifelong learning to maintain practice competency (McKauge, Stupans, Owen, Ryan, & Woulfe, 2011). Pharmacy students are also guided to develop their critical reflection skills for deep understanding and insight into the continued learning and professional development required to maintain long-term health care expertise (McKauge et al., 2011). Professionalism in pharmacy students composes of five domains: (1) Reliability, Responsibility and accountability; (2) Lifelong Learning and Adaptability; (3) Relationships with others; (4) Upholding principles of integrity and respect; and (5) Citizenship and professional engagement (Kelley, Stanke, Rabi, Kuba, & Janke, 2011). The second domain which is "Lifelong Learning and Adaptability" will support maintaining long-term health care expertise.

Both specialized knowledge and skills and boarder skills such as critical judgment, rigorous and independent thinking, self-evaluation, and problem-solving skills are expected attributes of pharmacy graduates. The boarder skills, as such, can support the students to engage with lifelong learning, which is critical for pharmacists to meet future professional challenges (Smith et al., 2007).

To be able to produce such the good characteristics of pharmacists, academic educators should pay attention to learning and teaching processes. Many studies presented that students' approaches to learning (SAL) can affect the students' learning outcomes (J. B. Biggs, 1989; Hamilton & Tee, 2010; Tam, 1999). There are two types of students' approaches to learning, which are deep and surface approaches. The deep approach is

based on intrinsic motivation and prefers seeking meaning whereas the surface approach is based on extrinsic motivation and usually adopts rote learning (J. B. Biggs & Moore, 1993). Deep approach to learning will lead to desirable learning outcomes such as deep learning, independent learning, critical thinking, and other lifelong learning attributes (J. B. Biggs, 1989; Hamilton & Tee, 2010; Tam, 1999).

A couple of studies revealed a relationship between particular disciplines and type of students' approaches to learning that students in 'soft pure' sciences, qualitative knowledge, such as humanities and social sciences are more inclined to adopt a deep approach to learning whereas those in 'hard pure' sciences and applied sciences, learning facts, such as physics and chemistry are more likely to adopt a surface approach to learning (Parpala, Lindblom-Ylanne, Komulainen, Litmanen, & Hirsto, 2010; Varunki, Katajavuori, & Postareff, 2015). Pharmacy can be categorized into hard-applied science because it is a science-based profession and mostly focuses on competencies and abilities to apply theoretical ideas to professional contexts. Over 20 percent of students from faculties of pharmacy adopted a surface approach to learning (Parpala et al., 2010). Another study also showed that many pharmacy students were more likely to adopt rote learning, which is similar to surface approach to learning (Taylor & Harding, 2007).

Studies in pharmacy students' approaches to learning with hierarchical analysis in Asia including Thailand are scant. Thus, this study aimed to examine the extent to which Thai pharmacy students adopt deep approach to learning and factors from different

levels influencing the deep approach. Factors affecting the students' deep approach to learning can be from both student-level and course-level.

Achievement goal orientation was an obvious factor in student-level. It can be known as motive-as-goals or goal orientation which can push individual toward actions and all actions are directed by the goals students set for (Covington, 2000; Was, 2006). Certain researchers agreed that achievement goal orientation, particularly mastery-approach goal, had a directly positive impact on deep approach to learning (Poondej, 2014; Yerdelen Damar & Aydın, 2015).

Course-level factors that can influence the students to adopt deep approach to learning were appropriate assessment, appropriate workload, and learning environment covering personalization, innovation, task orientation, cooperation, and individualization. All course-level factors had positive influences on the students' deep approach to learning (Dart et al., 1999; David Gijbels & Dochy, 2006; David Gijbels, Segers, & Struyf, 2008; Lizzio, Wilson, & Simons, 2002; Poondej, 2014; Tiwari et al., 2006; Trigwell & Prosser, 1991; Varunki et al., 2015; Warburton, 2003).

1.2 Research Questions

1. To what extent Thai pharmacy students adopt deep approach to learning?
2. Did achievement goal orientation, appropriate assessment, appropriate workload, and learning environment affect pharmacy students' deep approach to learning?

1.3 Purpose of the Study

1. To assess the extent of pharmacy students' deep approach to learning.
2. To examine achievement goal orientation, appropriate assessment, appropriate workload, and learning environment affected the students' deep approach to learning.
3. To validate a Multilevel Structural Equation Model of the student-level factors and course-level factors affecting the students' deep approach to learning.

1.4 Scope of Study

Population in this study were Thai pharmacy students studying in 2nd to 5th year in semester of 1, 2016. They were selected from two universities in Thailand, which are Chulalongkorn University and Burapha University. Majority of the 1st year pharmacy students' courses were general basic sciences and belongs to faculty of sciences. The 6th year pharmacy students went for their professional clerkships. Therefore, the 1st and 6th year pharmacy students were not included into the study.

1.5 Significance of the Study

It is obvious that contents of many pharmacy courses are complex and meticulous. Students, therefore, must pay attention and make high efforts for their learning. Students would benefit from adopting a suitable approach to learning as they can clearly understand the course contents and be able to apply them in the real situation. Hence, knowing the extent of pharmacy students' deep approach to learning and understanding the factors affecting it, both in student-level and course-level, are valuable for academic educators in order to design and improve their teaching contexts to be more effective. These finding can suggest some practical guidelines to encourage pharmacy students to adopt deeper approaches, in turn, strengthen their academic performance and desirable professional outcomes.

CHAPTER 2 LITERATURE REVIEW

This chapter was intended to provide all relevant aspects of this study. They were presented in sequence as listed.

1. Pharmacy Education in Thailand
2. Students' Approaches to Learning
3. The 3-P Model of Learning
4. Types of Students' Approaches to Learning
5. Measurement od Students' Approaches to Learning
6. Factors Influencing Deep Approach to Learning
7. Multilevel Analysis and Multilevel Structural Equation Modeling Analysis
8. Conceptual Framework

Pharmacists are ones of crucial members in a healthcare professional team since their roles are very important to patients' lives. Therefore, they should always obtain and maintain appropriate knowledge, skills, and competencies in order to provide the best services to patients. However, healthcare sciences and technologies are currently more complex and faster updated. To provide best services with high standard, pharmacists should pursue critical thinking, reflective thinking, and especially lifelong learning attributes. Lifelong learning can be defined as the habit of continuously learning throughout the lifespan (Pan, 1997; C.-Y. Wang, 1997). Many researchers revealed that lifelong learning is a relatively new construct in higher education and widely accepted as one goal of higher education (J. C. Chen, McGaughey, & Lord, 2012). For pharmacy education, various studies supported that desirable learning outcomes such as professional, reflective practice, critical skills for deep understanding and lifelong learning are important for pharmacy student development (Johnson, 2013; McKauge et al., 2011). In Thailand, Center for Continuing Pharmacy Education (C.C.P.E.) for cooperating and facilitating pharmacists' continuing education has been established since 20 June 2015 by pharmacy council of Thailand. The continuing education has been mandatory for all registered pharmacists because pharmacy knowledge and information are always updated ("Continuing Education is the new context for Thai pharmacists," 2015). The desirable learning outcomes were found a positive relationship with students' deep approach to learning (Barros, Monteiro, Nejmedinne, & Moreira, 2013; J. B. Biggs, 1989). Deep approach to learning and their desirable learning outcomes can be enhanced by students themselves and academic providers. Certain studies emphasized that it is important for universities, institutions, and faculties to build the national capacity for lifelong learning and offer a range of such

opportunities to their students for being in fast learning societies (Chapman & Aspin, 1997; Kuit & Fildes, 2014).

This study was intended to assess deep approach to learning of Thai pharmacy students and to examine factors from both student-level and course-level influencing the deep approach so that educators can properly develop their teaching methods and relevant teaching aspects to enhance the students' deep approach to learning. The following sessions will be mentioned on pharmacy education in Thailand, students' approaches to learning, the 3-P model of learning, types of students' approaches to learning, measurement of students' approaches to learning, factors influencing deep approach to learning, multilevel analysis and multilevel structural equation model analysis, and conceptual framework.

2.1 Pharmacy Education in Thailand

Curriculum of Pharmacy education in Thailand was changed from bachelor of pharmacy (5 years) to Doctoral of pharmacy (Pharm.D.; 6 years) in 2008 (The Pharmacy Education Consortium of Thailand, 2014). There are two main major curriculum, Pharmaceutical Sciences and Pharmaceutical care. At the present time, there are totally 19 Pharmacy schools in Thailand, which are Chulalongkorn, ChaingMai, Mahidol, Songkla, KhonKaen, Silapakorn, Naresuan, Ubonratchatani, Srinakarinwirot, Mahasarakham, Walailuk, Payow, Burapha, Thammasart, Rangsit, Hawchew, Payab, Siam, and Eastern Asia (The Pharmacy Education Consortium of Thailand, 2014).

2.2 Students' Approaches to Learning (SAL)

Learning approaches were originally coined by Marton and Saljo in 1976. They were categorized into two main approaches, deep and surface (Tsingos, Bosnic-Anticevich, & Smith, 2015). Approaches to learning measure the relationship between a student's conscious and "intentional" approach to a learning task and the subsequent understanding of learning content and context, which is a response to the educational environment. This level of understanding and mastery is a direct outcome of a chosen approach to learning. Learning approach refers to methods in which a student prefers to approach a learning task (Tsingos et al., 2015). Moreover, learning approaches are primarily associated with a level of understanding, rather than the way in which a student grasps or processes information for understanding. A research perspective in the students' approaches to learning (SAL) was originated in Europe and Australia with the aim of understanding how students set about their learning tasks. The students' approaches to learning (SAL) comprise both a motive (why they learn) and a related learning strategy (what they do). Both of them were sensitive to contextual and personological factors and generally influenced learning outcomes (Justicia, Pichardo, Cano, Berbén, & Fuente, 2008). This is consistent with J. Biggs (2003) and Tam (1999)' studies, which concluded that learning is a system process engaging exchanges between both the instructor and the student and this interaction with the student approaches to learning will influence learning outcomes.

2.3 The 3-P Model of Learning

This study used Biggs' 3P model of learning as a guideline for the study's theoretical framework (see Figure 2.1). It can be seen that there were three main components of the learning model, which are presage, process, and product (J. Biggs, Kember, & Leung, 2001; Tam, 1999) .

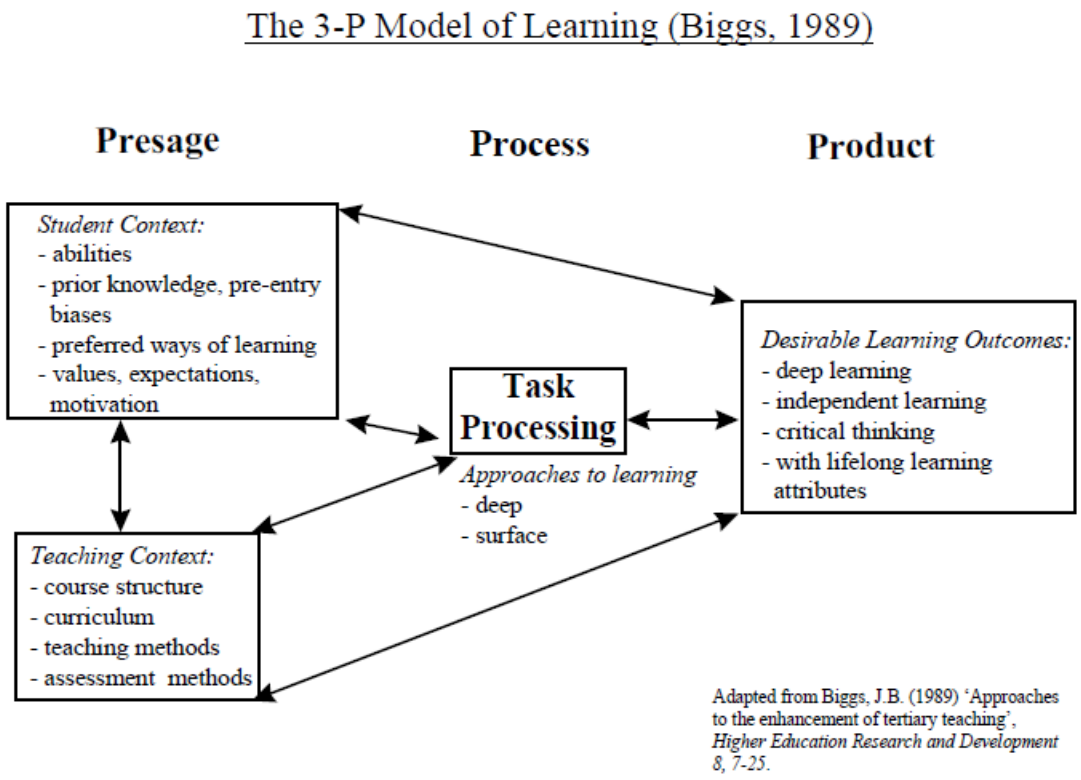


Figure 2.1 The 3-P Model of Learning
Source: Tam (1999)

Presage factors compose of student factors and teaching context factors. Student factors (personal learning influences) include prior-knowledge, abilities, intelligence, personality, home background, values, expectation, and ways of learning. Teaching context factors (learning environment) comprise groups' instructional mode, subject area, course structure, learning tasks, curriculum content, methods of teaching, and assessment. Process factors are approaches to learning students adopted towards their

learning. These can be separated into two main approaches, surface and deep. Product factors or learning outcomes may be different among students as they might adopt different approaches to learning. The learning outcomes can be seen as academic achievement and attributes of learning skills, for examples. (Hamilton & Tee, 2010; Tam, 1999).

2.4 Types of Students' Approaches to Learning

J. B. Biggs and Moore (1993) classified the students' approaches to learning into three approaches, which were surface, deep, and achieving or strategic approaches. The surface approach is based on extrinsic motivation and usually adopts rote learning whereas the deep approach is based on intrinsic motivation and prefers seeking meaning. The achieving approach can take place through either deep or surface processing depending on demands of context. It is like the surface approach in term of focusing on high grades and winning prizes. Students with this approach usually consider on their effort management and organized studying (J. B. Biggs & Moore, 1993; D. Gijbels, Van de Watering, Dochy, & Van den Bossche, 2005; Mattick, Dennis, & Bligh, 2004). Currently, most researchers focused only on surface and deep approaches as they proved that these two approaches are more appropriate in term of their conciseness and convenience (Halawi, McCarthy, & Moughalu, 2009).

2.4.1. Deep Approach to Learning

J. B. Biggs and Moore (1993) suggested that the deep motive is based on intrinsic motivation or more particularly, interest. Students with high interest always try to seek

meaning and plug into the content of the task. Warburton (2003) confirmed that deep learning is internally motivated and is associated with an intention to understand, rather than to simply pass a task. Students with deep approach to learning will seek underlying meaning and work in depth with the task in order to get a better understanding (Barros et al., 2013; Parpala et al., 2010; Salamonson, Attwood, Everett, Weaver, & Glew, 2013; Tam, 1999; Trigwell & Prosser, 1991). Deep learning was also considered as a key element of sustainability education (Warburton, 2003).

The students adopted a deep approach can manage a great deal of relevant content knowledge, operate at a high level of conceptualization, employ optimal learning strategies, enjoy the process, and sacrifice their time and effort for learning tasks (J. B. Biggs & Moore, 1993). High level cognition abilities are used for deep motivated students, such as syntheses, analyses, comparisons and confrontations (Barros et al., 2013). There were effective strategies employed by the deep motivated students, which are reading widely, combining a variety of resources, discussion, reflection, relating parts to a whole, applying knowledge in real world situations, using cross-referencing, imaging reconstruction, and thinking independently (Salamonson et al., 2013; Tam, 1999; Warburton, 2003).

Many benefits and desirable academic outcomes from adopting deep approach to learning were good grades, performance, achievement and attributes (Elias, 2005; Rithilert & Kaemkate, 2013; Tam, 1999; Trigwell & Prosser, 1991). Some high quality learning outcomes were learning in depth, understanding, independent learning, critical and creative thinking, problem solving, and other lifelong learning attributes (Tam, 1999). Lifelong learning was considered as a desirable outcome of the deep approach

to learning. This was because deep approach to learning had a positive association with some characteristics of lifelong learners, especially concerning the establishing of goals and the self-direction of learning (Barros et al., 2013). Other scholars also highlighted in lifelong learning and even it is a relatively new construct in higher education; it is extensively considered (J. C. Chen et al., 2012). The deep approach to learning have been associated with reflective learning attributes, one of the main preferable outcomes (Tsingos et al., 2015). Reflection on self's learning provides a strategy to maximize learning in depth as it fosters students to critically think, analyze, and problem solve.

It is crucial to understand the complexities of these constructs, applications of use and limitations in pharmacy education because learning environment moves from a predominantly theoretical perspective to a clinical setting and student must integrate knowledge with on-site practice (Tsingos et al., 2015).

2.4.2 Surface Approach to Learning

Students adopting surface approach will intend to reproduce the material to be learnt and avoid failure through regurgitating information and using rote learning techniques (Tam, 1999). The students also concentrate on the text itself (Parpala et al., 2010). Other scholars also found that students with this approach tend to use rote learning for their course material so that they can then reproduce it with little understanding (Salamonson et al., 2013; Trigwell & Prosser, 1991). J. B. Biggs and Moore (1993) explained that the motive here is extrinsic. Reasons students carry out the tasks could be either positively or negatively reinforcing consequences. The students are willing to do the tasks and pass at minimal requirements to feel a sense of accomplishment or

to gain the tasks' qualification with minimal efforts. Rote learning strategy is mostly adopted for surface motivated students. This in turn will influence lower quality outcomes.

2.5 Measurement of Students' Approaches to Learning

There were certain standardized tools for measuring students' approaches to learning such as Approaches to Study Inventory (ASI), Approaches and Study Skill Inventory for Students (ASSIST), National Survey of Student Engagement (NSSE), Study Process Questionnaire (SPQ), and Revised Two-Factor Study Process Questionnaire (R-SPQ-2F).

Approaches to Study Inventory (ASI) was designed for use in higher education to measure three kinds of orientation (reproducing, meaning, and achieving). It contains 64 items for 16 subscales as shown in Appendix A (Laird & Shoup, 2005).

Approaches and Study Skill Inventory for Students (ASSIST) composes of 66 items from three sections which are conceptions of learning, approaches to learning, and preferences for teaching. In the second section, three main approaches (surface, deep, and strategic) to learning will be measured. Each main approach contain four different sub-scales as shown in Appendix B (Entwistle & McCune, 2013).

National Survey of Student Engagement (NSSE) is a worldwide student engagement annual survey of first-year and senior undergraduate students. It was found that there

were 12 NSSE items belong to categories of higher-order learning, integrative learning, and reflective learning indicating deep approaches to learning as shown in Appendix C. Although, the NSSE items are convenient to assess, they seem unlikely to replace other more in-depth instruments. Moreover, they can be used to measure the deep approach to learning at campus level, rather than a more focused setting such as a classroom (Laird & Shoup, 2005).

Study Process Questionnaire (SPQ) was originally designed in 1987 to use in tertiary education. It consists of 42 items, with three main approaches (deep, surface, and achieving) and six sub-scales that divide the core scales into motives and strategies as shown in Appendix D (Halawi et al., 2009; Laird & Shoup, 2005).

Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) was then developed to consist of only two approaches: Deep Approach (DA) and Surface Approach (SA) since there have been various changes in higher education. The student population in colleges and universities are now more heterogeneous, learning curricula have changed considerably. The R-SPQ-2F consists of 20 items measuring surface approach (SA) and deep approach (DA). These two main scales compose of motive and strategy subscales as shown in Appendix E (J. Biggs et al., 2001). Recently, many academic educators emphasis on didactic effectiveness and staff development and they suggested that a short version of SPQ would be useful. The R-SPQ-2F consists of 20 questions with two main scales: deep approach (DA) and surface approach (SA), and four sub-scales: Deep motive (DM), deep strategy (DS), Surface motive (SM), and Surface

strategy (SS). J. Biggs et al. (2001) summarize key concepts of those four sub-scales in Table 2.1.

Table 2.1 Summary of the four sub-scales

	Surface	**Deep**
Motive	Fear of failure	Intrinsic interest
Strategy	Narrow target, rote learn	Maximize meaning

Source: J. Biggs et al. (2001)

Deep motive, intrinsic interest, represents students show their intrinsic motivation while learning driven by their curiosity and interest. Deep strategy, maximize meaning, represents students utilize more meaningful strategies to learn such as making connections and coherent understanding. Surface motive, fear of failure, represents students possess extrinsic motivation to learn such as course grades or others' expectations. Surface strategy, narrow target and rote learn, represents students use more rote-like strategies (such as remembering or narrowing targets) to learn (Chiou, Liang, & Tsai, 2012).

Each of the four indicators contains five items as listed in Table 2.2. Responses are recorded on five-point Likert scale. Summing up the five constituent items gives scores for the four indicators, each ranging from five to 25 (see Appendix E). The higher scores indicate greater use of that approach to learning (Leung & Kember, 2003).

Table 2.2 Five items of each sub-scales

	Surface	**Deep**
Motive	My aim is to pass the course while doing as little work as possible.	I find that at times studying gives me a feeling of deep personal satisfaction.
	I do not find my course very interesting so I keep my work to the minimum.	I feel that virtually any topic can be highly interesting one I get into it.
	I find I can get by in most assessments by memorizing key sections rather than trying to understand them.	I find that studying academic topics can at times be as exciting as a good novel or movie.
	I find it is not helpful to study topics in depth. It confuses and wastes time, when all you need is a passing acquaintance with topics.	I work hard at my studies because I find the material interesting.
	I see no point in learning material which is not likely to be in the examination.	I come to most classes with questions in mind that I want answering.
Strategy	I only study seriously what's given out in class or in the course outlines.	I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied.
	I learn something by rote, going over and over them until I know them by heart even if I do not understand them.	I find most new topics interesting and often spend extra time trying to obtain more information about them.
	I generally restrict my study to what is specifically set as I think it is unnecessary to do anything extra.	I test myself on important topics until I understand them completely.
	I believe that lecturers shouldn't expect students to spend significant amounts of time studying material everyone knows won't be examined.	I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.
	I find the best way to pass examinations is to try to remember answers to likely questions.	I make a point of looking at most of the suggested readings that go with the lectures.

Source: J. Biggs et al. (2001)

The revised two-factor study process questionnaire (R-SPQ-2F) developed by J. Biggs et al. (2001) was chosen over the others because its conciseness and convenience are suitable for college or university students. Moreover, it contains good reliability coefficient (Cronbach alpha value are 0.73 for DA and 0.64 for SA) and desirable goodness of fit with the intended two factors. The R-SPQ-2F was also translated into

Thai by Kusalanont (2006) presented in Appendix F. Its reliability coefficient (.805) was consistent with the accepted standard, .70 or higher (J.F. Hair, Black, Babin, & Anderson, 2013).

2.6 Factors Influencing Deep Approach to Learning (DA)

This study examined the effect of achievement goal orientation, appropriate assessment, appropriate workload, and learning environment on deep approach to learning. These factors can be classified into different levels. Achievement goal orientation was in student-level whereas appropriate assessment, appropriate workload, and learning environment were in course-level.

2.6.1 Student-Level Factors

There were many determinants at student-level that can influence students' deep approach to learning such as students' characteristics, demographic factors, motivation, self-regulation, goals, internal locus of control, self-efficacy, family support, interest, conceptions of learning, abilities, experiential background (Elias, 2005; Salamonson et al., 2013; Varunki et al., 2015)

In this study, some obvious student factors which also related to pharmacy contexts were selected to examine. Those factors are achievement goal orientation, gender, academic year, and cumulative grade point average as shown in Table 2.3.

Table 2.3 Synthesis Matrix of Student-Level Factors

	Gender	**Academic year**	**Cumulative Grade Point Average (GPAX)**	**Achievement Goal Orientation**	*. Mastery approach orientation*	*. Performance approach orientation*	*. Performance avoidance orientation*
Elias (2005)	✓	✓	✓				
Poondej (2014)	✓				✓	✓	✓ (-)
Rithilert and Kaemkate (2013)	✓	✓	✓	✓			
Salamonson et al. (2013)	✓						
Stes, De Maeyer, Gijbels, and Van Petegem (2013)	✓	✓					
Barros et al. (2013)				✓			
D. Gijbels et al. (2005)	✓						
Smith et al. (2007)	✓	✓					
Smith, Krass, Sainsbury, and Rose (2010)	✓	✓					
Covington (2000)					✓		
Kyndt, Dochy, Struyven, and Cascallar (2012)				✓			
Yerdelen Damar and Aydın (2015)					✓		✓ (-)
Varunki et al. (2015)				✓			
Lietz and Matthews (2009)			✓				

2.6.1.1 Achievement Goal Orientation (AGO)

Achievement goal orientation or goal orientation, in short, was another new term of motive-as-goals tradition (Covington, 2000; Was, 2006). It was developed by developmental, motivational, and educational psychologists to explain children's learning and performance on academic tasks and in school setting (Schunk, Pintrich, & Meece, 2010). Goals are defined as the end toward which effort is directed. It can be something that people attempts to accomplish. Covington (2000) also presented that motive-as-goals can push individual toward actions and all actions are directed by the

goals students set for. The role of goals was considered as a prominent feature in motivation theory (Was, 2006). Motivation refers to the process whereby goal-directed activity is instigated and sustained (Schunk et al., 2010). Motivation stands at center of education enterprise and it can effects all classroom activities by influencing learning behaviors and performance (Covington, 2000; Schunk et al., 2010). Achievement goal theory plays a vital role in educational research due to its high relevance to learning and instruction and the impact of goals on student performance (Schunk et al., 2010; Was, 2006). Poondej, Koul, and Sujivorakul (2013) also pointed that type of academic goals that a student employed is one of the most important variables in motivational research in educational contexts.

Types of Achievement Goal Orientation

According to Covington (2000), Was (2006) and Schunk et al. (2010), achievement goal orientation can be categorized into two main types, mastery goal orientation and performance goal orientation.

1. **Mastery goal orientation** (also referred as task-involved goals, task goals, learning goals, and task-focused goals)

Mastery goals refer to increasing one's competency, understanding, appreciation for what is being learned (Covington, 2000). Moreover, the mastery goal orientation was connected with focusing inwardly on learning, mastering tasks according to self-set standards or personal improvement, developing new skills, and trying to accomplish something challenging (Poondej et al., 2013; Schunk et al., 2010).

Mastery goal students persist longer on difficult tasks and are more likely to consider success and failure to internal controllable causes (Was, 2006). They are also more likely to show preference for challenge and academic risk taking. These findings are not limited to kindergarten to 12th grade students (k-12 students), but hold true for college students and adult populations as well (Was, 2006).

Mastery goal orientation can be separated to two categories, mastery approach and mastery avoidance (Kadıoğlu & Kondakci, 2014; Schunk et al., 2010; Was, 2006).

- **Mastery Approach**

  Mastery approach orientation leads one to attempt completing the task in order to increase knowledge.

- **Mastery Avoidance**

  Mastery avoidance orientation causes one to avoid an achievement task due to the sense that one is not capable of successfully completing the task. For example, perfectionists who set high standards for themselves will not consider about doing a task wrong because of comparisons with others, but rather because of their self-set high standards. This idea of the mastery avoidance awaits further theoretical and empirical supports (Schunk et al., 2010). This is consistent with Poondej et al. (2013)' study which presented that motivational goals have been measured in term of a three-dimensional model of mastery, performance approach and performance avoidance achievement goals orientation. Therefore, it will not be considered in this study.

2. **Performance goal orientation** (also referred as ego-involved goals, ability-focused goals, and self-enhancing goals)

Performance goals involve outperforming others (Covington, 2000). Students with performance goal orientation always concern about comparing their abilities and performance with others and more likely to attribute success and failure to more external factors (Was, 2006). This is consistent with Poondej et al. (2013)' study which presented that performance goals focus outwardly on regular outcomes such as grades, external evaluations, and comparisons. Some characteristics of performance goal oriented persons would be attempting to best others, using social comparative standards, striving to be the best in the group or class on a task, avoiding judgements of low ability or appearing stupid, and seeking public recognition of high performance levels (Schunk et al., 2010).

Performance goal orientation can be separated to two categories, performance approach and performance avoidance (Kadıoğlu & Kondakci, 2014; Schunk et al., 2010; Was, 2006)

- **Performance Approach**

  Performance-approach oriented students view themselves as having a good deal of ability and performance. They want to be seen as superior in ability compared to others.

- **Performance Avoidance**

  Performance avoidance oriented students view themselves as lacking ability and wishing to avoid public demonstrations of achievement that would confirm their

lack of ability (Was, 2006). Poondej et al. (2013) also confirmed that a student who endorses a performance avoidance goal wants to not appear inferior compared to others.

The summary of two goal orientations and their approach and avoidance forms was presented in Table 2.4 below.

Table 2.4 Two Goal Orientations and Their Approach and Avoidance Forms

	Approach Focus	**Avoidance Focus**
Mastery orientation	Focus on mastering task, learning, understanding	Focus on avoiding misunderstanding, avoiding not learning or not mastering task
	Use of standards of self-improvement, progress, deep understanding of task (learning goal, task goal, task-involved goal)	Use of standards of not being wrong, not doing it incorrectly relative to task
Performance orientation	Focus on being superior, besting others, being the smartest, best at task in comparison to others	Focus on avoiding inferiority, not looking stupid or dumb in comparison to others
	Use of normative standards such as getting best or highest grades, being top or best performer in class (performance goal, ego-involved goal, self-enhancing ego orientation, relative ability goal)	Use of normative standards of not getting worst grades, being lowest performer in class (performance goal, ego-involved goal, self-defeating ego orientation)

Source: Schunk et al. (2010, p. 189)

Relations of the AGO's Dimensions to Deep Approaches to Learning

Yerdelen Damar and Aydın (2015) investigated the relationships among students' approaches to learning science, perceptions of classroom learning environment, and achievement goals. The researcher revealed that learners' goal orientations play a role in their choice of learning approaches. A range of recent studies have demonstrated the positive consequences of adopting mastery goals and the negative consequences of adopting performance avoidance goals. Researchers found that mastery goal oriented students had more positive attitudes toward school and reported higher levels of self-efficacy than performance goal oriented ones (Poondej et al., 2013). Covington (2000) also mentioned that learning goals for deep-level and strategic processing of information can increase school achievement while performance goals induce rote-level and superficial processing, which would be a stultifying influence on achievement. It is obvious that achievement goals and motivation had a directly positive impact on deep learning processes (Kyndt et al., 2012; Rithilert & Kaemkate, 2013). This is consistent with Poondej (2014)' study, it was presented that students who have mastery-approach goal tend to adopt deep approach to learning. Another study supported that students' perceptions of classroom environment and mastery-approach goals affected positively their deep approaches to learning science (Yerdelen Damar & Aydın, 2015).

On the other hand, several researchers have examined the circumstances in which performance goal orientation leads to higher achievement. Poondej (2014) found that performance-approach goal orientation has a relationship with both deep approaches to learning and surface approaches to learning, whereas performance-avoidance goal

orientation has a relationship with surface approaches to learning. This is consistent with Yerdelen Damar and Aydın (2015)' study which presented that performance-approach, performance-avoidance and mastery-avoidance goals were positively associated with surface-approaches to learning science.

In pharmacy field, a study of Varunki et al. (2015) showed that first-year students' deep and strategy approaches to learning decreased, whereas surface approach increased during the course of Pharmaceutical Technology. Factors related to changes or stabilities in their deep approach during the course were motivation and goal.

Measurement of Achievement Goal Orientation

Elliot and Murayama (2008) developed Achievement Goal Questionnaire-Revised (AGQ-R, Appendix G) and it has been widely used. It was then developed by Ratsameemonthon (2015) to be more appropriate for Thai College Students and Asian Context (see Appendix H). It was also revised and translated by standardized processes.

2.6.1.2 Student Demographics

There are couple demographic factors affecting students' deep approach to learning, which are gender, academic year and cumulative grade point average (GPAX).

Gender

A researcher said that women are more likely to adopt deep approach to learning (Elias, 2005; Halawi et al., 2009; Salamonson et al., 2013) and found that men mostly preferred surface approach to learning.

Academic Year

Differences of academic year in undergraduate pharmacy program can affect to students' approaches to learning (Smith et al., 2007). This is consistent with Elias (2005) and Smith et al. (2010)' studies which presented that senior students employed the deep approach (meaning-directed approach) more often than did other students.

Cumulative Grade Point Average (GPAX)

Cumulative grade point average (GPAX) can be considered as students' abilities, which can influence learning approach (Lietz & Matthews, 2009). GPAX and expected course grade had a positive correlation with deep approach to learning (Elias, 2005; Rithilert & Kaemkate, 2013)

2.6.2 Course-Level Factors

Determinants at course-level that can influence pharmacy students' deep approach to learning are appropriate workload, appropriate assessment, and learning environment (Personalization, Innovation, Task Orientation, Cooperation, and Individualization) listed in Table 2.5.

Table 2.5 Synthesis Matrix of Determinants at Course-Level

	Appropriate Assessment	**Appropriate Workload**	**Learning Environment**	. *Personalization*	. *Innovation*	. *Task Orientation*	. *Cooperation*	. *Individualization*
Varunki et al. (2015)		✓						
Lizzio et al. (2002)	✓	✓				✓		
David Gijbels and Dochy (2006)	✓							
David Gijbels et al. (2008)	✓							
Salamonson et al. (2013)			✓					
Patria (2014)			✓					
Trigwell and Prosser (1991)			✓		✓	✓		
Smith et al. (2007)			✓					
Yerdelen Damar and Aydın (2015)			✓					
Dart et al. (1999)				✓			✓	✓
Tiwari et al. (2006)					✓			
Poondej (2014)							✓	
Cleave-Hogg and Rothman (1991)							✓	
Warburton (2003)								✓

2.6.2.1 Appropriate Assessment

Appropriate assessment is defined as appropriateness of the course assessment. It is also measured by the extent to which course depend on the recollection of factual knowledge for assessment purpose. Over-reliance on factual recall is generally considered to be inappropriate for assessment in higher education courses and indeed for many types of courses. David Gijbels and Dochy (2006) and David Gijbels et al. (2008) presented that one of the most salient contextual variables that influence students' approaches to learning is the assessment method. Students can shift between surface and deep approaches to suit the assessment demands of their courses. Lizzio et

al. (2002) also agreed that perceptions of inappropriate assessment influence students towards surface approaches to study. The strongest predictors of students using a deep approach to studying are their perceptions of the quality of the teaching and the appropriateness of the assessment.

According to Graduate Careers Australia (2013), appropriate assessment is one of the Course Experience Questionnaire (CEQ) scales. Three questions regarding to the appropriate assessment scales are listed below.

1) To do well in this course all you really needed was a good memory. *R ('reverse coded')*
2) The staff seemed more interested in testing what I had memorized than what I had understood. *R ('reverse coded')*
3) Too many staff asked me questions just about facts. *R ('reverse coded')*

These questions will be adapted into this study's questionnaire.

2.6.2.2 Appropriate Workload

Appropriate workload is defined as appropriate amount of workload or assignment involved in the course. It is also measured by the degree to which students felt the course workload was excessive. Many studies presented that course workload or demands of learning tasks is the major factor for making a decision on choosing approaches to learning (Yerdelen Damar & Aydın, 2015). Varunki et al. (2015) studied approaches to learning of first-year pharmacy students and factors related to changes or stabilities in their deep approach during the course, Pharmaceutical Technology. Their

study found that deep and strategy approach decreased, whereas surface approach increased during the course. One of the reasons was course's workload. This is consistent with Lizzio et al. (2002)' study, perceptions of heavy workload influence students towards surface approaches to study.

According to Graduate Careers Australia (2013), appropriate workload is one of the Course Experience Questionnaire (CEQ) scales. The CEQ measures 11 facets of the higher education student experiences, particularly in Australia. Four questions regarding to the appropriate workload scales are listed below.

1) I was generally given enough time to understand the things I had to learn.
2) The sheer volume of work to be got through in this course meant it couldn't all be thoroughly comprehended. *R ('reverse coded')*
3) The workload was too heavy. *R ('reverse coded')*
4) There was a lot of pressure on me as a student in this course. *R ('reverse coded')*

2.6.2.3 Learning Environment

Learning environment is defined as academic environmental factors conduce towards learning. Most researchers agreed that learning environment is one of the main influences on students' approaches to learning and their academic achievement (Patria, 2014; Salamonson et al., 2013). Trigwell and Prosser (1991) also revealed that perceived environments which encourage deep approach are more likely to facilitate higher quality learning. This is consistent with Smith et al. (2007)' study which mentioned that learning environment can influence students' approaches to learning

more than discipline of a study. Another research team also confirmed that learners' positive perceptions of learning environment influence their embracement of deep approach to learning (Yerdelen Damar & Aydın, 2015). According to Moos (1974) scheme for classifying human environments, there are three basic types of dimensions as followed:

1. Relationship Dimensions: identify the nature and intensity of personal relationships within the environment and assess the extent to which people are involved in the environment and support and help each other.
2. Personal Development Dimensions: assess basic directions along which personal growth and self-enhancement tend to occur
3. System Maintenance and System Change Dimensions: involve the extent to which the environment is orderly, clear in expectations, maintains control and is responsive to change.

Learning environment assessments have been used as a source of dependent and independent variables in a rich variety of research applications spanning many countries. The assessment of learning environments and research applications have involved a variety of quantitative and qualitative methods (Fraser, 1998). In 1986, Fraser B.J. & colleagues developed a learning environment assessment tool named "Colleges and Universities Classroom Environment Inventory (CUCEI)". Its scales were classified by Moos (1974) scheme. The Colleges and Universities Classroom Environment Inventory (CUCEI) was initially developed for small-scale classes at upper secondary and tertiary level. The original survey instrument contained seven dimensions (or factors) of classroom climate. Later, Nair and Fisher modified the

instrument, replacing the “involvement” and “satisfaction” factors with two new ones, “cooperation” and “equity” (Nair & Fisher, 1999; Nair & Fisher, 2000) (see Table 2.6). Each factor contains seven items. For each of the 49 items in the inventory, participants were given 5-point rating scales. The full version of CUCEI consists of four forms which were student actual form, student preferred form, teacher actual form, and teacher preferred form. Previous studies and the current one have mainly focused on the students’ perceptions of the actual learning environment in classrooms.

Table 2.6 Learning Environment Scales (CUCEI) classified according to Moos’s scheme

Instrument	**Level**	**Items per scale**	**Scales classified according to Moos’s scheme**		
			Relationship dimensions	**Personal development dimension**	**System maintenance and change dimensions**
College and University Classroom Environment Inventory (CUCEI), 1986	Higher Education	**7**	• Personalization • Involvement • Student cohesiveness • Satisfaction	• Task orientation	• Innovation • Individualization
College and University Classroom Environment Inventory (CUCEI), 1999	Higher Education	**7**	• Personalization • Student cohesiveness • Cooperation • Equity	• Task orientation	• Innovation • Individualization

Source: Fraser (1998)

The modified and personalized CUCEI composes of seven scales, 49 items with 5-point Likert scale. Definition of each scale has been described in Table 2.7. The modified CUCEI has been used widely. CUCEI was validated in the context of Chinese tertiary education in foreign language classroom (Li, 2014). The result showed that CUCEI performs well for Chinese sample at universities.

Table 2.7 Descriptions of the CUCEI Scales

Scale Name	**Description**
1. Personalization	Extent of opportunities for individual students to interact with the instructor and on concern for students personal welfare.
2. Innovation	Extent to which the instructor plans new unusual activities, teaching techniques and assignments.
3. Student Cohesiveness	Extent to which students know, help and are friendly towards each other.
4. Task Orientation	Extent to which class activities are clear and well organized.
5. Cooperation	Extent to which students cooperate rather than compete with another on learning tasks.
6. Individualization	Extent to which students are allowed to make decisions and are treated differently according to ability, interests and rate of working.
7. Equity	Extent to which students are treated equally by the teacher.

Source: Nair and Fisher (1999)

Students perceived their failure in university studies revealed that it was caused by lecturers who are out of touch with students' needs, fail to create attractive presentation, require too many course workload and demands on students' time, provide unclear or

unrealistic expectations for assignments, and design inappropriate assessment procedures (Nair & Fisher, 1999). Similar findings were also mentioned in a study by Booth, cited in Nair and Fisher (2000) when he investigated experiences and expectations of students in transition from high school to university studies.

In this study, learning environment factors specifically for pharmacy student were Personalization, Innovation, Task Orientation, Cooperation, and Individualization. Student cohesiveness were not included into the study framework because it seems duplicate to "Cooperation". For "Equity", it also was not considered as the major factor for pharmacy learning environment in Thailand. Therefore, the five learning environmental factors for pharmacy students considered in this study were Personalization, Innovation, Task Orientation, Cooperation, and Individualization, which are developed from Nair and Fisher (1999)' CUCEI.

Personalization was defined as extent of opportunities for individual students to interact with the instructor and on concern for students personal welfare (Nair & Fisher, 1999). Deep approach to learning was significantly related to classroom learning environment which were perceived to be highly personalized and to be encouraging active participation in the learning process and the use of investigative skills in learning activities (Dart et al., 1999). Facilitating students' learning by being close to students, guiding on their sides, and interacting with them can promote deep approach to learning (Oxnevad, 2017). Effective instructor-student interaction or friendly communication could influence students to adopt deep approach to learning, in turn, helps them to

achieve a better understanding in course contents (Bamwesiga, Dahlgren, & Fejes, 2012)

Innovation was defined as extent to which the instructor plans new unusual activities, teaching techniques and assignments (Nair & Fisher, 1999). The concept of learning innovation was also considered as a key element of learning system and environment. This is obvious and supported by both national and international education policies, Thailand Education 4.0 and 21st Century learning, respectively. Educational institutions are encouraged to integrate learning innovation and technologies into their learning system and environment (Chareonwongsak, 2016; Division of Research Administration and Educational Quality Assurance, 2016; P21Members, 2002). This is because the integration of learning innovation and technologies in any courses would benefit to students in term of increasing their deep understanding of the course's concepts (Chen, Lambert, & Guidry, 2010; Laguador, 2014). Creating classroom interest by using learning applications and active teaching methods such as problem-based learning (PBL) and blended learning were examples of learning innovation and technologies, which can increase students' deep approach to learning (Garrison & Kanuka, 2004; Tiwari et al., 2006; Trigwell & Prosser, 1991).

Task orientation was defined as extent to which class activities are clear and well organized (Nair & Fisher, 1999). Students' deep approach to learning was positively influenced by clear and well-organized class instruction and activities (Lizzio et al., 2002; J.-S. Wang, Pascarella, Nelson Laird, & Ribera, 2015).

Cooperation was defined as extent to which students cooperate rather than compete with another on learning tasks (Nair & Fisher, 1999). Cooperative classroom learning environment has a positive relation with master-approach goal orientation and deep approaches to learning (Poondej, 2014). Other studies revealed that students perceived their learning environment as competitive and teacher-controlled, with students employing surface approaches to learning (Cleave-Hogg & Rothman, 1991; Dart et al., 1999).

Individualization was defined as extent to which students were allowed to make decisions and were treated differently according to ability, interests and rate of working (Nair & Fisher, 1999). Dart et al. (1999) revealed that a deep achieving approach was related to independence in learning. Academic departments that provide good teaching, study support and a choice of content and study methods, are more likely to induce students to adopt a deep learning approach (Warburton, 2003).

2.7 Multilevel Analysis and Multilevel Structural Equation Modeling Analysis

Our conceptual model had two levels. The valid analysis tool used in this study was multilevel analysis. Multilevel models (also known as hierarchical models) are becoming well-known in social science research due to the recognition of data in this field often exist in clusters (Kelloway, 2014). Social, cultural, and educational data were structured hierarchically as natural (Kanjanawasee, 2011). Examples of clustered or nested data are students (who are clustered in classroom), employees (who are clustered in teams or work groups), and customers (who are clustered in service units). The traditional analytic techniques assume that the observations are independent and

ignoring clustering. This can cause underestimated standard errors and inflation of Type I error (Kanjanawasee, 2011; Kelloway, 2014).

2.7.1 Multilevel Analysis

Multilevel analysis is a statistical technique for analyzing influences of independent variables from different levels on dependent variables. The independent variables' structure is hierarchical with at least 2 levels. There is a relationship between independent variables and dependent variables at the lower level and both of them are influenced from variables at the higher level (Kanjanawasee, 2011).

2.7.1.1 Structure and Natural of Data

Social research regularly involves problems that investigate the relationship between individual and society. The basic concept is that individuals belongs to the social contexts or groups and they all have interaction or influences with each other. The individuals and the social groups are conceptualized as a hierarchical system of individuals nested within groups, with individuals and groups defined at separate levels of this hierarchical system. Naturally, such systems can be observed at different hierarchical levels, and variables may be defined at each level. The relationships between individual variables and group variables are considered to do research, a kind of research that is generally referred to as multilevel research (Hox, Moerbeek, & van de Schoot, 2010).

The sample data in multilevel research are a sample from the hierarchical population. It is important to make sure for successive sampling from each level of the hierarchical population. An example of successive sampling in educational research is that the

sampling procedure often proceeds in two stages, school sampling and pupil sampling within each school, as pupils are nested within schools (Hox et al., 2010).

2.7.1.2 Benefits of Multilevel Analysis

Multilevel analysis is more appropriate for analyzing hierarchical data than the traditional analysis. The traditional one see those data lined in a same level (i.e. a single level analysis), which is not as they truly are. The results of that are aggregation bias, misestimated standard error, and heterogeneity of regression. Many researchers considered these limitations of the traditional analysis and suggested multilevel analysis to solve them (Kanjanawasee, 2011).

- **Aggregation Bias**

The traditional analysis employs a single level approach for analyzing data, which is suitable for data structured within a single level. However, there are some data naturally structured in hierarchical levels such as social, culture, organization, and education. They should be employed by multilevel analysis as this approach is considering to relationships among observed variables in term of variations at individual level and group level (Kanjanawasee, 2011).

- **Misestimated Standard Error**

A group of people in an organization has specific characteristics and relationships, which are different from other groups. The traditional analysis controls these differences among groups with the same constant value. This is not appropriate as it is not considering on pre-existing differences among variables. Multilevel analysis can solve this problem by using a random effect

model. The variations among groups are allowed for this model and the variations of random effects can help to estimate adjusted standard error for intraclass correlation (Kanjanawasee, 2011).

- **Heterogeneity of Regressions**

Relationships between independent variables and dependent variables of each group or organization are different. Multilevel analysis can analyze regression coefficient within a group or organization. The variation of regression coefficient will be placed as dependent variables at higher level (Kanjanawasee, 2011)

2.7.2 Multilevel Causal Analysis

This analysis considers both causal relation and data structure in different levels. An example of the multilevel causal model is shown in Figure 2.2 below (Kanjanawasee, 2011)

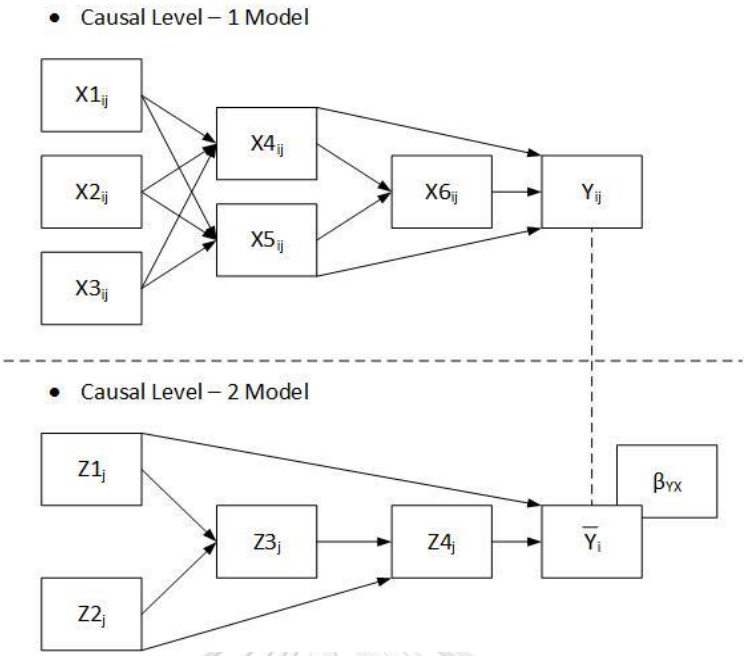


Figure 2.2 Multilevel Causal Model
Source: Kanjanawasee (2011)

There are five steps to analyze the multilevel causal model.

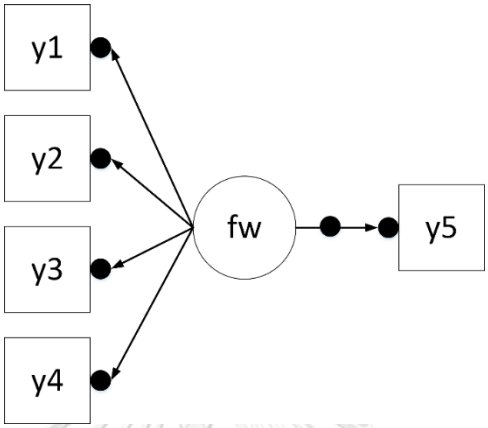
1) Development of multilevel causal model
2) Analysis of null model
3) Analysis of causal level-1
4) Analysis of causal level-2
5) Conclusion for direct effect, indirect effect, and total effect

2.7.3 Multilevel Structural Equation Modeling Analysis by M*plus* Program

This study will use M*plus* program for analyzing data. Muthén and Muthén (1998-2015) developed M*plus* program for analyzing multivariate study. The outstanding points of this program are unlimited types of independent and dependent variables. A

basic example of two-level structural equation model which will be analyzed by M*plus* program is presented in Figure 2.3 below.

Level-1 (individual-level *or* within-level)



Level-2 (cluster-level *or* between-level)

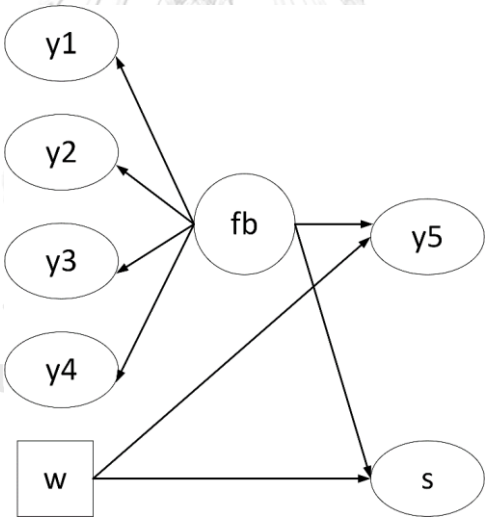


Figure 2.3 Two-Level Structural Equation Model
Source: Kanjanawasee (2011)

2.8 Conceptual Framework

The study framework was separated into two levels which were within-level or student-level and between-level or course-level. There were six influencing factors from student-level affected on students' deep approach to learning, which were mastery-approach goal, performance-approach goal, performance-avoidance goal, gender, cumulative grade point average, and academic year. The influencing factors from course-level composed of appropriate assessment, appropriate workload, personalization, innovation, task orientation, cooperation, and individualization (see Figure 2.4).

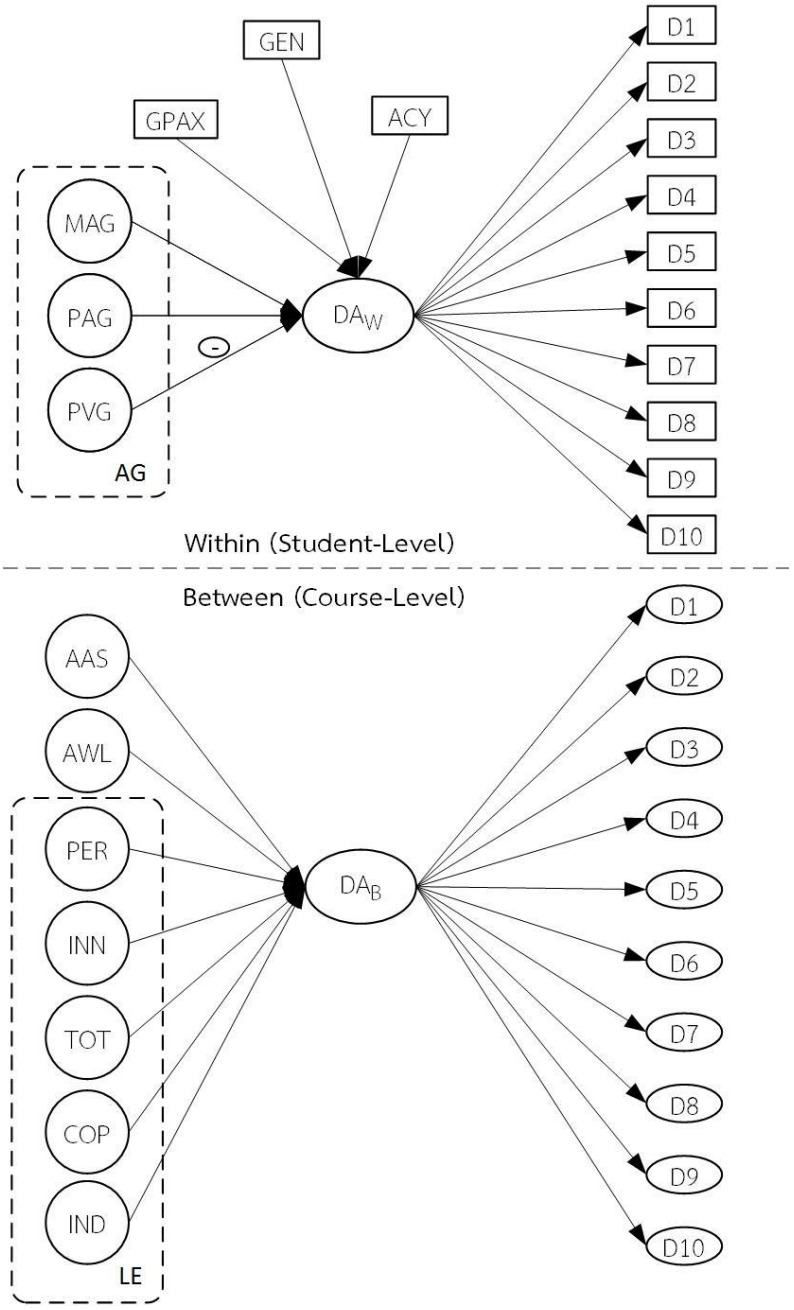


Figure 2.4 Conceptual Framework

GEN – Gender
ACY - Academic Year
GPAX – Cumulative Grade Point Average
MAG - Mastery-Approach Goal
PAG - Performance-Approach Goal
PVG - Performance -Avoidance Goal
AAS - Appropriate Assessment
AWL - Appropriate Workload
PER - Personalization
INN - Innovation
TOT - Task Orientation
COP - Cooperation
IND - Individualization
DA - Deep Approach to Learning
B - Between
W - Within

CHAPTER 3 METHODOLOGY

This chapter presented about the study's methodology starting with population and samples followed by instrument, data collection, and data analysis, respectively.

3.1 Population and samples

3.1.1 Population: Population in this study were Thai pharmacy students who were studying at 2nd to 5th year in semester 1, 2016. They were selected from two universities in Thailand, which are Chulalongkorn University and Burapha University. The 1st and 6th year students were be excluded from the study because majority of the 1st year students' courses belong to faculty of sciences for general basic sciences and the 6th year students were be in their clerkships.

3.1.2 Samples: In the analytic approach, the number of groups at the course-level (between-level) should be more than 50 in order to improve estimates of the standard error at between-level (Hox et al., 2010; Kanjanawasee, 2011). Here, there were total 67 courses in the first semester of 2nd to 5th year pharmacy curriculums from the two universities, and this number of courses meets the between-level criteria.

According to J. F. Hair, Anderson, Tatham, and Black (2003), the sample size for multilevel analysis should be 400-500 as the minimum in the student-level or within-level (J. F. Hair et al., 2003, p. 644; Boomsma, cited in Schumacker & Lomax, 2010, p. 42). The sample size calculation of structural equation modeling should be 5-10

times of the observed variables in the study. There were 73 items or observed variables in the questionnaire. Using this formula, the study's sample size should be between 400 and 730. Eight to twelve students were randomly selected to evaluate one of the 67 courses, and questionnaires were sent to 733 pharmacy students.

3.1.3 Sampling methods: Currently, there are totally 19 Faculties of Pharmaceutical Sciences in Thailand, which belong to the following universities: Chulalongkorn, ChaingMai, Mahidol, Songkla, KhonKaen, Silpakorn, Naresuan, Ubonratchatani, Srinakarinwirot, Mahasarakham, Walailuk, Payow, Burapha, Thammasart, Rangsit, Hawchew, Payab, Siam, and Eastern Asia (The Pharmacy Education Consortium of Thailand, 2014). The two faculties from Chulalongkorn and Burapha University were purposively selected for this study. After selecting the pharmacy schools, then pharmacy courses of 2^{nd}-5^{th} year students were all selected. Courses of the 1st and the 6th year students were excluded from this study because there is no coursework in the 6^{th} year students and the courses of the 1^{st} year were belong to other faculties. There were 37 courses in the first semester in 2016 of faculty of pharmaceutical sciences at Chulalongkorn University and 30 courses at Burapha University. A total number of course groups from the two universities in this study, thus, were 67 groups. Take into account non-response rate at 15 percent, 8-12 students were randomly selected to answer each learning course. The respondents of a course must not be included as respondents in other courses.

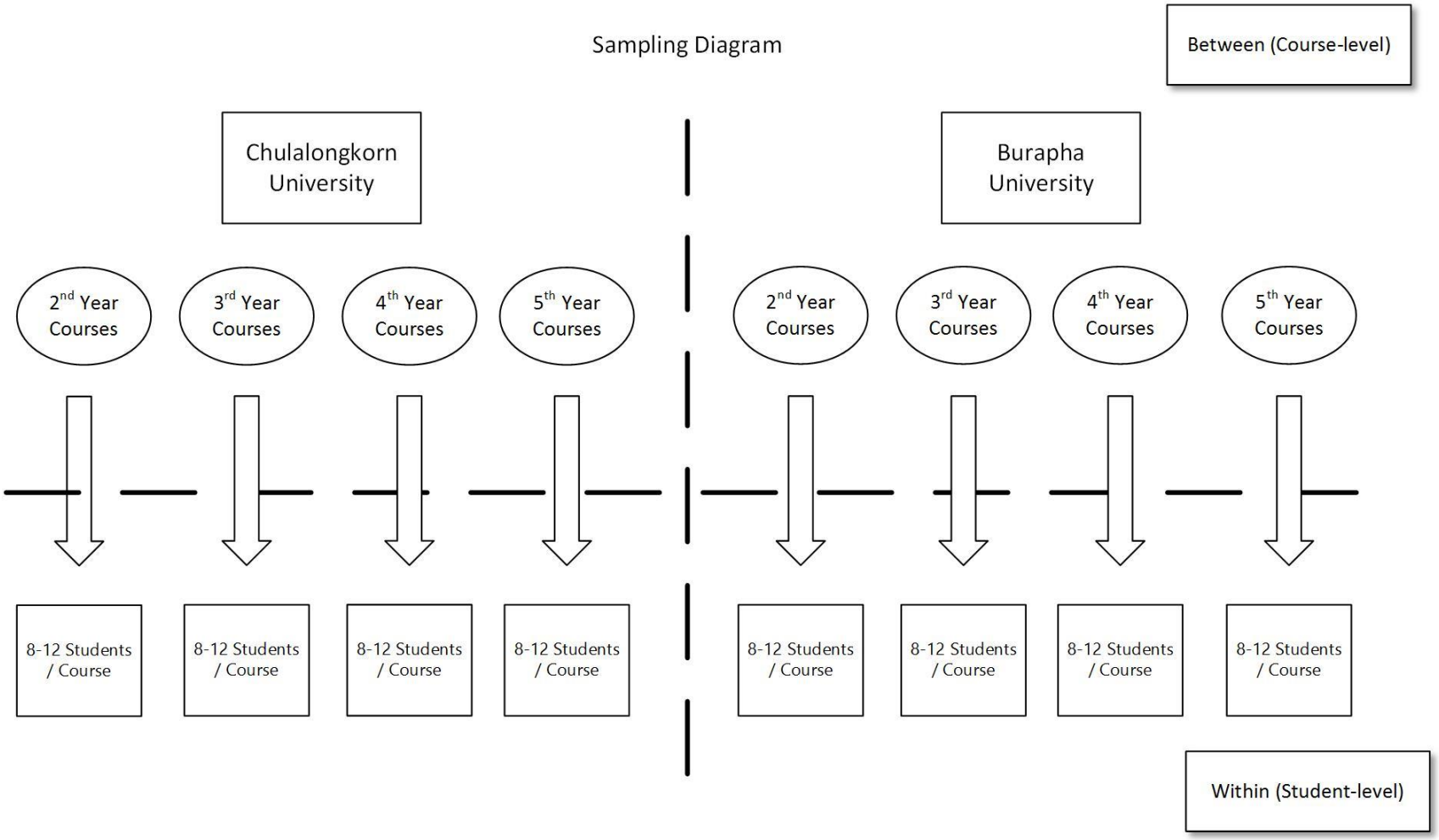


Figure 3.1 Sampling Diagram

3.2 Instrument

The self-administered questionnaire used in this study was properly modified from standardized tools, validated by experts, and tested for its reliability.

3.2.1 Instrument Development

The 5-point Likert scale questionnaire composes of totally 73 questions, which were separated into three sections as listed below.

1) Demographic information

   There were three questions for this section as listed.

   1. Please specify your gender
   2. At this present time, you are studying in which academic year
   3. Your current cumulative grade point average

2) Students' approaches to learning

There were 20 questions for measuring pharmacy students' approaches to learning. They were modified from standardized tool, R-SPQ-2F, by J. Biggs et al. (2001) and adapted from its Thai version by Kusalanont (2006).

Deep Approach to Learning (10 questions)

1. I find that at times studying gives me a feeling of deep personal satisfaction.
2. I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied.
3. I feel that virtually any topic can be highly interesting once I get into it.

4. I find most new topics interesting and often spend extra time trying to obtain more information about them.
5. I find that studying academic topics can at times be as exciting as a good novel or movie.
6. I test myself on important topics until I understand them completely.
7. I work hard at my studies because I find the material interesting.
8. I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.
9. I come to most classes with questions in mind that I want answering.
10. I make a point of looking at most of the suggested readings that go with the lectures.

Surface Approach to Learning (10 questions)

1. My aim is to pass the course while doing as little work as possible.
2. I only study seriously what's given out in class or in the course outlines.
3. I do not find my course very interesting so I keep my work to the minimum.
4. I learn something by rote, going over and over them until I know them by heart even if I do not understand them.
5. I find I can get by in most assessments by memorizing key sections rather than trying to understand them.
6. I generally restrict my study to what is specifically set as I think it is unnecessary to do anything extra.
7. I find it is not helpful to study topics in depth. It confuses and wastes time, when all you need is a passing acquaintance with topics.

8. I believe that lecturers shouldn't expect students to spend significant amounts of time studying material everyone knows won't be examined.
9. I see no point in learning material which is not likely to be in the examination.
10. I find the best way to pass examinations is to try to remember answers to likely questions.

3) Determinants at student-level and course-level on deep approaches to learning

There were totally 50 questions in this part. There were totally nine questions for measuring achievement goal orientation (three questions for each concept). These questions were modified from Achievement Goal Questionnaire-Revised for Thai college students and Asian context by Ratsameemonthon (2015).

There were five questions for measuring appropriate assessment and four questions for measuring appropriate workload. These nine questions were modified from Course Experience Questionnaire (CEQ) (Graduate Careers Australia, 2013).

Learning environment was measured by 32 questions which adapted from the modified College and University Classroom Environment Inventory (CUCEI) by Nair and Fisher (2000) and CUCEI Thai version (Charik, 2006).

Achievement Goal Orientation (9 questions)

Mastery-Approach Goal

1. My goal is to fully understand the contents taught in class.
2. My goal is to learn as much as I can.
3. I try very hard to understand as deep as possible in this subject matter.

Performance-Approach Goal

1. I am determined to do well when compared to other students.
2. My goal is to behave well when compared to other students.
3. My goal is to produce a better work than other students.

Performance-Avoidance Goal

1. My goal is to avoid having bad work when compared to other students.
2. I try hard to avoid producing worse work than others.
3. My goal is to avoid producing worse work than other students.

Appropriate Assessment (5 questions)

1. To do well in this course all you really needed was a good memory. (Reverse)
2. The staff seemed more interested in testing what I had memorized than what I had understood. (Reverse)
3. Too many staff asked me questions just about facts. (Reverse)
4. I found that most exam questions asking too much details from the course contents. (Reverse)

5. I notified that if my answers are not exactly fit with the course materials provided, I will get less marks. (Reverse)

Appropriate Workload (4 questions)

1. The sheer volume of work to be got through in this course meant it couldn't all be thoroughly comprehended. (Reverse)
2. The workload was too heavy. (Reverse)
3. Many individual and group works are assigned to me and their due dates are in the same periods of time. (Reverse)
4. I usually spend my personal time after classes with loads of assignments. (Reverse)

Learning Environment (32 questions)

Personalization

1. The instructor considers my feelings.
2. The instructor is friendly and talks to me.
3. The instructor goes out of his/her way to help me.
4. The instructor helps me when I am having trouble with my work.
5. The instructor moves around the classroom to talk with me.
6. The instructor is interested in my problems.
7. The instructor is unfriendly and inconsiderate towards me. (Reverse)

Innovation

1. My instructor uses new and different ways of teaching in this class.
2. The instructor thinks up innovative activities for me to do.

3. The teaching approaches used in this class are characterized by innovation and variety.
4. The instructor often thinks of unusual activities.
5. I seem to do the same type of activities in every class. (Reverse)

Task Orientation

1. I know exactly what has to be done in this class.
2. Getting a certain amount of work done is important in the class.
3. I often get sidetracked in this class instead of sticking to the point. (Reverse)
4. This class is always disorganized. (Reverse)
5. Class assignments are clear and I know what to do.
6. This class seldom starts on time. (Reverse)
7. Activities in this class are clearly and carefully planned.

Cooperation

1. I cooperate with other students when doing assignment work.
2. I share my books and resources with other students when doing assignments.
3. I work with other students on projects in this class.
4. I learn from other students in this class.
5. I work with other students in this class.
6. I cooperate with other students on class activities.
7. Students work with me to achieve class goals.

Individualization

1. I am expected to do the same work as all the students in the class, in the same way and in the same time. (Reverse)
2. I am generally allowed to work at my own pace in this class.
3. I am allowed to choose activities and how I will work.
4. Teaching approaches in this class allow me to proceed at my own pace.
5. I have little opportunity to pursue my particular interests in this class. (Reverse)
6. My instructor decides what I will do in this class. (Reverse)

3.2.2 Validation and Reliability

The questionnaire was assessed its content validity by three experts. One is an instructor of a Faculty of Pharmaceutical Sciences. The others experienced in psychology, educational measurement, and tool development. The content validity of this instrument was showed by computing a content validity index (CVI), based on experts' ratings of item relevance. The item content validity index (I-CVI) and content validity for scale (S-CVI) of this instrument are 1.00 and 1.00, respectively (See Appendix I). Both values were accepted as good content validity (Polit & Beck, 2008).

Pilot study was conducted with 27 students for internal consistency of the measurement by evaluating Cronbach's alpha coefficient. Cronbach's alpha coefficient at .7 or higher can be considered as good reliability while between .6 and .7 can be acceptable (J.F. Hair et al., 2013). Cronbach's alpha coefficient of all measurement were between .695 and .850 as shown in Table 3.1 below.

Table 3.1 Cronbach's alpha coefficient of measurement

Constructs	**Cronbach's alpha coefficient**
Deep Approach	.805
Deep Motive	.719
Deep Strategy	.718
Surface Approach	.799
Surface Motive	.695
Surface Strategy	.708
Mastery-Approach Goal	.697
Performance-Approach Goal	.796
Performance-Avoidance Goal	.740
Appropriate Assessment	.708
Appropriate Workload	.755
Personalization	.845
Innovation	.850
Task Orientation	.711
Cooperation	.777
Individualization	.708

The final questionnaire was shown in Appendix J.

3.3 Data Collection

Questionnaires were directly delivered to students at the last day of each course. The study's objectives and benefits were explained to participants in classrooms by the researcher or the researcher assistants before starting data collection. The respondents' name and student identity are not required. They has the right to deny participation in the study. The respondents took 20 minutes to answer the questionnaire. After finished answering questionnaires, a 60 Baht coupon for snack & drink was given to the participants. Copies of questionnaires were randomly distributed to students to evaluate each course. For example, there were 100 third-year students taking 8 courses in the first semester. Each course was evaluated by randomly selecting 12 students. If there were 70 students taking 8 courses in that semester. Each course was evaluated by 8 randomly selected students.

3.4 Data Analysis

After collecting questionnaires from respondents, the researcher performed completeness checking, developing a codebook, entering data into SPSS program, cleaning data, and performing data analysis. Since students were nested in classrooms, a multilevel approach as a statistical technique was employed. The following are steps of statistical analysis for this study.

3.4.1 Descriptive statistics, normality test, and correlation analysis were performed by using SPSS version 22 program

3.4.2 Confirmatory Factor Analysis by M*plus* 7.4 program

3.4.3 Multilevel Structural Equation Modeling Analysis by M*plus* 7.4 program. The criteria of goodness of fit indices for the model testing were listed in Table 3.2

Table 3.2 Goodness of fit indices

Indices	**Criteria**
Chi-Square (χ^2)	p-value ($p > 0.05$)
χ^2/df	< 2
Root Mean Square Error of Approximation (RMSEA)	< 0.07
Standardized Root Mean Square Residual (SRMR)	< 0.08
Tuker-Lewis Index (TLI)	> 0.95
Comparative Fit Index (CFI)	> 0.95

Source: Hooper, Coughlan, and Mullen (2008, p. 58)

The study was approved by the research ethics review committee for research involving human research participants, Health Sciences Group, Chulalongkorn University. The certificate of approval was in Appendix K.

CHAPTER 4 RESULTS

This study aimed to assess the extent of students' deep approaches to learning in Thai pharmacy students, investigate the effects of achievement goal orientation, appropriate assessment, appropriate workload, and learning environment on the students' deep approach to learning and validate a multilevel structural model of the student-level factors and course-level factors affecting the students' deep approach to learning.

For multilevel structural equation modeling, number of samples in the within-levels should be balanced in all between-levels (Hox et al., 2010). There were 16 courses that only 8 students evaluated the courses, so we randomly selected 8 questionnaires from each other courses and came up with 536 questionnaires for the analysis. The results of this study were separately presented in nine parts as listed.

1. Demographic Information
2. Descriptive Analysis
3. Normality Test
4. Correlation Analysis
5. Confirmatory Factor Analysis
6. Multilevel Confirmatory Factor Analysis of Deep Approach to Learning
7. Validation of Structural Equation Modeling between hypothesized model and empirical data
8. Validation of Multilevel Structural Equation Modeling of Deep Approach to Learning with student-level factors and course-level factors
9. Post Hoc Analysis

4.1 Demographic Information

There were totally 733 pharmacy students answered the questionnaires and 67 courses from two universities, which are Chulalongkorn University and Burapha University. However, 536 pharmacy students were randomly selected for the analysis because the reasons addressed above. Their characteristics were presented in Table 4.1 and Table 4.2.

Table 4.1 Demographic information

Variables	Amount (n=536)	Percent (%)
Gender		
Male	166	31.00
Female	370	69.00
Academic year		
2	136	25.40
3	144	26.90
4	176	32.80
5	80	14.90
University		
Chulalongkorn (CU)	296	55.20
Burapha (BUU)	240	44.80
Cumulative Grade Point Average (GPAX)		
Low: 2.00 – 2.74	72	13.43
Medium: 2.75 – 3.24	250	46.64
High: 3.25 – 4.00	214	39.93

Table 4.2 Frequency and Crosstab

University	Academic Year	Gender	GPAX			Total
			2.00 - 2.74	2.75 - 3.24	3.25-4.00	
CU	2	Male	0	8	6	14
		Female	3	14	17	34
		Total	3	22	23	48
	3	Male	3	8	10	21
		Female	5	29	33	67
		Total	8	37	43	88
	4	Male	6	18	7	31
		Female	14	34	25	73
		Total	20	52	32	104

University	Academic Year	Gender	GPAX			Total
			2.00 - 2.74	2.75 - 3.24	3.25-4.00	
	5	Male	1	8	5	14
		Female	3	25	14	42
		Total	4	33	19	56
	Total	Male	10	42	28	80
		Female	25	102	89	216
		Total	35	144	117	296
BUU	2	Male	4	15	14	33
		Female	0	15	40	55
		Total	4	30	54	88
	3	Male	4	6	4	14
		Female	7	22	13	42
		Total	11	28	17	56
	4	Male	9	15	5	29
		Female	10	19	14	43
		Total	19	34	19	72
	5	Male	0	7	3	10
		Female	3	7	4	14
		Total	3	14	7	24
	Total	Male	17	43	26	86
		Female	20	63	71	154
		Total	37	106	97	240

The majority of samples were female students (69%) and most of the samples were in the fourth academic year (32.8%). More than half of all participants (55.2%) were studying at Chulalongkorn University. The range of cumulative grade point average (GPAX) belonging to most samples were 2.75-3.24 (46.64%), followed by 3.25 – 4.00 (39.93%), and 2.00 – 2.74 (13.43%), respectively. Cumulative grade point average of the pharmacy students, thus, can be mainly considered as medium to high. Although number of students from Chulalongkorn University having medium and high GPAX was higher than those from Burapha University, number of Chulalongkorn students was lower in the low range of GPAX.

4.2 Descriptive Analysis

Primary assumption for estimating analysis by Maximum Likelihood (ML) is data's normal distribution. It can be evaluated by Mean (M), Standard Deviation (SD), Coefficient of Variation (CV), Skewness (SK), and Kurtosis (KU). These descriptive results of each variable including its items were presented in following Table 4.3, Table 4.6, and Table 4.7.

Students' Approaches to Learning

Deep Approach to Learning (DA)

An average score of deep approach to learning was 3.17 ± .58 (mean ± SD). The deep approach to learning composed of ten observed variables, which are D1 to D10 as listed in Table 4.3. The results shown that the top three items pharmacy students agreed the most were D2, D6, and D1, respectively. The lowest mean belongs to D3 (2.67± .963) (see Table 4.3).

Table 4.3 Descriptive Statistics of Deep Approach to Learning

Variables	M	SD	CV	SK	KU
Deep Approach to Learning (DA)	3.17	0.58	18.33	-0.27	-0.05
D1 I find that at times studying gives me a feeling of deep personal satisfaction.	3.60	0.83	22.99	-0.59	0.58
D2 I feel that virtually any topic can be highly interesting one I get into it.	3.87	0.78	20.08	-0.53	0.41
D3 I find that studying academic topics can at times be as exciting as a good novel or movie.	2.67	0.96	36.01	0.16	-0.39
D4 I work hard at my studies because I find the material interesting.	2.89	0.89	30.68	0.09	-0.22

Variables	M	SD	CV	SK	KU
D5 I come to most classes with questions in mind that I want answering.	3.01	0.81	26.73	-0.07	-0.05
D6 I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied.	3.83	0.82	21.43	-0.64	0.51
D7 I find most new topics interesting and often spend extra time trying to obtain more information about them.	3.21	0.95	29.60	-0.25	-0.42
D8 I test myself on important topics until I understand them completely.	3.01	0.90	29.79	-0.24	-0.56
D9 I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.	2.69	0.92	34.15	0.40	-0.35
D10 I make a point of looking at most of the suggested readings that go with the lectures.	2.87	0.88	30.74	-0.02	-0.59

Surface Approach to Learning (SA)

An average score of surface approach to learning was 2.95 ± .57 (mean ± SD). The surface approach to learning composed of ten observed variables, which are S1 to S10 as listed in Table 4.4.

Table 4.4 Descriptive Statistics of Surface Approach to Learning

Variables	M	SD	CV	SK	KU
Surface Approach to Learning (SA)	2.95	0.57	19.30	-0.11	-0.35
S1 My aim is to pass the course while doing as little work as possible.	3.28	0.95	29.00	-0.31	-0.50
S2 I do not find my course very interesting so I keep my work to the minimum.	2.39	0.94	39.31	0.47	-0.37

Variables	M	SD	CV	SK	KU
S3 I find I can get by in most assessments by memorizing key sections rather than trying to understand them.	3.16	0.93	29.34	-0.16	-0.55
S4 I find it is not helpful to study topics in depth. It confuses and wastes time, when all you need is a passing acquaintance with topics.	2.30	0.85	37.06	0.53	0.17
S5 I see no point in learning material which is not likely to be in the examination.	2.74	0.98	35.86	0.24	-0.78
S6 I only study seriously what's given out in class or in the course outlines.	3.33	0.84	25.20	-0.26	-0.44
S7 I learn something by rote, going over and over them until I know them by heart even if I do not understand them.	3.34	0.88	26.47	-0.29	-0.05
S8 I generally restrict my study to what is specifically set as I think it is unnecessary to do anything extra.	3.10	0.90	29.19	-0.14	-0.63
S9 I believe that lecturers shouldn't expect students to spend significant amounts of time studying material everyone knows won't be examined.	2.89	0.95	32.83	0.19	-0.59
S10 I find the best way to pass examinations is to try to remember answers to likely questions.	2.95	1.05	35.58	-0.01	-0.91

Relationship between deep and surface approach to learning

The maximum score of each approach to learning, deep and surface approach, equals 50 by summing up the ten constituent items gives scores for each approach, each ranging from ten to 50 (see Appendix E). The higher scores indicate greater use of that approach to learning (Leung & Kember, 2003). This study showed that an average total score of deep approach to learning (31.66 out of 50) in Thai pharmacy students was

significantly higher than that of surface approach to learning (29.49 out of 50) as shown in Table 4.5. Deep and surface approach to learning had a negative correlation (Table 4.5)

Table 4.5 Average total scores of deep and surface approach to learning and their correlation

	Mean ± SD	**Correlation**	
		DA	**SA**
Deep Approach to Learning (DA) (Total Score = 50)	31.66 ± 5.80	1	-.43**
Surface Approach to Learning (SA) (Total Score = 50)	29.49 ± 5.69	-.43**	1

Student-level Factors

Achievement goal orientation was considered as the students' crucial factor. It can be categorized into three concepts: mastery-approach goal (MAG), performance-approach goal (PAG), and performance-avoidance goal (PVG). It can be seen from Table 4.6 that each concept composed of three items and an average score of mastery-approach goal was the highest. Pharmacy students mostly agreed with mastery-approach goal and performance-avoidance goal whereas they felt neutral with performance-approach goal.

Table 4.6 Descriptive Statistics of Student-level Factors

Variables	M	SD	CV	SK	KU
MAG Mastery-Approach Goal	3.67	0.66	17.99	-0.47	0.43
MA1 My goal is to fully understand the contents taught in class.	3.81	0.78	20.35	-0.60	0.38
MA2 My goal is to learn as much as I can.	3.48	0.88	25.32	-0.26	-0.36
MA3 I try very hard to understand as deep as possible in this subject matter.	3.72	0.80	21.49	-0.47	0.23
PAG Performance-Approach Goal	3.31	0.69	20.75	-0.28	0.09
PA1 I am determined to do well when compared to other students.	3.40	0.83	24.40	-0.20	-0.20
PA2 My goal is to behave well when compared to other students.	3.28	0.82	25.08	-0.45	0.20
PA3 My goal is to produce a better work than other students.	3.24	0.84	25.93	-0.28	0.01
PVG Performance-Avoidance Goal	3.64	0.65	17.85	-0.90	1.33
PV1 My goal is to avoid having bad work when compared to other students.	3.69	0.76	20.51	-0.90	1.15
PV2 I try hard to avoid producing worse work than others.	3.68	0.79	21.61	-0.86	0.90
PV3 My goal is to avoid producing worse work than other students.	3.57	0.79	22.07	-0.75	0.41

Course-level Factors

Course –level factors consisted of appropriate assessment (AAS), appropriate workload (AWL), and learning environment covering Personalization (PER), Innovation (INN), Task Orientation (TOT), Cooperation (COP), and Individualization (IND).

Appropriate Assessment (AAS)

Pharmacy students seemed to disagree that pharmacy courses had appropriate assessment. An average score of appropriate assessment was 2.79 ± .61 (mean ± SD). They felt that to do well in a course they really needed a good memory (AA1) and their answers should be exactly fit with the course materials provided (AA5) (see Table 4.7).

Appropriate Workload (AWL)

There are four observed variables of appropriate workload (AWL), which are AW1, AW2, AW3, and AW4 as listed in Table 4.7. The results shown that an average score of appropriate workload was 3.31± .89 (mean ± SD). This could be implied that pharmacy students' workload was neutral and not too heavy.

Personalization (PER)

Personalization composed of seven observed variables, PE1-PE7 as listed in Table 4.7Table *4.7.* Most students agreed that their instructors were friendly (PE2 and PE7), helping them when they were having trouble with works (PE4), and considering their feelings (PE1).

Innovation (INN)

There are five observed variables of Innovation (INN), which are IN1, IN2, IN3, IN4, and IN5 as listed in Table 4.7. The pharmacy students did not sure about learning innovation in their classes as an average score of innovation was close to neutral, 2.97 ± .72 (mean ± SD). However, there were some interesting INN items from the results showed that most students felt they seem to do the same type of activities in every class (IN5) and their instructors do not often thinks of unusual activities (IN4).

Task Orientation (TOT)

Task Orientation (TOT) consisted of seven observed variables, which are TO1 - TO7 as listed in Table 4.7. Many students agreed that their class activities were clear and well-organized as the task orientation's average score was relatively high, 3.61 ± .48 (mean ± SD). Students felt that their classes usually start on time (TO6), activities in classes including assignment are clear and carefully planned (TO7, TO5), and they know exactly what has to be done in the classes (TO1).

Cooperation (COP)

Seven observed variables, CO1-CO7, of cooperation (COP) and their average scores were listed in Table 4.7. The results shown that average scores of each CO item were all close to 4, which means pharmacy students agreed with the items. An average score of cooperation was 3.70 ± .55 (mean ± SD). This was because most pharmacy courses required students to work as a group. The students, thus, cooperate with others when doing assignment work or class activities (CO1 and CO6).

Individualization (IND)

Six observed variables of individualization (IND), ID1- ID6, and their average scores were listed in Table 4.7. Pharmacy students mostly agreed with ID2 *"I am generally allowed to work at my own pace in this class."* (3.45 ± .74) and they felt about neutral for other items. An average score of individualization, thus, was 3.06 ± .50.

Table 4.7 Descriptive Statistics of Course-level Factors

Variables	M	SD	CV	SK	KU
AAS Appropriate Assessment	2.79	0.61	21.96	0.25	0.27
AA1 To do well in this course all you really needed was a good memory. (R)	2.49	0.82	32.98	0.38	-0.09
AA2 The staff seemed more interested in testing what I had memorized than what I had understood. (R)	3.15	0.99	31.25	-0.28	-0.37
AA3 Too many staff asked me questions just about facts. (R)	2.81	0.91	32.46	0.26	-0.45
AA4 I found that most exam questions asking too much details from the course contents. (R)	2.84	0.90	31.75	-0.04	-0.48
AA5 I notified that if my answers are not exactly fit with the course materials provided, I will get less marks. (R)	2.68	0.81	30.13	0.40	0.25
AWL Appropriate Workload	3.31	0.89	26.73	-0.28	-0.38
AW1 The sheer volume of work to be got through in this course meant it couldn't all be thoroughly comprehended. (R)	3.39	1.08	31.86	-0.47	-0.47
AW2 The workload was too heavy. (R)	3.42	1.07	31.31	-0.37	-0.45
AW3 Many individual and group works are assigned to me and their due dates are in the same periods of time. (R)	3.23	1.13	34.97	-0.24	-0.71
AW4 I usually spend my personal time after classes with loads of assignments. (R)	3.21	1.04	32.30	-0.12	-0.69
PER Personalization	3.47	0.61	17.47	-0.30	1.31
PE1 The instructor considers my feelings.	3.41	0.86	25.23	-0.25	0.22
PE2 The instructor is friendly and talks to me.	3.85	0.83	21.42	-0.60	0.53
PE3 The instructor goes out of his/her way to help me.	3.14	0.81	25.64	-0.16	0.93
PE4 The instructor helps me when I am having trouble with my work.	3.52	0.81	22.90	-0.40	0.42
PE5 The instructor moves around the classroom to talk with me.	3.02	1.08	35.73	0.01	-0.76

Variables	M	SD	CV	SK	KU
PE6 The instructor is interested in my problems.	3.31	0.79	23.97	-0.14	0.34
PE7 The instructor is unfriendly and inconsiderate towards me. (R)	4.07	0.86	21.20	-0.69	0.09
INN Innovation	2.97	0.72	24.14	0.09	0.06
IN1 My instructor uses new and different ways of teaching in this class.	3.10	0.93	29.91	-0.08	-0.26
IN2 The instructor thinks up innovative activities for me to do.	3.13	0.96	30.58	-0.03	-0.37
IN3 The teaching approaches used in this class are characterized by innovation and variety.	3.05	0.90	29.46	-0.18	-0.18
IN4 The instructor often thinks of unusual activities.	2.88	0.88	30.65	-0.05	-0.38
IN5 I seem to do the same type of activities in every class. (R)	2.70	0.892	33.078	0.286	-0.273
TOT Task Orientation	3.61	0.48	13.35	-0.19	-0.17
TO1 I know exactly what has to be done in this class.	3.42	0.73	21.41	-0.05	-0.32
TO2 Getting a certain amount of work done is important in the class.	3.86	0.71	18.42	-0.52	0.46
TO3 I often get sidetracked in this class instead of sticking to the point. (R)	3.54	0.73	20.52	-0.05	-0.27
TO4 This class is always disorganized. (R)	3.49	0.92	26.36	-0.26	-0.46
TO5 Class assignments are clear and I know what to do.	3.51	0.76	21.70	-0.74	0.62
TO6 This class seldom starts on time. (R)	3.90	0.90	23.12	-0.74	0.35
TO7 Activities in this class are clearly and carefully planned.	3.55	0.74	20.83	-0.40	0.41
COP Cooperation	3.70	0.55	14.97	-0.82	1.65
CO1 I cooperate with other students when doing assignment work.	3.86	0.73	18.76	-0.94	2.41

Variables	M	SD	CV	SK	KU
CO2 I share my books and resources with other students when doing assignments.	3.74	0.72	19.17	-0.97	1.93
CO3 I work with other students on projects in this class.	3.54	0.93	26.25	-0.69	0.23
CO4 I learn from other students in this class.	3.54	0.87	24.57	-0.52	0.05
CO5 I work with other students in this class.	3.72	0.83	22.26	-1.02	1.64
CO6 I cooperate with other students on class activities.	3.75	0.75	19.87	-0.90	1.46
CO7 Students work with me to achieve class goals.	3.74	0.71	19.03	-0.92	1.76
IND Individualization	3.06	0.50	16.23	-0.06	0.57
ID1 I am expected to do the same work as all the students in the class, in the same way and in the same time. (R)	2.77	0.77	27.78	0.31	-0.17
ID2 I am generally allowed to work at my own pace in this class.	3.45	0.74	21.43	-0.44	0.33
ID3 I am allowed to choose activities and how I will work.	3.25	0.81	24.98	-0.41	-0.07
ID4 Teaching approaches in this class allow me to proceed at my own pace.	3.26	0.75	23.02	-0.24	-0.22
ID5 I have little opportunity to pursue my particular interests in this class. (R)	3.01	0.81	26.76	0.01	-0.22
ID6 My instructor decides what I will do in this class. (R)	2.59	0.70	27.14	0.22	0.20

4.3 Normality Test

Coefficients of Variation (CV) of data are ranged from 18.42 to 36.01. This showed that data distribution is not highly different. The highest coefficient belongs to D3 “I find that studying academic topics can at times be as exciting as a good novel or movie”. The lowest coefficient belong to TO2 “Getting a certain amount of work done is important in the class”. These results can be explained that the participants had the biggest variation of ideas in deep approach to learning of how exciting academic topics are, while the smallest variation was in task orientation of how important getting a certain amount of work done (see Table 4.3, Table 4.6, and Table 4.7).

The majority of observed variables have acceptable values of skewness and kurtosis ranked from -1.00 to 1.00 (Meyers, Gamst, & Guarino, 2006). Moreover, all variables’ skewness and kurtosis are not exceed the range of -3.00 to 3.00 and -10.00 to 10.00, respectively (Kline, 2011). These can be represented as normal distribution of data. Because of appropriateness of the data, confirmatory factor analysis can be performed in order to validate the model.

4.4 Correlation Analysis

The results of correlation analysis from Table 4.8 showed that mastery-goal orientation had the highest correlation coefficient with deep approach to learning (r = .527**). Although their correlation coefficient was the highest comparing with others, their correlation was considered in moderate level as their correlation coefficient was between .50 and .69 (Runyon, Coleman, & Pittenger, 2000). Influencing factor that had the lowest correlation coefficient with deep approach to learning was performance-avoidance goal (r = .122**). The results also showed correlation coefficients among influencing factors and found that personalization correlated with innovation the most (r = .488**).

Table 4.8 Correlation among constructs

	DA	MAG	PAG	PVG	AAS	AWL	PER	INN	TOT	COP	IND
DA(α=.805)	1										
MAG(α=.697)	.527**	1									
PAG (α=.796)	.259**	.391**	1								
PVG (α=.740)	.122**	.116**	.418**	1							
AAS (α=.708)	.224**	.074	-.038	.017	1						
AWL(α=.755)	.208**	.146**	-.028	.067	.138**	1					
PER (α .845)	.358**	.296**	.186**	.073	.164**	.108*	1				
INN (α=.850)	.452**	.250**	.173**	-.024	.185**	-.002	.488**	1			
TOT (α=.711)	.435**	.352**	.160**	.168**	.236**	.235**	.411**	.270**	1		
COP (α=.777)	.201**	.187**	.148**	.158**	.053	-.087*	.272**	.248**	.198**	1	
IND (α=.708)	.307**	.153**	.152**	.076	.186**	.270**	.327**	.352**	.303**	.052	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Correlation coefficients among 60 observed variables were mostly significant (*p*-value < .01). Their correlation analysis was presented in Appendix L.

4.5 Confirmatory Factor Analysis

There are two basic statistical tests to assess the variables' appropriateness before running the confirmatory factor analysis. One is Bartlett's test of sphericity, which can tell a researcher whether the data' correlation matrix is considered as identity matrix (no relationship among variables) or not. If its *p*-value is lower or equal .5, the data' correlation matrix is not considered as identity matrix which is suitable for confirmatory factor analysis. Another one is Kaiser-Mayer-Olkin (KMO), its value should be higher than .5 or close to 1. This can be accepted for the confirmatory factor analysis (J. Hair, Anderson, Black, & Babin, 2016). The following steps were confirmatory factor analysis of deep approach to learning of pharmacy students and its influencing factors from both student- and course-levels. The analysis was performed by using M*plus* 7.4 program.

4.5.1 Measurement Model of Deep Approach to Learning (DA)

Deep Approach to Learning (DA) composed of ten observed variables. Bartlett's Test of Sphericity of DA showed χ^2= 1801.091 (df= 45, *p*-value = .000) and its Kaiser-Mayer-Olkin (KMO) was .903 (see Appendix M). The both values are acceptable and suitable for confirmatory factor analysis.

Table 4.9 Goodness of fit of Deep Approach to Learning (DA)

Goodness of Fit Indices	Recommended criteria	Results	Pass/ Not pass
1. Chi-Square (χ^2)	p-value > 0.05	0.14	Pass
2. χ^2/df	< 2.00	1.33	Pass
3. RMSEA	< 0.07	0.03	Pass
4. CFI	> 0.95	1.00	Pass
5. TLI	> 0.95	0.99	Pass
6. SRMR	< 0.08	0.02	Pass

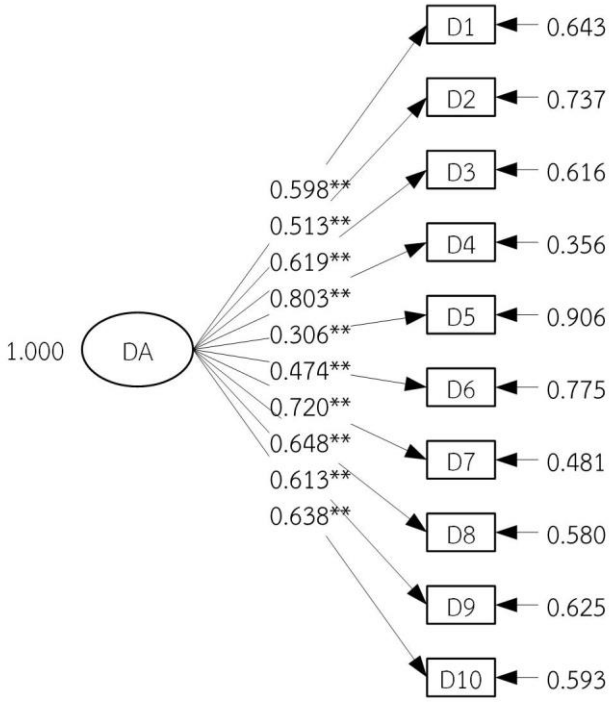
χ^2= 30.50, df= 23, χ^2/df= 1.33, *p*-value = 0.14, RMSEA = 0.03, CFI = 1.00, TLI = 0.99, SRMR = 0.02

The confirmatory factor analysis testing of model fit for deep approach to learning with empirical data showed consistency with χ^2= 30.50, df= 23, χ^2/df= 1.33, p-value = 0.14, RMSEA = 0.03, CFI = 1.00, TLI = 0.99, SRMR = 0.02 as shown in Table 4.9. All the fit indices passed the recommended criteria (Hooper et al., 2008; Makmee, 2016).

Table 4.10 Test of confirmatory factor analysis of Deep Approach to Learning (DA)

Components of Measurement Model	**Factor Loading Matrix**				R^2
	b	S.E.	β / S.E.	β	
D1 I find that at times studying gives me a feeling of deep personal satisfaction.	1.000	0.031	19.419	0.598**	0.357**
D2 I feel that virtually any topic can be highly interesting one I get into it.	0.805	0.035	14.632	0.513**	0.263**
D3 I find that studying academic topics can at times be as exciting as a good novel or movie.	1.205	0.030	20.564	0.619**	0.384**
D4 I work hard at my studies because I find the material interesting.	1.440	0.029	27.887	0.803**	0.644**
D5 I come to most classes with questions in mind that I want answering.	0.498	0.042	7.332	0.306**	0.094**
D6 I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied.	0.787	0.036	13.090	0.474**	0.225**
D7 I find most new topics interesting and often spend extra time trying to obtain more information about them.	1.383	0.030	24.254	0.720**	0.519**
D8 I test myself on important topics until I understand them completely.	1.174	0.033	19.527	0.648**	0.420**
D9 I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.	1.138	0.031	20.059	0.613**	0.375**
D10 I make a point of looking at most of the suggested readings that go with the lectures.	1.135	0.030	21.090	0.638**	0.407**

** $p < 0.01$, * $p < 0.05$



** $p < 0.01$

$\chi^2 = 30.50$, $df = 23$, $\chi^2/df = 1.33$, p-value = 0.14, RMSEA = 0.03, CFI = 1.00, TLI = 0.99, SRMR = 0.02

Figure 4.1 Measurement Model of Deep Approach to Learning (DA)

The results of confirmatory factor analysis for deep approach to learning showed that D4 *"I work hard at my studies because I find the material interesting"* mostly represented deep approach to learning concept (β = 0.803, $p < .01$), followed by D7 *"I find most new topics interesting and often spend extra time trying to obtain more information about them"* (β = 0.720, $p < .01$), and D8 *"I test myself on important topics until I understand them completely"* (β = 0.648, $p < .01$), respectively. The percentage of variation in deep approach to learning that can be explained by variation in the ten variables is from 9.40 to 64.40 percent (see Table 4.10 and Figure 4.1).

4.5.2 Measurement Model of Mastery-Approach Goal

Mastery-Approach Goal (MAG) composed of three observed variables. Bartlett's Test of Sphericity of MAG showed χ^2= 342.055 (df= 3, p-value = .000) and its Kaiser-Mayer-Olkin (KMO) was .674 (see Appendix M). The both values are acceptable and suitable for confirmatory factor analysis.

Table 4.11 Goodness of fit of Mastery-Approach Goal

Goodness of Fit Indices	Recommended criteria	Results	Pass/ Not pass
1. Chi-Square (χ^2)	p-value > 0.05	1.00	Pass
2. χ^2/df	< 2.00	0.00	Pass
3. RMSEA	< 0.07	0.00	Pass
4. CFI	> 0.95	1.00	Pass
5. TLI	> 0.95	1.01	Pass
6. SRMR	< 0.08	0.00	Pass

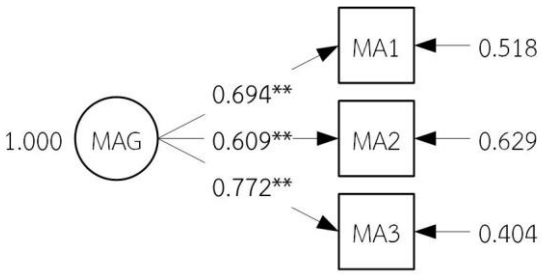
χ^2= 0.00, df= 1, χ^2/df= 0.00, p-value = 1.00, RMSEA = 0.00, CFI = 1.00, TLI = 1.01, SRMR = 0.00

The confirmatory factor analysis testing of model fit for mastery-approach goal with empirical data showed consistency with χ^2= 0.00, df= 1, χ^2/df= 0.00, p-value = 1.00, RMSEA = 0.00, CFI = 1.00, TLI = 1.01, SRMR = 0.00 as shown in Table 4.11. All the fit indices passed the recommended criteria (Hooper et al., 2008; Makmee, 2016).

Table 4.12 Test of confirmatory factor analysis of Mastery-Approach Goal

Components of Measurement Model	Factor Loading Matrix				R^2
	b	S.E.	β / S.E.	β	
MA1 My goal is to fully understand the contents taught in class.	1.000	0.037	18.993	0.694**	0.482**
MA2 My goal is to learn as much as I can.	0.997	0.027	22.150	0.609**	0.371**
MA3 I try very hard to understand as deep as possible in this subject matter.	1.146	0.036	21.596	0.772**	0.596**

** p < 0.01



** $p < 0.01$

χ^2= 0.00, df= 1, χ^2/df= 0.00, *p*-value = 1.00, RMSEA = 0.00, CFI = 1.00, TLI = 1.01, SRMR = 0.00

Figure 4.2 Measurement Model of Mastery-Approach Goal

The results of confirmatory factor analysis for mastery-approach goal showed that MA3 *"I try very hard to understand as deep as possible in this subject matter"* mostly represented mastery-approach goal concept (β = .772, $p < .01$). The percentage of variation in mastery-approach goal that can be explained by variation in the three variables is from 37.10 to 59.60 percent (see Table 4.12 and Figure 4.2).

4.5.3 Measurement Model of Performance-Approach Goal

Performance-Approach Goal (PAG) composed of three observed variables. Bartlett's Test of Sphericity of PAG showed χ^2= 413.760 (df= 3, *p*-value = .000) and its Kaiser-Mayer-Olkin (KMO) was .692 (see Appendix M). The both values are acceptable and suitable for confirmatory factor analysis.

Table 4.13 Goodness of fit of Performance-Approach Goal

Goodness of Fit Indices	Recommended criteria	Results	Pass/ Not pass
1. Chi-Square (χ^2)	*p*-value > 0.05	0.99	Pass
2. χ^2/df	< 2.00	0.00	Pass
3. RMSEA	< 0.07	0.00	Pass
4. CFI	> 0.95	1.00	Pass
5. TLI	> 0.95	1.01	Pass
6. SRMR	< 0.08	0.00	Pass

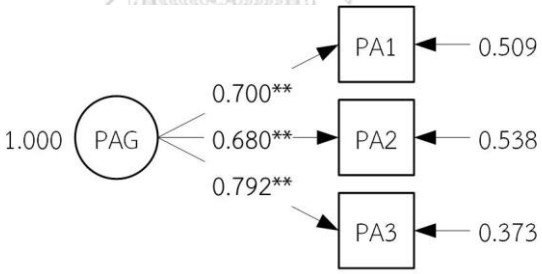
χ^2= 0.00, df= 1, χ^2/df= 0.00, p-value = 0.99, RMSEA = 0.00, CFI = 1.00, TLI = 1.01, SRMR = 0.00

The confirmatory factor analysis testing of model fit for performance-approach goal with empirical data showed consistency with χ^2= 0.00, df= 1, χ^2/df= 0.00, *p*-value = 0.99, RMSEA = 0.00, CFI = 1.00, TLI = 1.01, SRMR = 0.00 as shown in Table 4.13. All the fit indices passed the recommended criteria (Hooper et al., 2008; Makmee, 2016).

Table 4.14 Test of confirmatory factor analysis of Performance-Approach Goal

Components of Measurement Model	**Factor Loading Matrix**				R^2
	b	S.E.	β / S.E.	β	
PA1 I am determined to do well when compared to other students.	1.000	0.033	21.507	0.700**	0.491**
PA2 My goal is to behave well when compared to other students.	0.961	0.022	30.498	0.680**	0.462**
PA3 My goal is to produce a better work than other students.	1.143	0.030	26.039	0.792**	0.627**

** $p < 0.01$



** $p < 0.01$

χ^2= 0.00, df= 1, χ^2/df= 0.00, *p*-value = 0.99, RMSEA = 0.00, CFI = 1.00, TLI = 1.01, SRMR = 0.00

Figure 4.3 Measurement Model of Performance-Approach Goal (PAG)

The results of confirmatory factor analysis for performance-approach goal showed that PA3 *"My goal is to produce a better work than other students"* mostly represented performance-approach goal concept (β = .792, $p < .01$). The percentage of variation in

performance-approach goal that can be explained by variation in the three variables is from 46.20 to 62.70 percent (see Table 4.14 and Figure 4.3).

4.5.4 Measurement Model of Performance-Avoidance Goal

Performance-Avoidance Goal (PVG) composed of three observed variables. Bartlett's Test of Sphericity of PVG showed χ^2= 475.992 (df= 3, *p*-value = .000) and its Kaiser-Mayer-Olkin (KMO) was .672 (see Appendix M). The both values are acceptable and suitable for confirmatory factor analysis.

Table 4.15 Goodness of fit of Performance-Avoidance Goal

Goodness of Fit Indices	Recommended criteria	Results	Pass/ Not pass
1. Chi-Square (χ^2)	*p*-value > 0.05	0.99	Pass
2. χ^2/df	< 2.00	0.00	Pass
3. RMSEA	< 0.07	0.00	Pass
4. CFI	> 0.95	1.00	Pass
5. TLI	> 0.95	1.01	Pass
6. SRMR	< 0.08	0.00	Pass

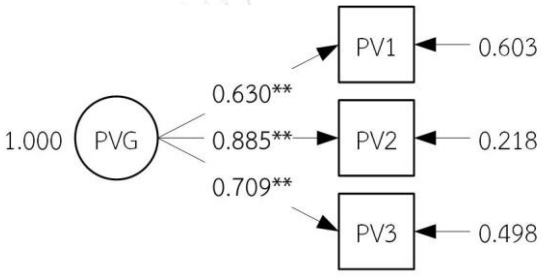
χ^2= 0.00, df= 1, χ^2/df= 0.00, p-value = 0.99, RMSEA = 0.00, CFI = 1.00, TLI = 1.01, SRMR = 0.00

The confirmatory factor analysis testing of model fit for performance-avoidance goal with empirical data showed consistency with χ^2= 0.00, df= 1, χ^2/df= 0.00, *p*-value = 0.99, RMSEA = 0.00, CFI = 1.00, TLI = 1.01, SRMR = 0.00 as shown in Table 4.15. All the fit indices passed the recommended criteria (Hooper et al., 2008; Makmee, 2016).

Table 4.16 Test of confirmatory factor analysis of Performance-Avoidance Goal

Components of Measurement Model	**Factor Loading Matrix**				R^2
	b	S.E.	β / S.E.	β	
PV1 My goal is to avoid having bad work when compared to other students.	1.000	0.025	24.784	0.630**	0.397**
PV2 I try hard to avoid producing worse work than others.	1.474	0.028	31.378	0.885**	0.782**
PV3 My goal is to avoid producing worse work than other students.	1.170	0.031	22.908	0.709**	0.502**

** $p < 0.01$



** $p < 0.01$

$\chi^2 = 0.00$, $df = 1$, $\chi^2/df = 0.00$, p-value = 0.99, RMSEA = 0.00, CFI = 1.00, TLI = 1.01, SRMR = 0.00

Figure 4.4 Measurement Model of Performance-Avoidance Goal (PVG)

The results of confirmatory factor analysis for performance-avoidance goal showed that PV2 *"I try hard to avoid producing worse work than others"* mostly represented performance-avoidance goal concept (β = .885, $p < .01$). The percentage of variation in performance-avoidance goal that can be explained by variation in the three variables is from 39.70 to 78.20 percent (see Table 4.16 and Figure 4.4).

4.5.5 Measurement Model of Appropriate Assessment

Appropriate Assessment (AAS) composed of five observed variables. Bartlett's Test of Sphericity of AAS showed χ^2= 484.028, (df= 10, p-value = .000) and its Kaiser-Mayer-Olkin (KMO) was .768 (see Appendix M). The both values are acceptable and suitable for confirmatory factor analysis.

Table 4.17 Goodness of fit of Appropriate Assessment

Goodness of Fit Indices	Recommended criteria	Results	Pass/ Not pass
1. Chi-Square (χ^2)	p-value > 0.05	0.18	Pass
2. χ^2/df	< 2.00	1.43	Pass
3. RMSEA	< 0.07	0.03	Pass
4. CFI	> 0.95	0.99	Pass
5. TLI	> 0.95	0.99	Pass
6. SRMR	< 0.08	0.04	Pass

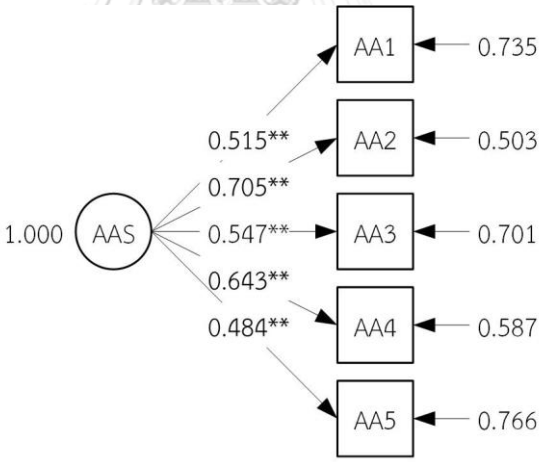
χ^2= 11.46, df= 8, χ^2/df= 1.43, p-value = 0.18, RMSEA = 0.03, CFI = 0.99, TLI = 0.99, SRMR = 0.04

The confirmatory factor analysis testing of model fit for appropriate assessment with empirical data showed consistency with χ^2= 11.46, df= 8, χ^2/df= 1.43, p-value = 0.18, RMSEA = 0.03, CFI = 0.99, TLI = 0.99, SRMR = 0.04 as shown in Table 4.17. All the fit indices passed the recommended criteria (Hooper et al., 2008; Makmee, 2016).

Table 4.18 Test of confirmatory factor analysis of Appropriate Assessment

Components of Measurement Model	**Factor Loading Matrix**				R^2
	b	S.E.	β / S.E.	β	
AA1 To do well in this course all you really needed was a good memory.	1.000	0.034	15.115	0.515**	0.265**
AA2 The staff seemed more interested in testing what I had memorized than what I had understood.	1.670	0.021	34.177	0.705**	0.497**
AA3 Too many staff asked me questions just about facts.	1.196	0.032	17.259	0.547**	0.299**
AA4 I found that most exam questions asking too much details from the course contents.	1.370	0.025	25.232	0.643**	0.413**
AA5 I notified that if my answers are not exactly fit with the course materials provided, I will get less marks.	0.902	0.038	12.653	0.484**	0.234**

** $p < 0.01$



** $p < 0.01$

χ^2= 11.46, df= 8, χ^2/df= 1.43, p-value = 0.18, RMSEA = 0.03, CFI = 0.99, TLI = 0.99, SRMR = 0.04

Figure 4.5 Measurement Model of Appropriate Assessment (AAS)

The results of confirmatory factor analysis for appropriate assessment showed that *AA2 "The staff seemed more interested in testing what I had memorized than what I had understood"* mostly represented appropriate assessment concept (β = .705, $p < .01$).

The percentage of variation in appropriate assessment that can be explained by variation in the five variables is from 23.40 to 49.70 percent (see Table 4.18 and Figure 4.5).

4.5.6 Measurement Model of Appropriate Workload

Appropriate Workload (AWL) composed of four observed variables. Bartlett's Test of Sphericity of AWL showed χ^2= 899.195, (df= 6, p-value = .000) and its Kaiser-Mayer-Olkin (KMO) was .778 (see Appendix M). The both values are acceptable and suitable for confirmatory factor analysis.

Table 4.19 Goodness of fit of Appropriate Workload

Goodness of Fit Indices	Recommended criteria	Results	Pass/ Not pass
1. Chi-Square (χ^2)	p-value > 0.05	0.92	Pass
2. χ^2/df	< 2.00	0.29	Pass
3. RMSEA	< 0.07	0.00	Pass
4. CFI	> 0.95	1.00	Pass
5. TLI	> 0.95	1.01	Pass
6. SRMR	< 0.08	0.01	Pass

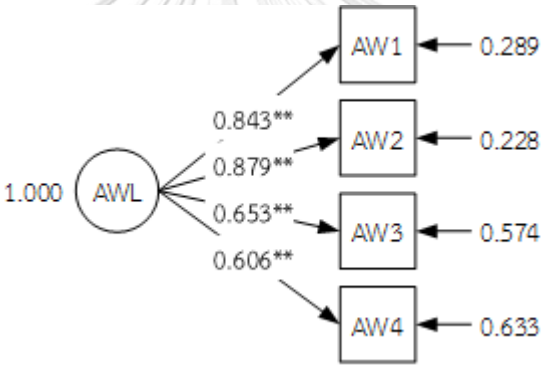
χ^2= 1.47, df= 5, χ^2/df= 0.29, p-value = 0.92, RMSEA = 0.00, CFI = 1.00, TLI = 1.01, SRMR = 0.01

The confirmatory factor analysis testing of model fit for appropriate workload with empirical data showed consistency with χ^2= 1.47, df= 5, χ^2/df= 0.29, p-value = 0.92, RMSEA = 0.00, CFI = 1.00, TLI = 1.01, SRMR = 0.01 as shown in Table 4.19. All the fit indices passed the recommended criteria (Hooper et al., 2008; Makmee, 2016).

Table 4.20 Test of confirmatory factor analysis of Appropriate Workload

Components of Measurement Model	**Factor Loading Matrix**				R^2
	b	S.E.	β / S.E.	β	
AW1 The sheer volume of work to be got through in this course meant it couldn't all be thoroughly comprehended.	1.000	0.010	82.112	0.843**	0.711**
AW2 The workload was too heavy.	1.035	0.008	111.950	0.879**	0.772**
AW3 Many individual and group works are assigned to me and their due dates are in the same periods of time.	0.802	0.023	28.174	0.653**	0.426**
AW4 I usually spend my personal time after classes with loads of assignments.	0.682	0.026	23.207	0.606**	0.367**

** $p < 0.01$



** $p < 0.01$

$\chi^2 = 1.47$, $df = 5$, $\chi^2/df = 0.29$, p-value = 0.92, RMSEA = 0.00, CFI = 1.00, TLI = 1.01, SRMR = 0.01

Figure 4.6 Measurement Model of Appropriate Workload (AWL)

The results of confirmatory factor analysis for appropriate workload showed that AW2 *"The workload was too heavy"* mostly represented appropriate workload concept (β = .879, $p < .01$). The percentage of variation in appropriate workload that can be explained by variation in the four variables is from 36.70 to 77.20 percent (see Table 4.20 and Figure 4.6).

4.5.7 Measurement Model of Personalization

Personalization (PER) composed of seven observed variables. Bartlett's Test of Sphericity of PER showed χ^2= 1266.967, (df= 21, p-value = .000) and its Kaiser-Mayer-Olkin (KMO) was .868 (see Appendix M). The both values are acceptable and suitable for confirmatory factor analysis.

Table 4.21 Goodness of fit of Personalization

Goodness of Fit Indices	Recommended criteria	Results	Pass/ Not pass
1. Chi-Square (χ^2)	p-value > 0.05	0.08	Pass
2. χ^2/df	< 2.00	1.54	Pass
3. RMSEA	< 0.07	0.03	Pass
4. CFI	> 0.95	0.99	Pass
5. TLI	> 0.95	0.99	Pass
6. SRMR	< 0.08	0.04	Pass

χ^2= 23.09, df= 15, χ^2/df= 1.54, p-value = 0.08, RMSEA = 0.03, CFI = 0.99, TLI = 0.99, SRMR = 0.04

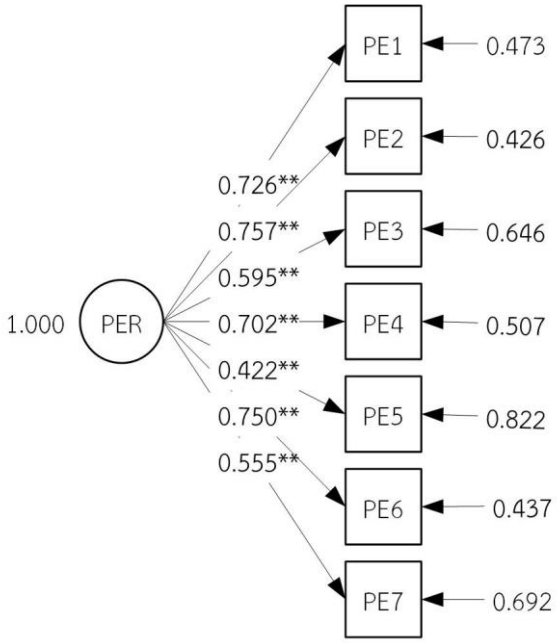
The confirmatory factor analysis testing of model fit for personalization with empirical data showed consistency with χ^2= 23.09, df= 15, χ^2/df= 1.54, p-value = 0.08, RMSEA = 0.03, CFI = 0.99, TLI = 0.99, SRMR = 0.04 as shown in Table 4.21. All the fit indices passed the recommended criteria (Hooper et al., 2008; Makmee, 2016).

Table 4.22 Test of confirmatory factor analysis of Personalization

Components of Measurement Model	Factor Loading Matrix				R^2
	b	S.E.	β / S.E.	β	
PE1 The instructor considers my feelings.	1.000	0.018	39.411	0.726**	0.527**
PE2 The instructor is friendly and talks to me.	1.016	0.016	46.000	0.757**	0.574**
PE3 The instructor goes out of his/her way to help me.	0.780	0.027	21.705	0.595**	0.354**
PE4 The instructor helps me when I am having trouble with my work.	0.914	0.020	35.162	0.702**	0.493**
PE5 The instructor moves around the classroom to talk with me.	0.723	0.038	11.197	0.422**	0.178**

PE6 The instructor is interested in my problems.	0.972	0.017	44.354	0.750**	0.563**
PE7 The instructor is unfriendly and inconsiderate towards me.	0.747	0.031	18.040	0.555**	0.308**

** $p < 0.01$



** $p < 0.01$

χ^2 = 23.09, df = 15, χ^2/df = 1.54, p-value = 0.08, RMSEA = 0.03, CFI = 0.99, TLI = 0.99, SRMR = 0.04

Figure 4.7 Measurement Model of Personalization (PER)

The results of confirmatory factor analysis for personalization showed that PE2 *"The instructor is friendly and talks to me"* mostly represented personalization concept (β = .757, $p < .01$), followed by PE6 *"The instructor is interested in my problems"* (β =.750, $p < .01$), and PE1 *"The instructor considers my feelings"* (β =.726, $p < .01$), respectively. The percentage of variation in personalization that can be explained by variation in the seven variables is from 17.80 to 57.40 percent (see Table 4.22 and Figure 4.7).

4.5.8 Measurement Model of Innovation

Innovation (INN) composed of five observed variables. Bartlett's Test of Sphericity of INN showed χ^2= 1121.226 (df= 10, p-value = .000) and its Kaiser-Mayer-Olkin (KMO) was .855 (see Appendix M). The both values are acceptable and suitable for confirmatory factor analysis.

Table 4.23 Goodness of fit of Innovation

Goodness of Fit Indices	Recommended criteria	Results	Pass/ Not pass
1. Chi-Square (χ^2)	p-value > 0.05	0.12	Pass
2. χ^2/df	< 2.00	1.76	Pass
3. RMSEA	< 0.07	0.04	Pass
4. CFI	> 0.95	1.00	Pass
5. TLI	> 0.95	0.99	Pass
6. SRMR	< 0.08	0.01	Pass

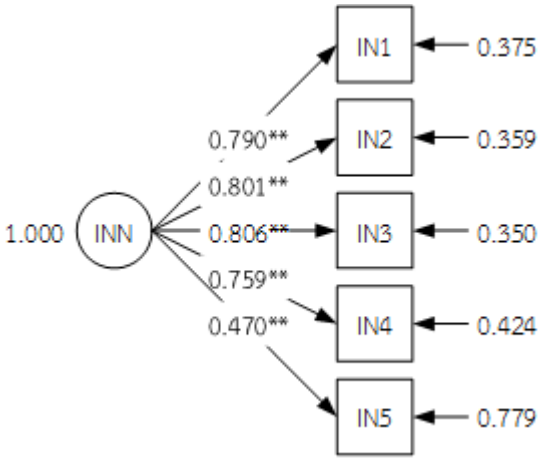
χ^2= 8.79, df= 5, χ^2/df= 1.76, p-value = 0.12, RMSEA = 0.04, CFI = 1.00, TLI = 0.99, SRMR = 0.01

The confirmatory factor analysis testing of model fit for innovation with empirical data showed consistency with χ^2= 8.79, df= 5, χ^2/df= 1.76, p-value = 0.12, RMSEA = 0.04, CFI = 1.00, TLI = 0.99, SRMR = 0.01 as shown in Table 4.23. All the fit indices passed the recommended criteria (Hooper et al., 2008; Makmee, 2016).

Table 4.24 Test of confirmatory factor analysis of Innovation

Components of Measurement Model	Factor Loading Matrix				R^2
	b	S.E	β / S.E.	β	
IN1 My instructor uses new and different ways of teaching in this class.	1.000	0.021	38.303	0.790**	0.625**
IN2 The instructor thinks up innovative activities for me to do.	1.045	0.020	39.664	0.801**	0.641**
IN3 The teaching approaches used in this class are characterized by innovation and variety.	0.990	0.020	40.530	0.806**	0.650**
IN4 The instructor often thinks of unusual activities.	0.916	0.022	33.786	0.759**	0.576**
IN5 I seem to do the same type of activities in every class.	0.573	0.037	12.764	0.470**	0.221**

** p < 0.01



** $p < 0.01$

$\chi^2 = 8.79$, $df = 5$, $\chi^2/df = 1.76$, p-value = 0.12, RMSEA = 0.04, CFI = 1.00, TLI = 0.99, SRMR = 0.01

Figure 4.8 Measurement Model of Innovation (INN)

The results of confirmatory factor analysis for innovation showed that IN3 *"The teaching approaches used in this class are characterized by innovation and variety"* mostly represented innovation concept (β = .806, $p < .01$). The percentage of variation in innovation that can be explained by variation in the five variables is from 22.10 to 65.00 percent (see Table 4.24 and Figure 4.8).

4.5.9 Measurement Model of Task Orientation

Task Orientation (TOT) composed of seven observed variables. Bartlett's Test of Sphericity of TOT showed $\chi^2 = 593.454$, ($df = 21$, p-value = .000) and its Kaiser-Mayer-Olkin (KMO) was .804 (see Appendix M). The both values are acceptable and suitable for confirmatory factor analysis.

Table 4.25 Goodness of fit of Task Orientation

Goodness of Fit Indices	Recommended criteria	Results	Pass/ Not pass
1. Chi-Square (χ^2)	*p*-value > 0.05	0.07	Pass
2. χ^2/df	< 2.00	1.50	Pass
3. RMSEA	< 0.07	0.03	Pass
4. CFI	> 0.95	0.98	Pass
5. TLI	> 0.95	0.98	Pass
6. SRMR	< 0.08	0.03	Pass

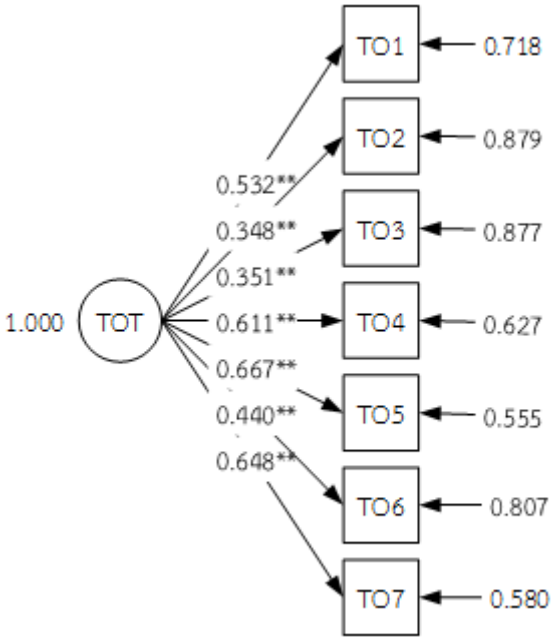
χ^2= 30.02, df= 20, χ^2/df= 1.50, *p*-value = 0.07, RMSEA = 0.03, CFI = 0.98, TLI = 0.98, SRMR = 0.03

The confirmatory factor analysis testing of model fit for task orientation with empirical data showed consistency with χ^2= 30.02, df= 20, χ^2/df= 1.50, *p*-value = 0.07, RMSEA = 0.03, CFI = 0.98, TLI = 0.98, SRMR = 0.03 as shown in Table 4.25. All the fit indices passed the recommended criteria (Hooper et al., 2008; Makmee, 2016).

Table 4.26 Test of confirmatory factor analysis of Task Orientation

Components of Measurement Model	Factor Loading Matrix				R^2
	b	S.E.	β / S.E.	β	
TO1 I know exactly what has to be done in this class.	1.000	0.032	16.468	0.532**	0.282**
TO2 Getting a certain amount of work done is important in the class.	0.637	0.042	8.277	0.348**	0.121**
TO3 I often get sidetracked in this class instead of sticking to the point.	0.650	0.042	8.282	0.351**	0.123**
TO4 This class is always disorganized.	1.441	0.027	22.461	0.611**	0.373**
TO5 Class assignments are clear and I know what to do.	1.308	0.023	28.715	0.667**	0.445**
TO6 This class seldom starts on time.	1.011	0.038	11.610	0.440**	0.193**
TO7 Activities in this class are clearly and carefully planned.	1.236	0.025	26.419	0.648**	0.420**

** p < 0.01



** $p < 0.01$

$\chi^2 = 30.02$, $df = 20$, $\chi^2/df = 1.50$, p-value = 0.07, RMSEA = 0.03, CFI = 0.98, TLI = 0.98, SRMR = 0.03

Figure 4.9 Measurement Model of Task Orientation (TOT)

The results of confirmatory factor analysis for task orientation showed that TO5 *"Class assignments are clear and I know what to do"* mostly represented task orientation concept (β = 0.667, $p < .01$), followed by TO7 *"Activities in this class are clearly and carefully planned"* (β =0.648, $p < .01$), and TO4 *"This class is always disorganized"* (β =.611, $p < .01$), respectively. The percentage of variation in task orientation that can be explained by variation in the seven variables is from 12.10 to 44.50 percent (see Table 4.26 and Figure 4.9).

4.5.10 Measurement Model of Cooperation

Cooperation (COP) composed of seven observed variables. Bartlett's Test of Sphericity of COP showed $\chi^2 = 1221.085$, ($df = 21$, p-value = .000) and its Kaiser-Mayer-Olkin (KMO) was .883 (see Appendix M). The both values are acceptable and suitable for confirmatory factor analysis.

Table 4.27 Goodness of fit of Cooperation

Goodness of Fit Indices	Recommended criteria	Results	Pass/ Not pass
1. Chi-Square (χ^2)	*p*-value > 0.05	0.26	Pass
2. χ^2/df	< 2.00	1.18	Pass
3. RMSEA	< 0.07	0.02	Pass
4. CFI	> 0.95	1.00	Pass
5. TLI	> 0.95	1.00	Pass
6. SRMR	< 0.08	0.02	Pass

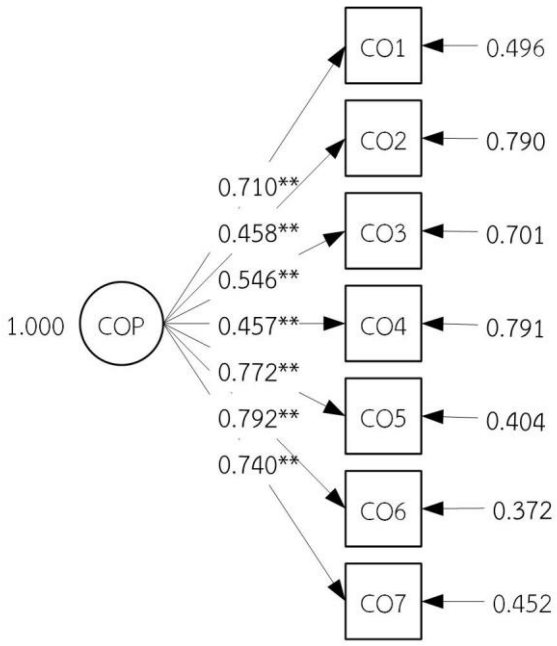
χ^2= 23.64, df= 20, χ^2/df= 1.18, *p*-value = 0.26, RMSEA = 0.02, CFI = 1.00, TLI = 1.00, SRMR = 0.02

The confirmatory factor analysis testing of model fit for cooperation with empirical data showed consistency with χ^2= 23.64, df= 20, χ^2/df= 1.18, *p*-value = 0.26, RMSEA = 0.02, CFI = 1.00, TLI = 1.00, SRMR = 0.02 as shown in Table 4.27. All the fit indices passed the recommended criteria (Hooper et al., 2008; Makmee, 2016).

Table 4.28 Test of confirmatory factor analysis of Cooperation

Components of Measurement Model	Factor Loading Matrix				R^2
	b	S.E.	β / S.E.	β	
CO1 I cooperate with other students when doing assignment work.	1.000	0.019	36.555	0.710**	0.504**
CO2 I share my books and resources with other students when doing assignments.	0.635	0.035	13.254	0.458**	0.210**
CO3 I work with other students on projects in this class.	0.987	0.030	18.415	0.546**	0.299**
CO4 I learn from other students in this class.	0.769	0.035	13.199	0.457**	0.209**
CO5 I work with other students in this class.	1.243	0.015	50.702	0.772**	0.596**
CO6 I cooperate with other students on class activities.	1.150	0.014	57.427	0.792**	0.628**
CO7 Students work with me to achieve class goals.	1.025	0.017	42.573	0.740**	0.548**

** p < 0.01



** $p < 0.01$

$\chi^2 = 23.64$, $df = 20$, $\chi^2/df = 1.18$, p-value = 0.26, RMSEA = 0.02, CFI = 1.00, TLI = 1.00, SRMR = 0.02

Figure 4.10 Measurement Model of Cooperation (COP)

The results of confirmatory factor analysis for cooperation showed that CO6 *"I cooperate with other students on class activities"* mostly represented cooperation concept (β = .792, $p < .01$), followed by CO5 *"I work with other students in this class*" (β = .772, $p < .01$), and CO7 *"Students work with me to achieve class goals"* (β = .740, $p < .01$), respectively. The percentage of variation in cooperation that can be explained by variation in the seven variables is from 20.90 to 62.80 percent (see Table 4.28 and Figure 4.10).

4.5.11 Measurement Model of Individualization

Individualization (IND) composed of six observed variables. Bartlett's Test of Sphericity of IND showed $\chi^2 = 669.922$ ($df = 15$, p-value = .000) and its Kaiser-Mayer-

Olkin (KMO) was .756 (see Appendix M). The both values are acceptable and suitable for confirmatory factor analysis.

Table 4.29 Goodness of fit of Individualization

Goodness of Fit Indices	Recommended criteria	Results	Pass/ Not pass
1. Chi-Square (χ^2)	*p*-value > 0.05	0.37	Pass
2. χ^2/df	< 2.00	1.08	Pass
3. RMSEA	< 0.07	0.01	Pass
4. CFI	> 0.95	1.00	Pass
5. TLI	> 0.95	1.00	Pass
6. SRMR	< 0.08	0.03	Pass

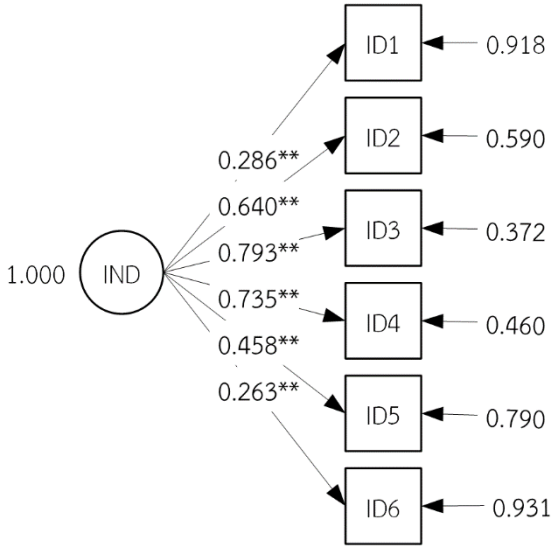
χ^2= 14.04, df= 13, χ^2/df= 1.08, *p*-value = 0.37, RMSEA = 0.01, CFI = 1.00, TLI = 1.00, SRMR = 0.03

The confirmatory factor analysis testing of model fit for individualization with empirical data showed consistency with χ^2= 14.04, df= 13, χ^2/df= 1.08, p-value = 0.37, RMSEA = 0.01, CFI = 1.00, TLI = 1.00, SRMR = 0.03 as shown in Table 4.29. All the fit indices passed the recommended criteria (Hooper et al., 2008; Makmee, 2016).

Table 4.30 Test of confirmatory factor analysis of Individualization

Components of Measurement Model	Factor Loading Matrix				R^2
	b	S.E.	β / S.E.	β	
ID1 I am expected to do the same work as all the students in the class, in the same way and in the same time.	1.000	0.043	6.602	0.286**	0.082**
ID2 I am generally allowed to work at my own pace in this class.	2.163	0.025	26.017	0.640**	0.410**
ID3 I am allowed to choose activities and how I will work.	2.950	0.014	56.687	0.793**	0.628**
ID4 Teaching approaches in this class allow me to proceed at my own pace.	2.524	0.018	40.653	0.735**	0.540**
ID5 I have little opportunity to pursue my particular interests in this class.	1.673	0.036	12.819	0.458**	0.210**
ID6 My instructor decides what I will do in this class.	0.831	0.044	5.902	0.263**	0.069**

** p < 0.01



** $p < 0.01$

χ^2 = 14.04, df = 13, χ^2/df = 1.08, p-value = 0.37, RMSEA = 0.01, CFI = 1.00, TLI = 1.00, SRMR = 0.03

Figure 4.11 Measurement Model of Individualization (IND)

The results of confirmatory factor analysis for individualization showed that ID3 *"I am allowed to choose activities and how I will work"* mostly represented individualization concept (β = 0.793, $p < .01$), followed by ID4 *"Teaching approaches in this class allow me to proceed at my own pace"* (β = 0.735, $p < .01$), and ID2 *"I am generally allowed to work at my own pace in this class"* (β = .640, $p < .01$), respectively. The percentage of variation in individualization that can be explained by variation in the six variables is from 6.90 to 62.80 percent (see Table 4.30 and Figure 4.11).

4.6 Multilevel Confirmatory Factor Analysis of Deep Approach to Learning

Validating the multilevel model, intraclass correlation coefficient (ICC) should be highly considered. This was because it can be explained the proportion of cluster variance to total variance (i.e., cluster plus individual variance). Generally, ICC should be equal or higher than .05 (Ntoumanis & Myers, 2016; Snijders & Bosker, 2011). In this model, ICCs were ranged from .05 to .25, which are all acceptable (see Appendix N). The model fit testing of multilevel confirmatory factor analysis for deep approach to learning with empirical data showed consistency with χ^2= 71.88, df= 66, χ^2/df= 1.09, *p*-value = 0.29, RMSEA = 0.01, CFI = 1.00, TLI = 1.00, SRMRw = 0.03, and SRMRb = 0.10 as shown in Table 4.31. Most of the fit indices passed the recommended criteria (Hooper et al., 2008; Makmee, 2016). For SRMRb, its value is .10 which is higher than the recommended criteria, however; the higher values can be accepted as fit by Fackler and Malmberg (2016) and Iacobucci (2010).

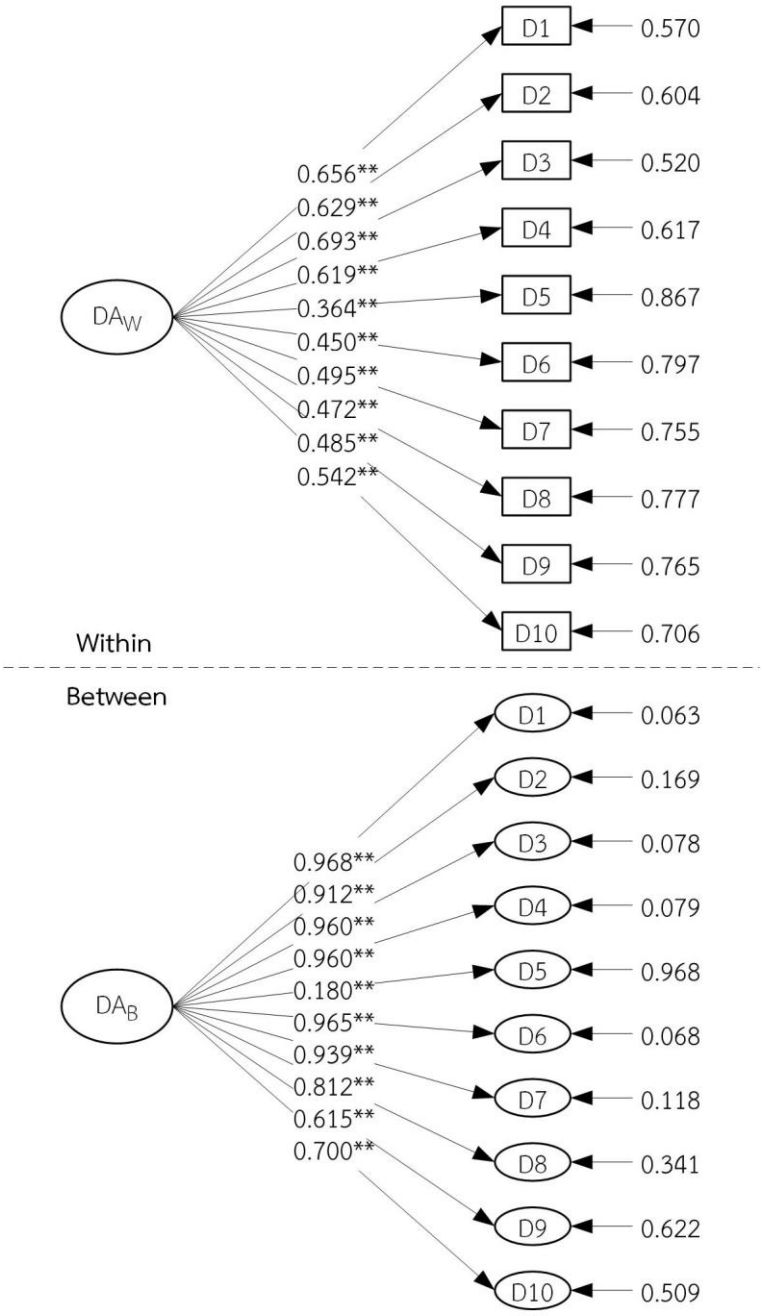
Table 4.31 Goodness of Fit of Multilevel confirmatory factor analysis of deep approach to learning

Goodness of Fit Indices	Recommended criteria	Results	Pass/ Not pass
1. Chi-Square (χ^2)	*p*-value > 0.05	0.29	Pass
2. χ^2/df	< 2.00	1.09	Pass
3. RMSEA	< 0.07	0.01	Pass
4. CFI	> 0.95	1.00	Pass
5. TLI	> 0.95	1.00	Pass
6. SRMRw	< 0.08	0.03	Pass
7. SRMRb	< 0.08	0.10	Not Pass

χ^2= 71.88, df= 66, χ^2/df= 1.09, p-value = 0.29, RMSEA = 0.01, CFI = 1.00, TLI = 1.00, SRMRw = 0.03, SRMRb = 0.10

At within level, D3 *"I find that studying academic topics can at times be as exciting as a good novel or movie"* had the highest factor loading (β = .693, *p* –value < .01), followed by D1 *"I find that at times studying gives me a feeling of deep personal satisfaction"* (β = .656, *p* –value < .01), and D2 *"I feel that virtually any topic can be highly interesting one I get into it"* (β = .629, *p* –value < .01), respectively. The lowest factor loading belongs to D5 *"I come to most classes with questions in mind that I want answering"* (β = .364, *p* –value < .01). Coefficient of determination (R-Squared; R^2) of DA components at within-level were ranged from .133 to .480 at *p*-value < .01. This means that variation in deep approach to learning can be explained by variation in the ten variables from 13.30 to 48.00 percent (see Figure 4.12 and Appendix N).

At between level, D1 *"I find that at times studying gives me a feeling of deep personal satisfaction"* had the highest factor loading (β = .968, *p* –value < .01), followed by D6 *"I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied"* (β = .965, *p* –value < .01), and D3 *"I find that studying academic topics can at times be as exciting as a good novel or movie"* (β = .960, *p* –value < .01), respectively. The lowest factor loading belongs to D5 *"I come to most classes with questions in mind that I want answering"* (β = .180, *p* –value < .01). Coefficient of determination (R-Squared; R^2) of DA components at between-level were ranged from .032 to .937 at *p*-value < .01. This means that variation in deep approach to learning can be explained by variation in the observed ten variables from 3.2 to 93.7 percent (see Figure 4.12 and Appendix N).



** $p < 0.01$

$\chi^2 = 71.88$, $df = 66$, $\chi^2/df = 1.09$, p-value = 0.29, RMSEA = 0.01, CFI = 1.00, TLI = 1.00, SRMRw = 0.03, SRMRb = 0.10

Figure 4.12 Measurement Model of Multilevel Confirmatory Factor Analysis of Deep Approach to Learning

4.7 Validation of Structural Equation Modeling between hypothesized model and empirical data

4.7.1 Within Level

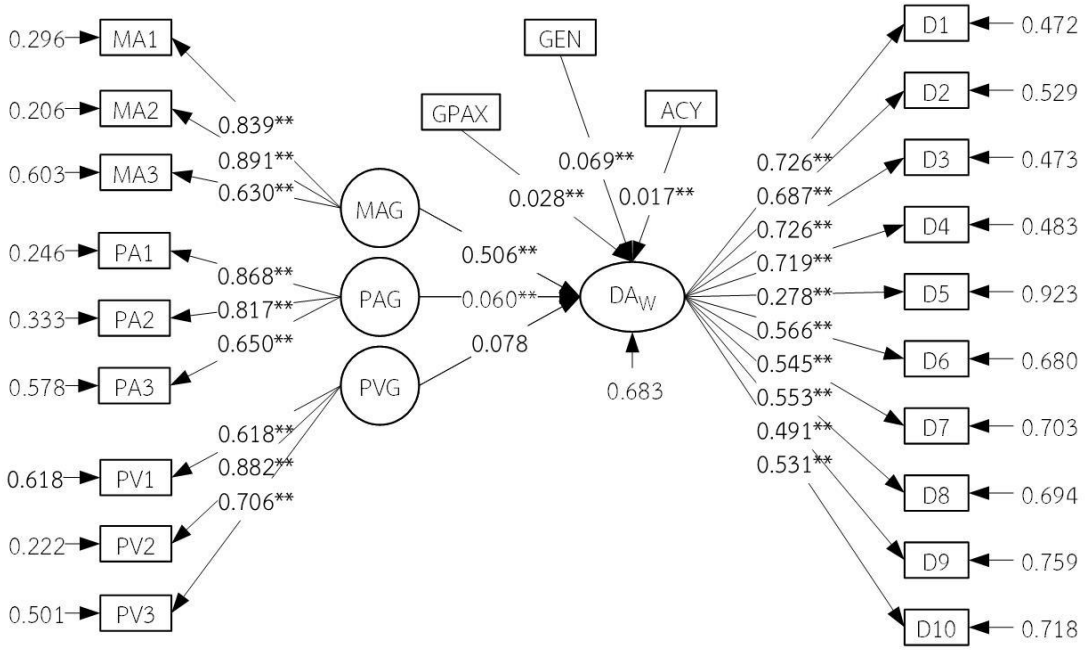
The effects of influencing factors from within-level or student-level on pharmacy students' deep approach to learning were considered to analyze as a structural equation model (SEM). The hypothesized model was validated with empirical data by M*plus* 7.4 program. The analyzing results were shown in Table 4.32, Figure 4.13, and Appendix O.

Table 4.32 Goodness of Fit of Structural Equation Modeling of Deep Approach to Learning at Within Level

Goodness of Fit Indices	Recommended criteria	Results	Pass/ Not pass
1. Chi-Square (χ^2)	*p*-value > 0.05	0.05	Pass
2. χ^2/df	< 2.00	1.17	Pass
3. RMSEA	< 0.07	0.02	Pass
4. CFI	> 0.95	0.99	Pass
5. TLI	> 0.95	0.99	Pass
6. SRMR	< 0.08	0.04	Pass

χ^2= 221.92, df= 189, χ^2/df= 1.17, *p*-value = 0.05, RMSEA = 0.02, CFI = 0.99, TLI = 0.99, SRMR = 0.04

The testing of model fit with empirical data showed consistency with χ^2= 221.92, df= 189, χ^2/df= 1.17, *p*-value = 0.05, RMSEA = 0.02, CFI = 0.99, TLI = 0.99, and SRMR = 0.04 as shown in Table 4.32. All the fit indices passed the recommended criteria (Hooper et al., 2008; Makmee, 2016).



** $p < 0.01$

$\chi^2 = 221.92$, $df = 189$, $\chi^2/df = 1.17$, p-value = 0.05, RMSEA = 0.02, CFI = 0.99, TLI = 0.99, SRMR = 0.04

Figure 4.13 Measurement Model of Structural Equation Modeling of Deep Approach to Learning at Within Level

Deep approach to learning (DA) composed of ten observed variables. The first highest standardized coefficient belongs to D1 *"I find that at times studying gives me a feeling of deep personal satisfaction"* (β = .726, p –value < .01), followed by D3 *"I find that studying academic topics can at times be as exciting as a good novel or movie"* (β = .726, p –value < .01), and D4 *"I work hard at my studies because I find the material interesting"* (β = .719, p –value < .01), respectively. The lowest factor loading belongs to D5 *"I come to most classes with questions in mind that I want answering"* (β = .278, p –value < .01). Coefficients of determination (R-Squared; R^2) of DA components were ranged from .077 to .528 at p-value < .01. This means that variation in deep approach

to learning can be explained by variation in the ten variables from 7.70 to 52.80 percent as shown in Figure 4.13 and Appendix O.

Achievement goal orientation can be separated into three components which were mastery-approach goal, performance-approach goal, and performance-avoidance goal. They had influences on pharmacy students' deep approach to learning. Mastery-Approach Goal (MAG) composed of three observed variables. The highest standardized coefficient belongs to MA2 *"My goal is to learn as much as I can"* (β = .891, $p < .01$). The percentage of variation in mastery-approach goal that can be explained by variation in the three variables is from 39.70 to 79.40 percent. Performance-Approach Goal (PAG) composed of three observed variables. The highest standardized coefficient belongs to PA1 *"I am determined to do well when compared to other students"* (β = .868, $p < .01$). The percentage of variation in performance-approach goal that can be explained by variation in the three variables is from 42.20 to 75.40 percent. The last component, Performance-Avoidance Goal (PVG), also composed of three observed variables. The highest standardized coefficient belongs to PV2 *"I try hard to avoid producing worse work than others"* (β = .882, $p < .01$). The percentage of variation in performance-avoidance goal that can be explained by variation in the three variables is from 38.20 to 77.80 percent (see Figure 4.13 and Appendix O).

Table 4.33 Total, Direct, and Indirect Effect of predictor variables in student-level influenced on deep approach to learning

Variables	Deep Approach to Learning (DA)		
	TE	DE	IE
Gender (GEN)	0.069** (0.003)	0.069** (0.003)	-
Cumulative Grade Point Average (GPAX)	0.028** (0.001)	0.028** (0.001)	-
Academic Year (ACY)	0.017** (0.001)	0.017** (0.001)	-
Mastery-Approach Goal (MAG)	0.506** (0.034)	0.506** (0.034)	-
Performance-Approach Goal (PAG)	0.060** (0.003)	0.060** (0.003)	-
Performance-Avoidance Goal (PVG)	0.078 (0.043)	0.078 (0.043)	-

R^2DA_W = 0.317**

** $p < 0.01$

The analyzing results of structural equation modeling (SEM) for deep approach to learning at within-level showed that mastery-approach goal is the highest total effect (direct effect) on students' deep approach to learning (β = .506, p –value < .01). The predictor variables at student-level accounted for variance of pharmacy students' deep approaches to learning about 31.70% (R^2DA_W = 0.317**) (see Figure 4.13, Table 4.33, and Appendix O).

4.7.2 Between Level

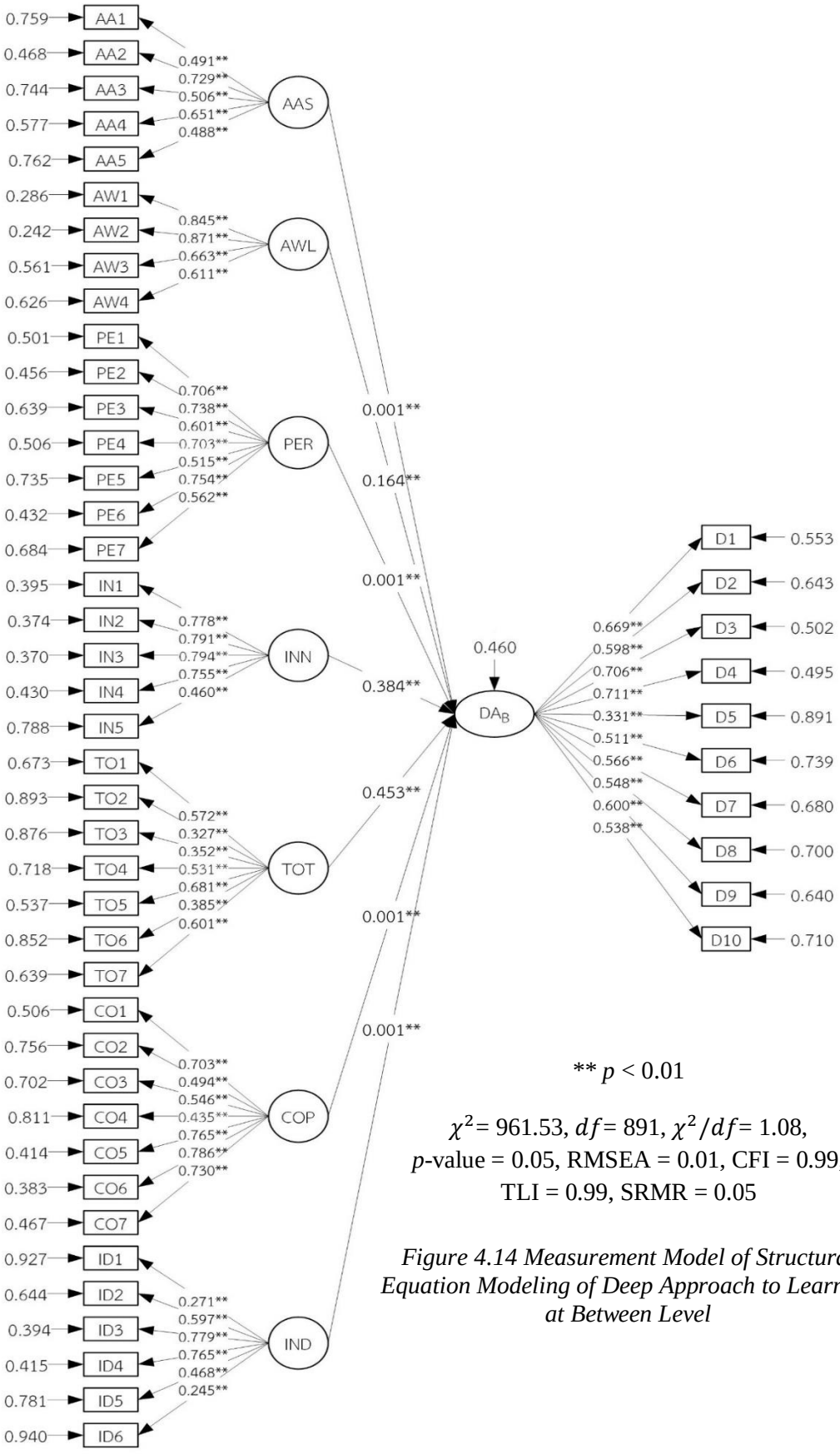
The effects of influencing factors from between-level or course-level on pharmacy students' deep approach to learning were considered to analyze as a structural equation model (SEM). The hypothesized model was validated with empirical data by M*plus* 7.4 program. The analyzing results were shown in Table 4.34, Figure 4.14, and Appendix P.

Table 4.34 Goodness of Fit of Structural Equation Modeling of Deep Approach to Learning at Between Level

Goodness of Fit Indices	**Recommended criteria**	**Results**	**Pass/ Not pass**
1. Chi-Square (χ^2)	*p*-value > 0.05	0.05	Pass
2. χ^2/df	< 2.00	1.08	Pass
3. RMSEA	< 0.07	0.01	Pass
4. CFI	> 0.95	0.99	Pass
5. TLI	> 0.95	0.99	Pass
6. SRMR	< 0.08	0.05	Pass

χ^2= 961.53, df= 891, χ^2/df= 1.08, *p*-value = 0.05, RMSEA = 0.01, CFI = 0.99, TLI = 0.99, SRMR = 0.05

All the fit indices of the model testing with empirical data passed the recommended criteria as shown in Table 4.34 (Hooper et al., 2008; Makmee, 2016).



** $p < 0.01$

χ^2= 961.53, df= 891, χ^2/df= 1.08,
p-value = 0.05, RMSEA = 0.01, CFI = 0.99,
TLI = 0.99, SRMR = 0.05

Figure 4.14 Measurement Model of Structural Equation Modeling of Deep Approach to Learning at Between Level

Deep Approach to Learning (DA) composed of ten observed variables. The highest standardized coefficient belongs to D4 *"I work hard at my studies because I find the material interesting"* (β = .711, *p* –value < .01), followed by D3 *"I find that studying academic topics can at times be as exciting as a good novel or movie"* (β = .706, *p*-value < .01), and D1 *"I find that at times studying gives me a feeling of deep personal satisfaction"* (β = .669, *p* –value < .01), respectively. The lowest factor loading belongs to D5 *"I come to most classes with questions in mind that I want answering"* (β = .331, *p* –value < .01). Coefficients of determination (R-Squared; R^2) of DA components were ranged from .109 to .505 at *p*-value < .01. This means that variation in deep approach to learning can be explained by variation in the ten variables from 10.90 to 50.50 percent as shown in Figure 4.14 and Appendix P.

Influencing factors at course-level were Appropriate Assessment (AAS), Appropriate Workload (AWL), and learning environment (Personalization (PER), Innovation (INN), Task Orientation (TOT), Cooperation (COP), and Individualization (IND)). Appropriate Assessment (AAS) composed of five observed variables. The highest standardized coefficient belongs to AA2 *"The staff seemed more interested in testing what I had memorized than what I had understood"* (β = .729, *p* < .01). The percentage of variation in appropriate assessment that can be explained by variation in the five variables is from 23.80 to 53.20 percent. Appropriate Workload (AWL) composed of four observed variables. The highest standardized coefficient belongs to AW2 *"The workload was too heavy"* (β = .871, *p* < .01). The percentage of variation in appropriate workload that can be explained by variation in the four variables is from 37.40 to 75.80 percent. Personalization (PER) composed of seven observed variables. The highest

standardized coefficient belongs to PE6 *"The instructor is interested in my problems"* (β = .754, $p < .01$), followed by PE2 *"The instructor is friendly and talks to me"* (β = .738, $p < .01$), and PE1 *"The instructor considers my feelings"* (β = .706, $p < .01$), respectively. The percentage of variation in personalization that can be explained by variation in the seven variables is from 26.50 to 56.80 percent. Innovation (INN) composed of five observed variables. The highest standardized coefficient belongs to IN3 *"The teaching approaches used in this class are characterized by innovation and variety"* (β = .794, $p < .01$). The percentage of variation in innovation that can be explained by variation in the five variables is from 21.20 to 63.00 percent. Task Orientation (TOT) composed of seven observed variables. The highest standardized coefficient belongs to TO5 *"Class assignments are clear and I know what to do"* (β = .681, $p < .01$), followed by TO7 *"Activities in this class are clearly and carefully planned"* (β = .601, $p < .01$), and TO1 *"I know exactly what has to be done in this class"* (β = .572, $p < .01$), respectively. The percentage of variation in task orientation that can be explained by variation in the seven variables is from 10.70 to 46.30 percent. Cooperation (COP) composed of seven observed variables. The highest standardized coefficient belongs to CO6 *"I cooperate with other students on class activities"* (β = .786, $p < .01$), followed by CO5 *"I work with other students in this class"* (β = .765, $p < .01$), and CO7 *"Students work with me to achieve class goals"* (β = .730, $p < .01$), respectively. The percentage of variation in cooperation that can be explained by variation in the seven variables is from 18.90 to 61.70 percent. Individualization (IND) composed of six observed variables. The highest standardized coefficient belongs to ID3 *"I am allowed to choose activities and how I will work"* (β = .779, $p < .01$),

followed by ID4 *"Teaching approaches in this class allow me to proceed at my own pace"* (β = .765, p < .01), and ID2 *"I am generally allowed to work at my own pace in this class"* (β = .597, p < .01), respectively. The percentage of variation in individualization that can be explained by variation in the six variables is from 6.00 to 60.60 percent (see Figure 4.14 and Appendix P).

Table 4.35 Total, Direct, and Indirect Effect of predictor variables in course level influenced on deep approach to learning

Variables	Deep Approach to Learning (DA)		
	TE	DE	IE
Appropriate Assessment (AAS)	0.001** (0.000)	0.001** (0.000)	-
Appropriate Workload (AWL)	0.164** (0.008)	0.164** (0.008)	-
Personalization (PER)	0.001** (0.000)	0.001** (0.000)	-
Innovation (INN)	0.384** (0.016)	0.384** (0.016)	-
Task Orientation (TOT)	0.453** (0.026)	0.453** (0.026)	-
Cooperation (COP)	0.001** (0.000)	0.001** (0.000)	-
Individualization (IND)	0.001** (0.000)	0.001** (0.000)	-
R^2DA_B = 0.540**			

** p < 0.01

The analyzing results of structural equation modeling (SEM) for deep approach to learning at between-level showed that task orientation is the highest influence on students' deep approach to learning (β = .453, p –value < .01), followed by innovation (β = .384, p –value < .01), and appropriate workload (β = .164, p –value < .01). The rest factors had similar small strengths (β = .001, p –value < .01) on the pharmacy students' deep approach to learning. The predictor variables at course-level accounted for variance of pharmacy students' deep approaches to learning about 54.00% (R^2DA_B = 0.540**) (see Figure 4.14, Table 4.35, and Appendix P).

4.8 Validation of Multilevel Structural Equation Modeling of Deep Approach to Learning with student-level factors and course-level factors

The effects of influencing factors from both student-level and course-level on deep approach to learning were considered to analyze as a Multilevel Structural Equation Model (MSEM). The hypothesized model was validated with empirical data by M*plus* 7.4 program. The analyzing results were shown in Table 4.36, Table 4.37, and Figure 4.15.

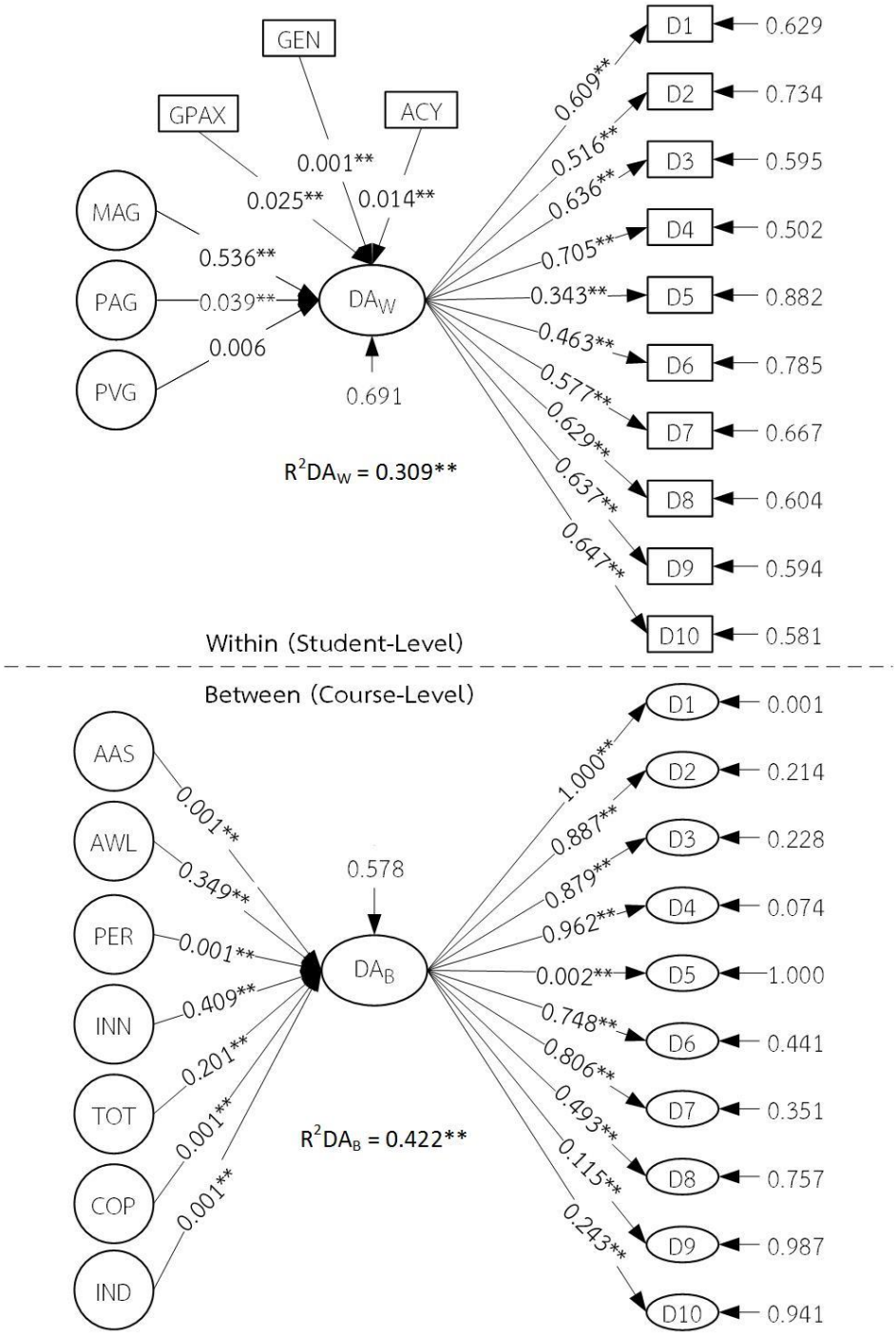
Validating the multilevel model, intraclass correlation coefficient (ICC) should be highly considered. This is because it can be explained the proportion of cluster variance to total variance (i.e., cluster plus individual variance). Generally, ICC should be .05 or higher (Ntoumanis & Myers, 2016; Snijders & Bosker, 2011). In this model, ICCs were ranged from .05 to .17, which are all acceptable (Appendix Q)

Table 4.36 Goodness of Fit of Multilevel Structural Equation Modeling of Deep Approach to Learning

Goodness of Fit Indices	Recommended criteria	Results	Pass/ Not pass
1. Chi-Square (χ^2)	*p*-value > 0.05	0.00	Not Pass
2. χ^2/df	< 2.00	1.68	Pass
3. RMSEA	< 0.07	0.04	Pass
4. CFI	> 0.95	0.90	Not Pass
5. TLI	> 0.95	0.90	Not Pass
6. SRMRw	< 0.08	0.07	Pass
7. SRMRb	< 0.08	0.22	Not Pass

χ^2= 468.23, df= 279, χ^2/df= 1.68, *p*-value = 0.00, RMSEA = 0.04, CFI = 0.90, TLI = 0.90, SRMRw = 0.07, SRMRb = 0.22

The testing of model fit with empirical data showed consistency with χ^2= 468.23, df= 279, χ^2/df= 1.68, *p*-value = 0.00, RMSEA = 0.04, CFI = 0.90, TLI = 0.90, SRMRw = 0.07, SRMRb = 0.22 as shown in Table 4.36. Most of the fit indices passed the recommended criteria (Hooper et al., 2008; Makmee, 2016). Although some fit indices passed the recommended criteria by Hooper et al. (2008) and Makmee (2016), there were four indices, *p*-value of χ^2, CFI, TLI, and SRMRb, which did not meet the criteria. Nevertheless, the model could be considered as reasonable fit. This is because those four indices can be accepted at different values recommended by other scholars (Al-Mamary, Shamsuddin, Hamid, & Al-Maamari, 2015; Chotima & Blauw, 2016; Fackler & Malmberg, 2016; Hooper et al., 2008; Kenny, 2015; Machado, Telles, Costa-Silva, & Barreto, 2016; Makmee, 2016).



** $p < 0.01$

χ^2 = 468.23, df = 279, χ^2/df = 1.68, p-value = 0.00, RMSEA = 0.04, CFI = 0.90, TLI = 0.90, SRMRw = 0.07, SRMRb = 0.22

Figure 4.15 Measurement of Multilevel Structural Equation Modeling of Deep Approach to Learning

The analyzing results of multilevel structural equation modeling (MSEM) showed that mastery approach goal was the most important predictor at student-level because it had the highest relationship with a deep approach to learning ($\beta = .536^{**}$). Even though the performance approach goal, gender, academic year, and cumulative grade point average had statistically significant relationships with the deep approach to learning, their effect sizes were much smaller than those of mastery goal orientation. Female students adopted a deep approach to learning more than male students ($\beta = .001^{**}$). Students who were in higher years particularly in 4th and 5th years had a deep approach to learning more than students who were in lower years ($\beta = .014^{**}$). Students with medium to high cumulative grade point average (2.75-4.00) employed deep approach to learning more than students with low cumulative grade point average ($\beta = .025^{**}$). Performance avoidance goal ($\beta = .006$) had no significant relationship with deep approach to learning. The predictor variables at student-levels accounted for variance of pharmacy students' deep approaches to learning about 30.90 % ($R^2DA_W = 0.309^{**}$) (see Table 4.37, Figure 4.15, and Appendix Q).

Among course-level factors, innovation had the highest impact ($\beta = .409^{**}$) on deep approach to learning, followed by appropriate workload ($\beta = .349^{**}$) and task orientation ($\beta = .201^{**}$). Although appropriate assessment, personalization, cooperation, and individualization had significant relationships with the deep approach to learning, their effect sizes ($\beta = .001^{**}$) were smaller than the top three factors. The predictor variables at course-level accounted for variance of pharmacy students' deep

approaches to learning about 42.20% (R^2DA_B = 0.422**) (see Table 4.37, Figure 4.15, and Appendix Q).

Table 4.37 Total, Direct, and Indirect Effect of predictor variables in student and course level influenced on deep approach to learning

Variables	Deep Approach to Learning (DA)		
	TE	DE	IE
Within Level			
Gender (GEN)	0.001** (0.000)	0.001** (0.000)	-
Cumulative Grade Point Average (GPAX)	0.025** (0.001)	0.025** (0.001)	-
Academic Year (ACY)	0.014** (0.001)	0.014** (0.001)	-
Mastery-Approach Goal (MAG)	0.536** (0.036)	0.536** (0.036)	-
Performance-Approach Goal (PAG)	0.039** (0.002)	0.039** (0.002)	-
Performance-Avoidance Goal (PVG)	0.006 (0.043)	0.006 (0.043)	-
Between Level			
Appropriate Assessment (AAS)	0.001** (0.000)	0.001** (0.000)	-
Appropriate Workload (AWL)	0.349** (0.029)	0.349** (0.029)	-
Personalization (PER)	0.001** (0.000)	0.001** (0.000)	-
Innovation (INN)	0.409** (0.032)	0.409** (0.032)	-
Task Orientation (TOT)	0.201** (0.013)	0.201** (0.013)	-
Cooperation (COP)	0.001** (0.000)	0.001** (0.000)	-
Individualization (IND)	0.001** (0.000)	0.001** (0.000)	-

R^2DA_W = 0.309**
R^2DA_B = 0.422**

** $p < 0.01$

POST HOC ANALYSIS

Since we collected data of surface approach to learning, we analyzed model for surface approach to learning. The data was available to fit only in the within level. Thus, the multilevel analysis was not possible. Result from the within level analysis showed that mastery-approach goal and gender had negative relationships with surface approach to learning (Figure 4.16).

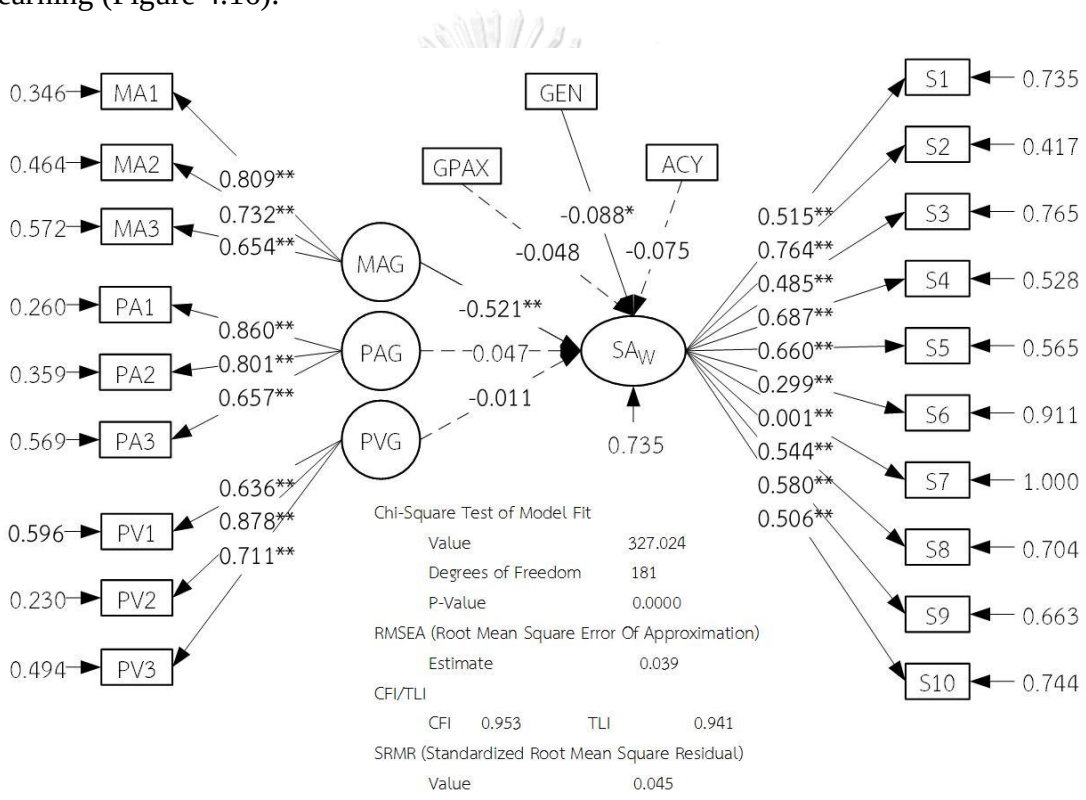


Figure 4.16 Measurement Model of Structural Equation Modeling of Surface Approach to Learning at Within Level

CHAPTER 5 DISCUSSION & CONCLUSION

This study aimed to assess the extent of students' deep approaches to learning of pharmacy students in Thailand, examine achievement goal orientation, appropriate assessment, appropriate workload, and learning environment affected the students' deep approach to learning, and validate a multilevel structural equation model of the student-level factors and course-level factors affecting the students' deep approach to learning. The results of this study were discussed in the following sections.

5.1 Deep Approach to Learning of Thai Pharmacy Students

5.2 Achievement goal orientation, appropriate assessment, appropriate workload, and learning environment affecting the students' deep approach to learning

5.3 Validation of the Multilevel Structural Equation Model

5.4 Application of Research Findings, Limitation, and Future Research

5.5 Conclusion

5.1 Deep approach to learning of Thai pharmacy students

The study results showed that an average total score of Thai pharmacy students' deep approach to learning was 31.66 out of 50 while the one of surface approach was 29.49 out of 50. It is obvious that the average total score of the deep approach was significantly higher than the surface approach (*p-value* < .001). Although this result was not consistent with some previous studies which found that students in the sciences and applied sciences including pharmaceutical sciences were more likely to adopt a surface approach to learning (Parpala et al., 2010; Taylor & Harding, 2007), there were certain studies supporting the current result (Cebeci, Dane, Kaya, & Yigitoglu, 2013; Salamonson et al., 2013). Health and sciences students mainly adopted deep approach to learning (Cebeci et al., 2013; Salamonson et al., 2013). Another study in an Australian University was presented that most of pharmacy students from each of the 4 years adopted "application directed" which is quite similar to deep approach (Smith et al., 2010; Smith et al., 2007). The negative significant correlation between deep and surface approach to learning was found in our study similar to many studies (Balasooriya, Toohey, & Hughes, 2005; Hussin, Hamed, & Jam; Trigwell, Prosser, & Waterhouse, 1999).

The two total scores, 31.66 and 29.49 out of 50, can be transformed to 3.17 and 2.95 out of 5 instead. This is for a better meaningful interpretation. Ranges of mean scores can be divided into five groups for each specific interpretation as listed below (Best & Kahn, 2006).

1.00 – 1.49	Very poor level; urgent need for improvement
1.50 – 2.49	Poor level; strong need for improvement

2.50 – 3.49	Mediocre level; need for enhancing improvement
3.50 – 4.49	Good level
4.50 – 5.00	Very good level

In this study, pharmacy students' deep scores was 3.17 which can be categorized in the mediocre level. This can be implied that there was a room to improve the students' deep approaches to learning. Therefore, educators and faculty team should consider effective methods to enhance the students' deep approach so that their deep approaches can be stepped-up to the better levels. This in turn increases the pharmacy students' preferable outcomes and outstanding professional performance.

5.2 Achievement goal orientation, appropriate assessment, appropriate workload, and learning environment affecting the students' deep approach to learning

The analyzing results of multilevel structural equation modeling (MSEM) showed that achievement goal orientation, appropriate assessment, appropriate workload, and learning environment had impacts on students' deep approach to learning.

Amongst achievement goal orientation, mastery-approach goal, attention to understand study contents and assignments, had the highest significant effect on pharmacy students' deep approach to learning. This result was similar to many studies that students who have mastery-approach goal tend to adopt deep approach to learning (Diseth, 2011; Kyndt et al., 2012; Poondej, 2014; Rithilert & Kaemkate, 2013; Yerdelen Damar & Aydın, 2015). The result from post hoc analysis also showed that mastery-approach goal had negative relationship with surface approach to learning. Thus,

educators in the universities should greatly support students to be aware and practice themselves to be more mastery-approach goal oriented such as trying to deeply understand the subject matter, fully understanding the contents taught in class, and learning as much as possible.

Many studies have found that performance approach goal orientation is a positive predictor of deep approach to learning (Diseth, 2011; Liem, Lau, & Nie, 2008; Poondej, 2014), and these results support this finding. The relationship of performance approach goal orientation on deep approach to learning was smaller than mastery approach goal orientation. Thus, students' attention to understand study content and assignments influenced deep approach to learning much more than students' comparing abilities and performance with others. A couple of studies found that female were more likely to adopt deep approaches to learning while male mostly preferred a surface approach to learning (Elias, 2005; Halawi et al., 2009; Salamonson et al., 2013), and these results were similar. The current study results showed the same trend with a number of researches that students who were in higher academic years had more of a deep approach to learning more than students who were in lower years (Baeten, Kyndt, Struyven, & Dochy, 2010; Elias, 2005; Karagiannopoulou, Naka, Kamtsios, Savvidou, & Michalis, 2014; Mansouri, 2009; Smith et al., 2010). Certain studies showed that students in other disciplines with medium to high cumulative grade point average employed a deep approach to learning more than students with low cumulative grade point average (Elias, 2005; Rithilert & Kaemkate, 2013), and our study results were consistent with these findings. A few studies in psychology undergraduates and a recent study in general education undergraduates found that performance avoidance

goal or avoiding to be inferior compared with others had no relationship with deep approach to learning (Liem et al., 2008; Poondej, 2014; Poondej & Lerdpornkulrat, 2016; Yerdelen Damar & Aydın, 2015), and these results were similar with our findings.

At the course-level, the top three influencing factors on deep approach to learning were innovation, appropriate workload, and task orientation. Many scholars agree that the integration of technology or innovation into courses benefits students in terms of increasing their deep understanding of the course's concepts (Chen et al., 2010; Laguador, 2014). Our study showed the same trend, in that innovation had the highest impact on pharmacy students' deep approach to learning. Thus, to increase deep approaches to learning, a variety of innovations such as YouTube videos for learning, online pharmacy course, E-book, Clicker Assessment and Feedback (CAF), and Twitter are recommended to integrate in the teaching processes of Thai pharmacy schools, similar to other educators (Han & Finkelstein, 2013; Junco, Heiberger, & Loken, 2011; Lim & Hew, 2014). Recently, Thai government has launched Thailand 4.0 policy. It covers many aspects including education. Innovative education is the most outstanding concept of the educational views (Chareonwongsak, 2016). The Pharmacy Education Consortium of Thailand (PECT) and the National Health Professional Education Foundation of Thailand also agreed on the benefits of educational technology and innovation, and they have encouraged Thai pharmacy educators to implement new media for learning, online education, and massive open online courses (MOOC) in pharmacy courses. Our results supported this paradigm shift in pharmacy education in Thailand. Educators and pharmacy schools must pay more attention and efforts on

teaching and learning innovation implementation such as employing innovative and various teaching approaches and offering innovative activities and various learning activities in class so that pharmacy students can learn effectively and increase their deep approach to learning.

Our study presented that students tend to employ a deep approach if their workload was considered as appropriate or manageable. This result was consistent with previous study that course workload or demand of learning tasks is the major factor for making a decision on choosing an approach to learning (Yerdelen Damar & Aydın, 2015). A perceived heavy workload related to a surface approach (Baeten et al., 2010; Struyven, Dochy, Janssens, & Gielen, 2006; Varunki et al., 2015). It would be better if instructors assign properly learning workload, not too heavy for students, and arrange due dates of students' assignments in different periods time so that students do not need to spend their personal time after class with loads of assignments.

There was significant relationship between clear and well-organized instruction and activities in class and pharmacy students' deep approach to learning. This finding was in line with couple studies that students exposing clear and organized instruction or clarification tend to employ deep approach to learning (Baeten et al., 2010; Pascarella & Blaich, 2013; J.-S. Wang et al., 2015). Hence, instructors should be aware of providing clear requirements for class assignments, offering clear and well-planned activities, and well-organizing the class, for examples.

Even though pharmacy schools can enhance deep approach to learning by implementing innovative teaching, providing appropriate workload, and giving well-organized and clear instruction in class, appropriate assessment, supporting individual students to interact with instructors, encouraging students incorporate with friends, and allowing students to make decisions and be treated individually should not be neglected.

For Multilevel Structural Equation Modeling, mastery-approach goal from within level has the highest influence on students' deep approach to learning ($\beta = .536$, p –value < .01), followed by innovation ($\beta = .409$, p –value < .01), appropriate workload ($\beta = .349$, p –value < .01), and task orientation ($\beta = .201$, p –value < .01) from between level, respectively. The predictor variables at student- and course-levels accounted for variance of pharmacy students' deep approaches to learning about 30.90 % and 42.20%, consecutively. This can be seen that percentage of course-level factors which explained variance of the deep approaches was higher than percentage of student-level factors. This result was in line with concept of Thai Education 4.0 and 21st Century learning (Chareonwongsak, 2016; Division of Research Administration and Educational Quality Assurance, 2016; P21Members, 2002). The both concepts emphasized on learning system and environment that can enhance students' the 21st Century knowledge and skills as listed in the 21st Century student outcomes such as critical thinking, creativity, problem solving, innovation, collaboration, and media and technology skills (P21Members, 2002). Many parts of learning system and environment recommended by the both concepts mentioned about learning innovation and technologies. We can simply apply this obvious remark into pharmacy learning context. Moreover, appropriate workload and task orientation could also be considered in order to improve

the pharmacy courses for being more effective. These will increase pharmacy students' academic performance and desirable professional outcomes which in turn benefits to patients and healthcare system in Thailand.

5.3 Validation of the Multilevel Structural Equation Model

Validation of the multilevel structural equation model of student-level factors and course-level factors affecting the students' deep approach to learning was validated by M*plus* 7.4 program. The testing of model fit with empirical data of 67 courses and 536 students showed consistency with acceptable criteria as follows: χ^2= 468.23, df= 279, χ^2/df= 1.68, *p*-value = 0.00, RMSEA = 0.04, CFI = 0.90, TLI = 0.90, SRMRw = 0.07, and SRMRb = 0.22, R^2DA_W = 0.309**, R^2DA_B = 0.422**. Although some fit indices passed the recommended criteria by Hooper et al. (2008) and Makmee (2016), there were four indices, *p*-value of χ^2, CFI, TLI, and SRMRb, which did not meet the criteria. Nevertheless, the model could be considered as reasonable fit. This is because those four indices can be accepted at different values recommended by other scholars. For *p*-value of χ^2, it is sensitive to sample size (Hooper et al., 2008; Machado et al., 2016). This can be explained that the chi-square statistic is always statistically significant when the model's samples are 400 or higher (Kenny, 2015). For CFI, there are plenty of evidences to confirm that CFI exceed .90 can be accepted as "desirable fit", "acceptable fit", or "satisfactory fit" (Al-Mamary et al., 2015; Fackler & Malmberg, 2016; Machado et al., 2016). For TLI, a couple studies were revealed that the value of TLI exceed .80 could be considered as adequate to good fit (Chotima & Blauw, 2016; Hu & Bentler,

1999; Machado et al., 2016). For SRMRb, it could be accepted as fit even its value is not less than .08 (Fackler & Malmberg, 2016; Iacobucci, 2010).

5.4 Application of Research Findings, Limitation, and Further Research

It is crucial to increase pharmacy students' deep approach to learning. Our results can guide interventions for enhancing the deep approach to learning by using the significant factors found in this study.

Amongst achievement goal orientation, mastery-approach goal which is attention to understand study contents and assignments had the highest significant effect on pharmacy students' deep approach to learning. Educators in universities should encourage and support students to practice more a mastery approach by focusing on learning, attempting to complete a task, increasing their knowledge, setting self-standards, developing new skills, and trying to accomplish something challenging.

At the course-level, the top three influencing factors on deep approach to learning were innovation, appropriate workload, and task orientation, respectively. Thus, to increase deep approaches to learning, a variety of innovations such as YouTube videos for learning, online pharmacy course, E-book, Clicker Assessment and Feedback (CAF), Twitter, and online education, and massive open online courses (MOOC) are recommended to integrate in the teaching processes of Thai pharmacy schools. Course workload or demands of learning tasks should be reconsidered by educators to make sure that it is appropriate or manageable for Thai pharmacy students. All pharmacy

courses in Thailand should be also improved in term of clear and well-organized instruction and class activities.

This study had limitations. It would be better to sample pharmacy students from all universities in Thailand, but the collaboration from all universities was not possible at this time. However, we compared descriptive data of all variables between the two universities and found that they were no significant different between these two universities. Thus, students' characteristics may be similar to all pharmacy schools in Thailand. Further research is needed to conduct qualitative analyses such as focus groups and in-depth interviews in order to gain a better understanding and more details about influencing factors.

5.5 Conclusion

Both student-level and course-level factors were considered as deep approach to learning's predictors. In order to increase pharmacy students' deep approach to learning, motivating students to have intention to get a better understanding in studies and outperform others were the important issues at student-level. Pharmacy schools should emphasize on innovative teaching, appropriate students' workload, well-organized and clear instruction of class activities, appropriate assessment, students' opportunities to interact with instructors, students' cooperation with friends, and allowing students to make their own decisions and treating student individually for increasing pharmacy students' deep approaches to learning. Ultimately, the deep approach to learning will strengthen pharmacy students' academic and desirable professional outcomes.

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APPENDIX

Appendix A Approaches to Study Inventory (ASI)

Box 6.1 **Subscales contained in the 64-item Approaches to Studying Inventory**

Subscale	*Meaning*
Meaning orientation	
Deep approach	Active questioning in learning
Interrelating ideas	Relating to other parts of the course
Use of evidence	Relating evidence to conclusions
Intrinsic motivation	Interest in learning for learning's sake
Reproducing orientation	
Surface approach	Preoccupation with memorisation
Syllabus-boundness	Relying on staff to define learning tasks
Fear of failure	Pessimism and anxiety about academic outcomes
Extrinsic motivation	Interest in courses for the qualifications they offer
Achieving orientation	
Strategic approach	Awareness of implications of academic demands made by staff
Disorganised study methods	Unable to work regularly and effectively*
Negative attitudes to studying	Lack of interest and application*
Achievement motivation	Competitive and confident
Styles and pathologies	
Comprehension learning	Readiness to map out subject area and think divergently
Globetrotting	Overready to jump to conclusions
Operation learning	Emphasis on facts and logical analysis
Improvidence	Overcautious reliance on details

Source: Ramsden and Entwistle 1981: 371
* These subscales are meant to be scored in reverse

Source: Richardson (2000)

Appendix B Approaches and Study Skill Inventory for Students (ASSIST)

A S S I S T

Approaches and Study Skills Inventory for Students

(Short version)

This questionnaire has been designed to allow you to describe, in a systematic way, how you go about learning and studying. The technique involves asking you a substantial number of questions which overlap to some extent to provide good overall coverage of different ways of studying. Most of the items are based on comments made by other students. Please respond truthfully, so that your answers will **accurately** describe your **actual** ways of studying, and work your way through the questionnaire quite **quickly.**

Background information

Name or Identifier ..... **Age** ..... **years** **Sex** M / F

University or College ..... **Faculty or School** .....

Course ..... **Year of study** .....

A. What is learning?

When you think about the term 'LEARNING ', what does it mean to you?

Consider each of these statements carefully, and rate them in terms of how close they are to ***your own*** *way of thinking about it.*

	Very close	*Quite close*	*Not so close*	*Rather different*	*Very different*
a. Making sure you remember things well.	5	4	3	2	1
b. Developing as a person.	5	4	3	2	1
c. Building up knowledge by acquiring facts and information.	5	4	3	2	1
d Being able to use the information you've acquired.	5	4	3	2	1
e. Understanding new material for yourself.	5	4	3	2	1
f. Seeing things in a different and more meaningful way.	5	4	3	2	1

 Please turn over

B. Approaches to studying

The next part of this questionnaire asks you to indicate your relative agreement or disagreement with comments about studying again made by other students. Please work through the comments, giving your **immediate** response. In deciding your answers, think in terms of **this particular lecture course.** It is also very important that you answer **all** the questions: check you have.

***5** means agree (√)* ***4** = agree somewhat (√?)* ***2** = disagree somewhat (**x?**)* ***1** = disagree (**x**).*

*Try <u>not</u> to use **3** = unsure (**??**), unless you really have to, or if it cannot apply to you or your course.*

		√	√?	??	x?	x
1.	I manage to find conditions for studying which allow me to get on with my work easily.	5	4	3	2	1
2.	When working on an assignment, I'm keeping in mind how best to impress the marker.	5	4	3	2	1
3.	Often I find myself wondering whether the work I am doing here is really worthwhile.	5	4	3	2	1
4.	I usually set out to understand for myself the meaning of what we have to learn.	5	4	3	2	1
5.	I organise my study time carefully to make the best use of it.	5	4	3	2	1
6.	I find I have to concentrate on just memorising a good deal of what I have to learn.	5	4	3	2	1
7.	I go over the work I've done carefully to check the reasoning and that it makes sense.	5	4	3	2	1
8.	Often I feel I'm drowning in the sheer amount of material we're having to cope with.	5	4	3	2	1
9.	I look at the evidence carefully and try to reach my own conclusion about what I'm studying.	5	4	3	2	1
10.	It's important for me to feel that I'm doing as well as I really can on the courses here.	5	4	3	2	1
11.	I try to relate ideas I come across to those in other topics or other courses whenever possible.	5	4	3	2	1
12.	I tend to read very little beyond what is actually required to pass.	5	4	3	2	1
13.	Regularly I find myself thinking about ideas from lectures when I'm doing other things.	5	4	3	2	1
14.	I think I'm quite systematic and organised when it comes to revising for exams.	5	4	3	2	1
15.	I look carefully at tutors' comments on course work to see how to get higher marks next time.	5	4	3	2	1
16.	There's not much of the work here that I find interesting or relevant.	5	4	3	2	1
17.	When I read an article or book, I try to find out for myself exactly what the author means.	5	4	3	2	1
18.	I'm pretty good at getting down to work whenever I need to.	5	4	3	2	1
19.	Much of what I'm studying makes little sense: it's like unrelated bits and pieces.	5	4	3	2	1
20.	I think about what I want to get out of this course to keep my studying well focused.	5	4	3	2	1
21.	When I'm working on a new topic, I try to see in my own mind how all the ideas fit together.	5	4	3	2	1
22	I often worry about whether I'll ever be able to cope with the work properly.	5	4	3	2	1
23.	Often I find myself questioning things I hear in lectures or read in books.	5	4	3	2	1
24.	I feel that I'm getting on well, and this helps me put more effort into the work.	5	4	3	2	1
25.	I concentrate on learning just those bits of information I have to know to pass.	5	4	3	2	1
26.	I find that studying academic topics can be quite exciting at times.	5	4	3	2	1
27.	I'm good at following up some of the reading suggested by lecturers or tutors.	5	4	3	2	1
28.	I keep in mind who is going to mark an assignment and what they're likely to be looking for.	5	4	3	2	1
29.	When I look back, I sometimes wonder why I ever decided to come here.	5	4	3	2	1
30.	When I am reading, I stop from time to time to reflect on what I am trying to learn from it.	5	4	3	2	1

		√	√?	??	x?	x
31.	I work steadily through the term or semester, rather than leave it all until the last minute.	5	4	3	2	1
32.	I'm not really sure what's important in lectures so I try to get down all I can.	5	4	3	2	1
33.	Ideas in course books or articles often set me off on long chains of thought of my own.	5	4	3	2	1
34.	Before starting work on an assignment or exam question, I think first how best to tackle it.	5	4	3	2	1
35.	I often seem to panic if I get behind with my work.	5	4	3	2	1
36.	When I read, I examine the details carefully to see how they fit in with what's being said.	5	4	3	2	1
37.	I put a lot of effort into studying because I'm determined to do well.	5	4	3	2	1
38.	I gear my studying closely to just what seems to be required for assignments and exams.	5	4	3	2	1
39.	Some of the ideas I come across on the course I find really gripping.	5	4	3	2	1
40.	I usually plan out my week's work in advance, either on paper or in my head.	5	4	3	2	1
41.	I keep an eye open for what lecturers seem to think is important and concentrate on that.	5	4	3	2	1
42.	I'm not really interested in this course, but I have to take it for other reasons.	5	4	3	2	1
43.	Before tackling a problem or assignment, I first try to work out what lies behind it.	5	4	3	2	1
44.	I generally make good use of my time during the day.	5	4	3	2	1
45.	I often have trouble in making sense of the things I have to remember.	5	4	3	2	1
46.	I like to play around with ideas of my own even if they don't get me very far.	5	4	3	2	1
47.	When I finish a piece of work, I check it through to see if it really meets the requirements.	5	4	3	2	1
48	Often I lie awake worrying about work I think I won't be able to do.	5	4	3	2	1
49	It's important for me to be able to follow the argument, or to see the reason behind things.	5	4	3	2	1
50.	I don't find it at all difficult to motivate myself.	5	4	3	2	1
51.	I like to be told precisely what to do in essays or other assignments.	5	4	3	2	1
52.	I sometimes get 'hooked' on academic topics and feel I would like to keep on studying them.	5	4	3	2	1

C. Preferences for different types of course and teaching

***5** means definitely like (√) **4** = like to some extent (√?) **2** = dislike to some extent (**x?**) **1** = definitely dislike (**x**).*
*Try <u>not</u> to use **3** = unsure (**??**), unless you really have to, or if it cannot apply to you or your course.*

		√	√?	??	x?	x
a.	lecturers who tell us exactly what to put down in our notes.	5	4	3	2	1
b.	lecturers who encourage us to think for ourselves and show us how they themselves think	5	4	3	2	1
c.	exams which allow me to show that I've thought about the course material for myself.	5	4	3	2	1
d.	exams or tests which need only the material provided in our lecture notes.	5	4	3	2	1
e.	courses in which it's made very clear just which books we have to read.	5	4	3	2	1
f.	courses where we're encouraged to read around the subject a lot for ourselves.	5	4	3	2	1
g.	books which challenge you and provide explanations which go beyond the lectures.	5	4	3	2	1
h.	books which give you definite facts and information which can easily be learned.	5	4	3	2	1

Finally, how well do you think you have been doing in your assessed work overall, so far?

*Please rate yourself **objectively**, based on the grades you have been obtaining*

Very well		*Quite Well*		*About average*		*Not so well*		*Rather badly*
9	8	7	6	5	4	3	2	1

Thank you very much for spending time completing this questionnaire: it is much appreciated.

Source: Learning and Instruction (1997)

Appendix C Combination items from National Survey of Student Engagement (NSSE)

Table 1.
Deep Learning Scale, Subscales, and Component Items

Deep Learning (α_{2004} = .77, α_{2005} = .73)	
	Combination of the 3 subscales listed below
Higher-Order Learning[a] (α_{2004} = .82, α_{2005} = .82)	
HL1	Analyzed the basic elements of an idea, experience, or theory, such as examining a particular case or situation in depth and considering its components
HL2	Synthesized and organized ideas, information, or experiences into new, more complex interpretations and relationships
HL3	Made judgments about the value of information, arguments, or methods, such as examining how others gathered and interpreted data and assessing the soundness of their conclusions
HL4	Applied theories or concepts to practical problems or in new situations
Integrative Learning[b] (α_{2004} = .71, α_{2005} = .71)	
IL1	Worked on a paper or project that required integrating ideas or information from various sources
IL2	Included diverse perspectives (different races, religions, genders, political beliefs, etc.) in class discussions or writing assignments
IL3	Put together ideas or concepts from different courses when completing assignments or during class discussions
IL4	Discussed ideas from your readings or classes with faculty members outside of class
IL5	Discussed ideas from your readings or classes with others outside of class (students, family members, co-workers, etc.)
Reflective Learning[b,c] (α_{2004} = .89, α_{2005} = .81[d])	
RL1	Examined the strengths and weaknesses of your own views on a topic or issue[e]
RL2	Tried to better understand someone else's views by imagining how an issue looks from his or her perspective[e]
RL3	Learned something that changed the way you understand an issue or concept[e]
RL4	Learned something from discussing questions that have no clear answers
RL5	Applied what you learned in a course to your personal life or work
RL6	Enjoyed completing a task that required a lot of thinking and mental effort

[a] Component items measure on a 4-point scale (1=Very little, 2=Some, 3=Quite a bit, 4=Very much).
[b] Component items measured on a 4-point scale (1=Never, 2=Sometimes, 3=Often, 4=Very often)
[c] Component items were additional items asked of online responders during the 2004 NSSE administration.
[d] In 2005, the reflective learning sub-scale consisted of only three items, the first three items listed.
[e] Item added to the core survey for the 2005 NSSE administration. Other items were not retained.

Source: Laird and Shoup (2005)

Appendix D Study Process Questionnaire (SPQ)

SPQ

Study Process Questionnaire

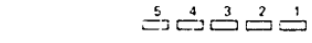
What the SPQ is About

On the following pages are a number of questions about your attitudes towards your studies and your usual ways of studying.

There is no *right* way of studying. It all depends on what suits your own style and the courses you are studying. The following questions have been carefully selected to cover the more important aspects of studying. It is accordingly important that you answer each question as honestly as you can. If you think that your answer to a question would depend on the subject being studied, give the answer that would apply to the subject(s) most important to you.

How to Answer

For each item there is a row of boxes for a five-point scale on the Answer Sheet:



. A response is shown by marking *one* of the five boxes for an item to underline the desired number.

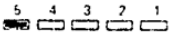
The numbers stand for the following responses:

5 — this item is *always* or *almost always* true of me
4 — this item is *frequently* true of me
3 — this item is true of me about *half the time*
2 — this item is *sometimes* true of me
1 — this item is *never* or *only rarely* true of me.

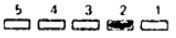
Example

I study best with the radio on.

If this was almost always true of you, you would underline 5 thus:



If you only sometimes studied well with the radio on, you would underline 2, thus:



Underline the number on the Answer Sheet that best fits your *immediate* reaction. Do not spend a long time on each item: your first reaction is probably the best one. Please answer each item.

Underline one number for each item.

1 I chose my present courses largely with a view to the job situation when I graduate rather than out of their intrinsic interest to me.

2 I find that at times studying gives me a feeling of deep personal satisfaction.

3 I want top grades in most or all of my courses so that I will be able to select from among the best positions available when I graduate.

4 I think browsing around is a waste of time, so I only study seriously what's given out in class or in the course outlines.

5 While I am studying, I often think of real life situations to which the material that I am learning would be useful.

6 I summarize suggested readings and include these as part of my notes on a topic.

7 I am discouraged by a poor mark on a test and worry about how I will do on the next text.

8 While I realize that truth is forever changing as knowledge is increasing, I feel compelled to discover what appears to me to be the truth at this time.

9 I have a strong desire to excel in all my studies.

10 I learn some things by rote, going over and over them until I know them by heart.

11 In reading new material I often find that I'm continually reminded of material I already know and see the latter in a new light.

12 I try to work consistently throughout the term and review regularly when the exams are close.

13 Whether I like it or not, I can see that further education is for me a good way to get a well-paid or secure job.

14 I feel that virtually any topic can be highly interesting once I get into it.

15 I would see myself basically as an ambitious person and want to get to the top, whatever I do.

16 I tend to choose subjects with a lot of factual content rather than theroretical kinds of subjects.

17 I find that I have to do enough work on a topic so that I can form my own point of view before I am satisfied.

18 I try to do all of my assignments as soon as possible after they are given out.

19 Even when I have studied hard for a test, I worry that I may not be able to do well in it.

20 I find that studying academic topics can at times be as exciting as a good novel or movie.

21 If it came to the point, I would be prepared to sacrifice immediate popularity with my fellow students for success in my studies and subsequent career.

22 I generally restrict my study to what is specifically set as I think it is unnecessary to do anything extra.

23 I try to relate what I have learned in one subject to that in another.

24 After a lecture or lab I reread my notes to make sure they are legible and that I understand them.

25 Lecturers shouldn't expect students to spend significant amounts of time studying material everyone knows won't be examined.

26 I usually become increasingly absorbed in my work the more I do.

27 One of the most important considerations in choosing a course is whether or not I will be able to get top marks in it.

28 I learn best from lecturers who work from carefully prepared notes and outline major points neatly on the blackboard.

29 I find most new topics interesting and often spend extra time trying to obtain more information about them.

30 I test myself on important topics until I understand them completely.

31 I almost resent having to spend a further three or four years studying after leaving school, but feel that the end results will make it all worthwhile.

32 I believe strongly that my main aim in life is to discover my own philosophy and belief system and to act strictly in accordance with it.

33 I see getting high grades as a kind of competitve game, and I play it to win.

34 I find it best to accept the statements and ideas of my lecturers and question them only under special circumstances.

35 I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.

36 I make a point of looking at most of the suggested readings that go with the lecturers.

37 I am at college/university mainly because I feel that I will be able to obtain a better job if I have a tertiary qualification.

38 My studies have changed my views about such things as politics, my religion, and my philosophy of life.

39 I believe that society is based on competition and school and universities should reflect this.

40 I am very aware that lecturers know a lot more than I do and so I concentrate on what they say is important rather than rely on my own judgment.

41 I try to relate new material, as I am reading it, to what I already know on that topic.

42 I keep neat, well-organized notes for most subjects.

Source: J. Biggs (1987)

Appendix E Revised Study Process Questionnaire (R-SPQ-2F)

Revised Study Process Questionnaire (R-SPQ-2F)

This questionnaire has a number of questions about your attitudes towards your studies and your usual way of studying.

There is no *right* way of studying. It depends on what suits your own style and the course you are studying. It is accordingly important that you answer each question as honestly as you can. If you think your answer to a question would depend on the subject being studied, give the answer that would apply to the subject(s) most important to you.

Please fill in the appropriate circle alongside the question number on the 'General Purpose Survey/Answer Sheet'. The letters alongside each number stand for the following response.

A—this item is *never* or *only rarely* true of me
B—this item is *sometimes* true of me
C—this item is true of me about *half the time*
D—this item is *frequently* true of me
E—this item is *always* or *almost always* true of me

Please choose the *one* most appropriate response to each question. Fill the oval on the Answer Sheet that best fits your immediate reaction. Do not spend a long time on each item: your first reaction is probably the best one. Please answer each item.

Do not worry about projecting a good image. Your answers are CONFIDENTIAL.

Thank you for your cooperation.

1. I find that at times studying gives me a feeling of deep personal satisfaction.
2. I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied.
3. My aim is to pass the course while doing as little work as possible.
4. I only study seriously what's given out in class or in the course outlines.
5. I feel that virtually any topic can be highly interesting once I get into it.
6. I find most new topics interesting and often spend extra time trying to obtain more information about them.
7. I do not find my course very interesting so I keep my work to the minimum.
8. I learn some things by rote, going over and over them until I know them by heart even if I do not understand them.
9. I find that studying academic topics can at times be as exciting as a good novel or movie.
10. I test myself on important topics until I understand them completely.
11. I find I can get by in most assessments by memorising key sections rather than trying to understand them.
12. I generally restrict my study to what is specifically set as I think it is unnecessary to do anything extra.
13. I work hard at my studies because I find the material interesting.
14. I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.
15. I find it is not helpful to study topics in depth. It confuses and wastes time, when all you need is a passing acquaintance with topics.
16. I believe that lecturers shouldn't expect students to spend significant amounts of time studying material everyone knows won't be examined.
17. I come to most classes with questions in mind that I want answering.
18. I make a point of looking at most of the suggested readings that go with the lectures.
19. I see no point in learning material which is not likely to be in the examination.
20. I find the best way to pass examinations is to try to remember answers to likely questions.

The responses to items are scored as follows:

A = 1, B = 2, C = 3, D = 4, E = 5

To obtain main scale scores add item scores as follows:

DA = 1 + 2 + 5 + 6 + 9 + 10 + 13 + 14 + 17 + 18

SA = 3 + 4 + 7 + 8 + 11 + 12 + 15 + 16 + 19 + 20

Subscale scores can be calculated as follows:

DM = 1 + 5 + 9 + 13 + 17

DS = 2 + 6 + 10 + 14 + 18

SM = 3 + 7 + 11 + 15 + 19

SS = 4 + 8 + 12 + 16 + 20

Source: J. Biggs et al. (2001)

Appendix F Revised Study Process Questionnaire (R-SPQ-2F): Thai version

1. (DM)	I find that at times studying gives me a feeling of deep personal satisfaction.
	ฉันพบว่าเมื่อใดก็ตามที่ฉันกำลังเรียน มักทำให้ฉันรู้สึกว่าฉันได้รับความพอใจ
2. (DS)	I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied.
	ฉันพบว่าฉันจะต้องขยันให้มากกับหัวข้อที่เรียน ฉันจึงจะไม่สับสนและสามารถสรุปได้ ฉันจึงจะพอใจ
3. (SM)	My aim is to pass the course while doing as little work as possible.
	จุดประสงค์ของฉันที่จะทำให้ผ่านหลักสูตรที่เรียนคือ เรียนเล็กๆน้อยๆ เท่าที่จะทำได้
4. (SS)	I only study seriously what's given out in class or in the course outlines.
	ฉันขยันและตั้งใจเรียนในห้องเรียนหรือตามหลักสูตรที่ระบุให้เท่านั้น
5. (DM)	I feel that virtually any topic can be highly interesting one I get into it.
	เมื่อหัวข้อที่เรียนน่าสนใจมากๆและฉันได้เริ่มเรียนเมื่อนั้นฉันรู้สึกตั้งใจเรียนอย่างมากๆ
6. (DS)	I find most new topics interesting and often spend extra time trying to obtain more information about them.
	ฉันพบว่าหัวข้อเรียนใหม่ส่วนมากน่าสนใจและบ่อยครั้งฉันจะหาเวลาศึกษา หาข้อมูลเพิ่มเติมเกี่ยวกับหัวข้อนั้นๆ
7. (SM)	I do not find my course very interesting so I keep my work to the minimum.
	ฉันไม่เคยคิดว่าหลักสูตรที่เรียนน่าสนใจเลย ฉันจึงใช้เวลาน้อยมากในการการเรียน
8. (SS)	I learn something by rote, going over and over them until I know them by heart even if I do not understand them.
	หากฉันไม่เข้าใจเรื่องบางเรื่องฉันจะอ่านซ้ำไปมาหลายๆครั้งจนกระทั่งรู้เรื่องทั้งหมดอย่างขึ้นใจ
9. (DM)	I find that studying academic topics can at times be as exciting as a good novel or movie.
	ฉันพบว่าการเรียนหัวข้อทางวิชาการหลายๆหัวข้อในเวลาเดียวกันน่าตื่นเต้นพอๆกับการอ่านนวนิยายหรือดูภาพยนตร์
10. (DS)	I test myself on important topics until I understand them completely.
	ฉันนำหัวข้อสำคัญทดสอบตัวฉันจนกระทั่งฉันเข้าใจเรื่องทั้งหมด
11. (SM)	I find I can get by in most assessments by memorizing key sections rather than trying to understand them.
	ผลการเรียนทั้งหมดของฉันได้จากการท่องจำมากกว่าการได้รับจากความเข้าใจในการเรียน

12. (SS)	I generally restrict my study to what is specifically set as I think it is unnecessary to do anything extra.
	โดยทั่วไปฉันมักมุ่งเรียนเรื่องเฉพาะเรื่องเพียงเรื่องเดียว เพราะฉันคิดว่าไม่จำเป็นเลยที่จะต้องสนใจเรื่องอื่นเพิ่มเติม
13. (DM)	I work hard at my studies because I find the material interesting.
	ฉันสนใจการเรียนอย่างหนักเพราะฉันคิดว่าเรื่องที่เรียนน่าสนใจ
14. (DS)	I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.
	ฉันใช้เวลาว่างจำนวนมากที่ฉันมีกับการศึกษาเพิ่มเติมในหัวข้อที่น่าสนใจซึ่งเป็นเรื่องที่ได้นำไปใช้ในวิชาอื่นๆ
15. (SM)	I find it is not helpful to study topics in depth. It confuses and wastes time, when all you need is a passing acquaintance with topics.
	ฉันคิดว่าไม่มีประโยชน์ที่จะศึกษาแบบเจาะลึกหัวข้อต่างๆ มันสับสนและเสียเวลา เมื่อไหร่ก็ตามที่ต้องการก็ค่อยกลับมาทบทวนดูใหม่อีกครั้งก็ได้
16. (SS)	I believe that lecturers shouldn't expect students to spend significant amounts of time studying material everyone knows won't be examined.
	ฉันเชื่อว่าครูผู้สอนไม่ควรจะคาดหวังกับนักเรียนให้ใช้เวลามากมายกับการศึกษาเนื้อหาที่เรียน ทุกคนทราบดีว่าเนื้อหาทั้งหมดไม่นำไปสอบทั้งหมดอยู่แล้ว
17. (DM)	I come to most classes with questions in mind that I want answering.
	ฉันเข้าชั้นเรียนเกือบทุกวิชาและชั่วโมง พร้อมคำถามในใจซึ่งฉันก็มีคำตอบแล้ว
18. (DS)	I make a point of looking at most of the suggested readings that go with the lectures.
	ถ้าผู้สอนให้อ่านหนังสือหรือเนื้อหาก่อนชั้นเรียน ฉันจะหาประเด็นสำคัญจากเนื้อเรื่องนั้นๆ และพร้อมเสมอที่จะนำเข้าไปในชั้นเรียนด้วย
19. (SM)	I see no point in learning material which is not likely to be in the examination.
	ฉันไม่เห็นด้วยกับการศึกษาเนื้อหาซึ่งผู้สอนจะไม่นำไปออกสอบ
20. (SS)	I find the best way to pass examinations is to try to remember answers to likely questions.
	ฉันพบว่าวิธีการที่ฉันจะสอบผ่านได้ โดยการจำทั้งคำตอบและคำถาม

Reliability of R-SPQ-2F (Thai version) is 0.805

Source: Kusalanont (2006)

Appendix G　Achievement Goal Questionnaire-Revised (AGO-R)

Table 1
Items for the Achievement Goal Questionnaire–Revised (AGQ-R) Paired With the Original Achievement Goal Questionnaire (AGQ) Items

Item	Item content
	Mastery-approach goal items
1	My aim is to completely master the material presented in this class. (original Item 9: I desire to completely master the material presented in this class.)
7	I am striving to understand the content of this course as thoroughly as possible. (original Item 8: It is important for me to understand the content of this course as thoroughly as possible.)
3	My goal is to learn as much as possible. (original Item 7: I want to learn as much as possible from this class.)
	Mastery-avoidance goal items
5	My aim is to avoid learning less than I possibly could. (original Item 4: I worry that I may not learn all that I possibly could in this class.)
11	I am striving to avoid an incomplete understanding of the course material. (original Item 5: Sometimes I'm afraid that I may not understand the content of this class as thoroughly as I'd like).
9	My goal is to avoid learning less than it is possible to learn. (original Item 6: I am often concerned that I may not learn all that there is to learn in this class.)
	Performance-approach goal items
4	My aim is to perform well relative to other students. (original Item 3: My goal in this class is to get a better grade than most of the other students.)
2	I am striving to do well compared to other students. (original Item 2: It is important for me to do well compared to others in this class.)
8	My goal is to perform better than the other students. (original Item 1: It is important for me to do better than other students.)
	Performance-avoidance goal items
12	My aim is to avoid doing worse than other students. (original Item 10: I just want to avoid doing poorly in this class.)
10	I am striving to avoid performing worse than others. (original Item 12: My fear of performing poorly in this class is often what motivates me.)
6	My goal is to avoid performing poorly compared to others. (original Item 11: My goal in this class is to avoid performing poorly.)

Note. Original AGQ items are from "A 2 × 2 achievement goal framework," by A. J. Elliot and H. A. McGregor, 2001, *Journal of Personality and Social Psychology, 80,* 501–519. Copyright 2001 by the American Psychological Association.

Source: Elliot A.J. & Murayama K. (2008)

Appendix H Achievement Goal Questionnaire-Revised (AGO-R) for Thai College Students and Asian Context

Table 4. Standardized Regression Weights of the four-factor measurement model representing achievement goal

Item	Estimate	S.E.	C.R.	*p*	Standardized Regression Weights
Mastery-Approach Goal					
My goal is to fully understand the contents taught in class.	1.00	-	-	-	.66
My goal is to learn as much as I can.	1.21	.117	10.34	<.001	.76
I try very hard to understand as deep as possible in this subject matter.	.94	.094	9.93	<.001	.60
Performance-Approach Goal					
I am determined to do well when compared to other students.	1.00	-	-	-	.60
My goal is to behave well when compared to other students.	1.29	.140	9.22	<.001	.76
My goal is to produce a better work than other students.	1.08	.123	8.77	<.001	.56
Mastery-Avoidance Goal					
My goal is to avoid learning less than my capability.	1.00			-	.68
My goal is to avoid learning less than what it should be.	.82	.091	8.98	<.001	.65
I try to avoid partially understanding of the subject.	.76	.088	8.68	<.001	.57
Performance-Avoidance Goal					
My goal is to avoid having bad work when compared to other students.	1.00			-	.59
I try hard to avoid producing worse work than others.	1.00	.108	9.32	<.001	.66
My goal is to avoid producing worse work than other students.	1.02	.109	9.40	<.001	.70

Source: Ratsameemonthon L. (2015)

Appendix I Content Validity Index Calculation

ตอนที่ 1 วิธีการเรียนรู้

No.	Item	Expert 1	Expert 2	Expert 3	I-CVI
1	I find that at times studying gives me a feeling of deep personal satisfaction. ฉันรู้สึกพอใจอย่างมากที่ได้ใช้เวลาไปกับการเรียน	/	/	/	1.00
2	I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied. ฉันจะรู้สึกพึงพอใจ ถ้าฉันได้ศึกษาในหัวข้อหนึ่งๆอย่างมากพอจนสามารถสรุปใจความสำคัญได้ด้วยตัวเอง	/	/	/	1.00
3	My aim is to pass the course while doing as little work as possible. ฉันตั้งเป้าหมายว่าจะเรียนให้ผ่านรายวิชานี้ โดยทำงานให้น้อยที่สุดเท่าที่จะเป็นไปได้	/	/	/	1.00
4	I only study seriously what's given out in class or in the course outlines. ฉันศึกษาอย่างจริงจังกับเนื้อหาที่มีในชั้นเรียนและระบุไว้ในรายวิชาเท่านั้น	/	/	/	1.00
5	I feel that virtually any topic can be highly interesting one I get into it. เมื่อฉันสนใจในหัวข้อใด ฉันจะตั้งใจเรียนอย่างมาก	/	/	/	1.00
6	I find most new topics interesting and often spend extra time trying to obtain more information about them. ฉันมีความสนใจในหัวข้อใหม่ๆ และมักจะใช้เวลาค้นคว้าข้อมูลเพิ่มเติมเกี่ยวกับหัวข้อนั้นๆ	/	/	/	1.00
7	I do not find my course very interesting so I keep my work to the minimum. รายวิชานี้ไม่น่าสนใจ ดังนั้นฉันจึงใช้เวลากับรายวิชานี้น้อยมาก	/	/	/	1.00
8	I learn something by rote, going over and over them until I know them by heart even if I do not understand them. ฉันพยายามอ่านเนื้อหาซ้ำๆ เพื่อให้จำเนื้อหาได้ แม้จะไม่เข้าใจก็ตาม	/	/	/	1.00

No.	Item	Expert 1	Expert 2	Expert 3	I-CVI
9	I find that studying academic topics can at times be as exciting as a good novel or movie. การศึกษาหัวข้อทางวิชาการต่างๆ ทำให้ฉันรู้สึกตื่นเต้นราวกับได้อ่านนวนิยายหรือได้ดูภาพยนตร์	/	/	/	1.00
10	I test myself on important topics until I understand them completely. ฉันทดสอบตัวฉันกับหัวข้อสำคัญต่างๆจนกว่าจะเข้าใจเนื้อหาทั้งหมด	/	/	/	1.00
11	I find I can get by in most assessments by memorizing key sections rather than trying to understand them. ฉันผ่านการทดสอบส่วนใหญ่ของรายวิชานี้ได้ด้วยการท่องจำมากกว่าการพยายามเข้าใจเนื้อหา	/	/	/	1.00
12	I generally restrict my study to what is specifically set as I think it is unnecessary to do anything extra. โดยปกติฉันจะเรียนเฉพาะเนื้อหาที่ระบุไว้ โดยไม่จำเป็นต้องศึกษาค้นคว้าเนื้อหาอื่นเพิ่มเติม	/	/	/	1.00
13	I work hard at my studies because I find the material interesting. ฉันตั้งใจเรียนรายวิชานี้อย่างมากเพราะเอกสารการเรียนน่าสนใจ	/	/	/	1.00
14	I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes. ฉันใช้เวลาว่างส่วนใหญ่ไปกับการค้นคว้าข้อมูลเกี่ยวกับหัวข้อที่ฉันสนใจซึ่งเป็นหัวข้อที่มีการอภิปรายกันในชั้นเรียน	/	/	/	1.00
15	I find it is not helpful to study topics in depth. It confuses and wastes time, when all you need is a passing acquaintance with topics. ฉันคิดว่าเราไม่ควรอ่านหัวข้อต่างๆแบบลึกซึ้ง มันจะทำให้สับสนและเสียเวลา อ่านแค่ผ่านๆก็พอ	/	/	/	1.00
16	I believe that lecturers shouldn't expect students to spend significant amounts of time studying material everyone knows won't be examined. ฉันคิดว่าอาจารย์ไม่ควรจะคาดหวังให้นิสิตใช้เวลามากมายในการศึกษาหัวข้อที่ไม่ได้จะออกข้อสอบ	/	/	/	1.00

No.	Item	Expert 1	Expert 2	Expert 3	I-CVI
17	I come to most classes with questions in mind that I want answering. ฉันมีคำถามในใจที่ต้องการหาคำตอบเกือบทุกครั้งที่เข้าชั้นเรียน	/	/	/	1.00
18	I make a point of looking at most of the suggested readings that go with the lectures. ฉันมักจะตามอ่านเนื้อหาที่อาจารย์แนะนำให้ศึกษาเพิ่มเติม	/	/	/	1.00
19	I see no point in learning material which is not likely to be in the examination. ฉันเห็นว่าไม่จำเป็นต้องอ่านเนื้อหาของรายวิชานี้ ที่มีแนวโน้มว่าจะไม่ถูกนำมาออกข้อสอบ	/	/	/	1.00
20	I find the best way to pass examinations is to try to remember answers to likely questions. ทางที่ดีที่สุดที่จะทำให้สอบผ่านคือการจำคำตอบของคำถามที่คาดว่าจะออกข้อสอบ	/	/	/	1.00

ตอนที่ 2 ปัจจัยที่ส่งผลต่อวิธีการเรียนรู้แบบลุ่มลึก

No.	Item	Expert 1	Expert 2	Expert 3	I-CVI
1	My goal is to fully understand the contents taught in class. เป้าหมายของฉันคือต้องเข้าใจเนื้อหาที่สอนในชั้นเรียนทั้งหมด	/	/	/	1.00
2	I am determined to do well when compared to other students. ฉันอยากทำงานที่ได้รับมอบหมายให้ได้ดีกว่าเพื่อนๆ	/	/	/	1.00
3	My goal is to avoid having bad work when compared to other students. ฉันมีเป้าหมายที่จะหลีกเลี่ยงการมีผลงานที่แย่กว่าเพื่อนๆ	/	/	/	1.00
4	To do well in this course all you really needed was a good memory. (R) หากฉันต้องการให้ได้คะแนนดี ฉันต้องท่องจำเนื้อหาที่เรียนมาให้แม่นยำ	/	/	/	1.00

No.	Item	Expert 1	Expert 2	Expert 3	I-CVI
5	I was generally given enough time to understand the things I had to learn. โดยทั่วไป ฉันมีเวลาเพียงพอในการทำความเข้าใจเนื้อหาที่ได้เรียนมา	/	/	/	1.00
6	The instructor considers my feelings. อาจารย์ผู้สอนในรายวิชานี้คำนึงถึงความรู้สึกของฉัน	/	/	/	1.00
7	New ideas are seldom tried out in this class. แนวความคิดใหม่ๆ มักจะถูกนำมาใช้น้อยมากในรายวิชานี้	/	/	/	1.00
8	I know exactly what has to be done in this class. ฉันรู้แน่นอนว่าจะต้องทำอะไรบ้างในรายวิชานี้	/	/	/	1.00
9	I cooperate with other students when doing assignment work. ฉันร่วมมือกับเพื่อนๆ ในการทำงานที่ได้รับมอบหมายของรายวิชานี้	/	/	/	1.00
10	I am expected to do the same work as all the students in the class, in the same way and in the same time. (R) ฉันถูกคาดหวังให้ทำงานแบบเดียวกับเพื่อนทุกคนในรายวิชานี้ ด้วยวิธีเดียวกันและในเวลาเดียวกัน	/	/	/	1.00
11	The instructor is friendly and talks to me. อาจารย์ผู้สอนในรายวิชานี้มีความเป็นมิตรและพูดคุยกับฉัน	/	/	/	1.00
12	The sheer volume of work to be got through in this course meant it couldn't all be thoroughly comprehended. (R) รายวิชานี้มีการมอบหมายงานเป็นจำนวนมาก ทำให้ไม่สามารถประมวลหรือทำความเข้าใจความรู้ต่างๆทั้งหมดได้	/	/	/	1.00
13	The staff seemed more interested in testing what I had memorized than what I had understood. (R) อาจารย์ผู้สอนของรายวิชานี้จะสนใจทดสอบความจำมากกว่าความเข้าใจ	/	/	/	1.00
14	My instructor uses new and different ways of teaching in this class. อาจารย์ผู้สอนในรายวิชานี้ใช้วิธีการสอนใหม่ๆและหลากหลายในชั้นเรียน	/	/	/	1.00
15	My goal is to learn as much as I can. เป้าหมายของฉันคือจะเรียนให้มากที่สุดเท่าที่จะทำได้	/	/	/	1.00

No.	Item	Expert 1	Expert 2	Expert 3	I-CVI
16	I share my books and resources with other students when doing assignments. ฉันแบ่งปันหนังสือและอุปกรณ์ต่างๆกับเพื่อนๆ ในการทำงานที่ได้รับมอบหมายของรายวิชานี้	/	/	/	1.00
17	My goal is to behave well when compared to other students. เป้าหมายของฉันคือการมีความประพฤติที่ดีกว่าเพื่อนๆ	/	/	/	1.00
18	I am generally allowed to work at my own pace in this class. โดยทั่วไป ฉันได้รับอนุญาตให้ทำงานตามแนวทางของฉันในรายวิชานี้	/	/	/	1.00
19	I try hard to avoid producing worse work than others. ฉันพยายามอย่างมากที่จะหลีกเลี่ยงการผลิตผลงานที่แย่กว่าเพื่อนๆ	/	/	/	1.00
20	Getting a certain amount of work done is important in the class. การทำงานที่ระบุไว้ให้สำเร็จเป็นเรื่องที่สำคัญมากสำหรับรายวิชานี้	/	/	/	1.00
21	I have a say in how class time is spent. ฉันได้เสนอความคิดเห็นเกี่ยวกับความเหมาะสมของเวลาที่ถูกใช้ไปในการเรียนการสอนของรายวิชานี้	/	/	/	1.00
22	I try very hard to understand as deep as possible in this subject matter. ฉันพยายามอย่างมากเพื่อให้เข้าใจเนื้อหาอย่างลึกซึ้งที่สุดเท่าที่จะทำได้	/	/	/	1.00
23	I work with other students on projects in this class. ฉันทำโครงการของรายวิชานี้ร่วมกับเพื่อนๆ	/	/	/	1.00
24	My goal is to produce a better work than other students. เป้าหมายของฉันคือทำงานให้มีผลงานดีกว่าเพื่อนๆ	/	/	/	1.00
25	I often get sidetracked in this class instead of sticking to the point. (R) ฉันทำงานไม่ตรงตามประเด็นหลักที่กำหนดให้อยู่บ่อยๆ	/	/	/	1.00
26	My goal is to avoid producing worse work than other students. ฉันมีเป้าหมายที่จะหลีกเลี่ยงการผลิตผลงานที่แย่กว่าเพื่อนๆ	/	/	/	1.00
27	The instructor thinks up innovative activities for me to do. อาจารย์ผู้สอนในรายวิชานี้ คิดหากิจกรรมใหม่ๆ มาให้ฉันทำ	/	/	/	1.00

No.	Item	Expert 1	Expert 2	Expert 3	I-CVI
28	Too many staff asked me questions just about facts. (R) อาจารย์ผู้สอนของรายวิชานี้มักถามเกี่ยวกับเนื้อหาเท่านั้น	/	/	/	1.00
29	The instructor goes out of his/her way to help me. อาจารย์ผู้สอนในรายวิชานี้วางมือจากงานที่กำลังทำอยู่มาช่วยเหลือฉัน	/	/	/	1.00
30	The workload was too heavy. (R) รายวิชานี้มีการมอบหมายงานในปริมาณที่มากเกินไป	/	/	/	1.00
31	I found that most exam questions asking too much details from the course contents. (R) ฉันพบว่าข้อสอบส่วนใหญ่ของรายวิชานี้ มักถามถึงรายละเอียดปลีกย่อยของเนื้อหามากเกินไป	/	/	/	1.00
32	There was a lot of pressure on me as a student in this course. (R) ฉันรู้สึกได้รับแรงกดดันอย่างมากในการเรียนวิชานี้	/	/	/	1.00
33	The instructor helps me when I am having trouble with my work. อาจารย์ผู้สอนในรายวิชานี้ช่วยเหลือฉันเมื่อฉันมีปัญหาในการทำงาน	/	/	/	1.00
34	The teaching approaches used in this class are characterized by innovation and variety. วิธีการสอนในรายวิชานี้มีลักษณะเป็นเทคนิคการสอนรูปแบบใหม่ๆ และมีความหลากหลาย	/	/	/	1.00
35	This class is always disorganized. (R) การเรียนการสอนในวิชานี้ไม่ค่อยมีระบบระเบียบ	/	/	/	1.00
36	I learn from other students in this class. ฉันเรียนรู้จากเพื่อนๆ ในรายวิชานี้	/	/	/	1.00
37	I am allowed to choose activities and how I will work. ฉันสามารถเลือกกิจกรรมและเลือกวิธีทำงานของตนเองได้ในรายวิชานี้	/	/	/	1.00
38	The instructor moves around the classroom to talk with me. อาจารย์ผู้สอนในรายวิชานี้เดินรอบๆ ชั้นเรียนเพื่อมาพูดคุยกับฉัน	/	/	/	1.00
39	Many individual and group works are assigned to me and their due dates are in the same periods of time. (R) ฉันต้องส่งทั้งงานเดี่ยวและงานกลุ่มหลายชิ้นในเวลาไล่เลี่ยกัน	/	/	/	1.00

No.	Item	Expert 1	Expert 2	Expert 3	I-CVI
40	I notified that if my answers are not exactly fit with the course materials provided, I will get less marks. (R) ฉันพบว่าหากคำตอบของฉันในแบบฝึกหัดหรือข้อสอบไม่ตรงกับที่เอกสารประกอบการเรียนระบุไว้ ฉันจะได้คะแนนไม่ค่อยดี	/	/	/	1.00
41	The instructor often thinks of unusual activities. อาจารย์ผู้สอนในรายวิชานี้มักนำกิจกรรมต่างๆ ที่ไม่ซ้ำเดิม มาใช้ในการสอน	/	/	/	1.00
42	I work with other students in this class. ฉันทำงานกับเพื่อนๆในรายวิชานี้	/	/	/	1.00
43	Teaching approaches in this class allow me to proceed at my own pace. กระบวนการสอนในรายวิชานี้ เอื้อให้ฉันดำเนินงานได้ตามจังหวะของตนเอง	/	/	/	1.00
44	Class assignments are clear and I know what to do. การมอบหมายงานในรายวิชานี้มีความชัดเจนและฉันรู้ว่าต้องทำอะไร	/	/	/	1.00
45	I have little opportunity to pursue my particular interests in this class. (R) ฉันมีโอกาสน้อยที่จะได้ทำตามความสนใจเฉพาะของตนเองในรายวิชานี้	/	/	/	1.00
46	I cooperate with other students on class activities. ฉันร่วมมือกับเพื่อนๆ ในการทำกิจกรรมของรายวิชานี้	/	/	/	1.00
47	This class seldom starts on time. (R) อาจารย์ผู้สอนในรายวิชานี้เริ่มสอนไม่ตรงเวลา	/	/	/	1.00
48	I seem to do the same type of activities in every class. (R) ฉันรู้สึกเหมือนกับว่าได้ทำกิจกรรมเหมือนๆเดิมในทุกครั้งของการเรียนรายวิชานี้	/	/	/	1.00
49	The instructor is interested in my problems. อาจารย์ผู้สอนในรายวิชานี้สนใจปัญหาของฉัน	/	/	/	1.00
50	I usually spend my personal time after classes with loads of assignments. (R) ฉันใช้เวลาว่างหลังเลิกเรียนส่วนใหญ่ ไปกับการทำงานที่ได้รับมอบหมายที่มีเป็นจำนวนมากของรายวิชานี้	/	/	/	1.00

No.	Item	Expert 1	Expert 2	Expert 3	I-CVI
51	The instructor is unfriendly and inconsiderate towards me. (R) อาจารย์ผู้สอนในรายวิชานี้ไม่เป็นมิตรและไม่ใส่ใจฉัน	/	/	/	1.00
52	Activities in this class are clearly and carefully planned. กิจกรรมต่างๆในรายวิชานี้มีความชัดเจนและมีการวางแผนมาอย่างรอบคอบ	/	/	/	1.00
53	Students work with me to achieve class goals. เพื่อนๆทำงานร่วมกับฉันเพื่อให้บรรลุวัตถุประสงค์ของรายวิชานี้	/	/	/	1.00
54	My instructor decides what I will do in this class. (R) อาจารย์ผู้สอนในรายวิชานี้ตัดสินใจว่าฉันจะต้องทำอะไรในรายวิชานี้	/	/	/	1.00

ค่า S-CVI/Ave	1.00

The questionnaire was assessed its content validity by three experts. Their names were listed below.

1) Assoc.Prof.Phantipa Sakthong, Ph.D., an instructor of a Faculty of Pharmaceutical Sciences
2) Suchada Sakolkijrungroj, Ph.D., her expertise in psychology, educational measurement, and tool development
3) Piyathip Pradudprom, Ph.D., her expertise in psychology, educational measurement, and tool development

Appendix J Research questionnaire for participants

แบบสอบถามวิธีการเรียนรู้แบบลุ่มลึกของนิสิตเภสัชศาสตร์

คำชี้แจง

1. แบบสอบถามวิธีการเรียนรู้แบบลุ่มลึกของนิสิตเภสัชศาสตร์ชุดนี้ เป็นส่วนหนึ่งของดุษฎีนิพนธ์ เรื่อง วิธีการเรียนรู้แบบลุ่มลึกของนิสิตเภสัชศาสตร์ : การวิเคราะห์พหุระดับ ของนางสาวชามิภา ภาณุดุลกิตติ นิสิตระดับปริญญาเอก หลักสูตรเภสัชศาสตร์สังคมและบริหาร คณะเภสัชศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย ข้อมูลจากแบบสอบถามนี้จะเป็นประโยชน์ต่อการพัฒนาวิธีการเรียนรู้แบบลุ่มลึกของนิสิตเภสัชศาสตร์ ซึ่งจะช่วยเพิ่มประสิทธิผลและทักษะของนิสิตในวิชาชีพเภสัชกรรม

2. ข้อมูลจากการตอบแบบสอบถามนี้จะไม่มีผลกระทบต่อนิสิต อาจารย์ และสถาบัน การรายงานผลจะนำเสนอสรุปเป็นภาพรวม โดยไม่กล่าวถึงชื่อนิสิต อาจารย์ และสถาบัน ความเห็นของนิสิตแต่ละคนจะเป็นความลับ จึงขอความร่วมจากมือนิสิตให้ตอบแบบสอบถามให้ครบทุกข้อตามความเห็นของนิสิต เพื่อจะได้ผลที่ตรงตามความเป็นจริง และสามารถนำไปใช้ประโยชน์ได้

3. แบบสอบถามนี้ ประกอบด้วย 3 ตอน รวมทั้งหมด 73 ข้อ
   ตอนที่ 1 วิธีการเรียนรู้ (20 ข้อ)
   ตอนที่ 2 ปัจจัยที่ส่งผลต่อวิธีการเรียนรู้แบบลุ่มลึก (50 ข้อ)
   ตอนที่ 3 ข้อมูลส่วนตัว (3 ข้อ)

ขอขอบคุณที่ท่านเสียสละเวลาในการตอบแบบสอบถามมา ณ ที่นี้

นางสาวชามิภา ภาณุดุลกิตติ (ผู้วิจัย)

ติดต่อโทร: 084-665-4888

แบบสอบถามวิธีการเรียนรู้แบบลุ่มลึกของนิสิตเภสัชศาสตร์

ตอนที่ 1 วิธีการเรียนรู้

โปรดทำเครื่องหมาย ✓ ในช่องที่ตรงกับความคิดเห็นของท่านมากที่สุด ดังนี้

1 หมายถึง นิสิตไม่เห็นด้วยกับข้อความนั้นเลย

2 หมายถึง นิสิตค่อนข้างไม่เห็นด้วยกับข้อความนั้น

3 หมายถึง นิสิตไม่สามารถตัดสินใจได้ว่าเห็นด้วยกับข้อความนั้น

4 หมายถึง นิสิตค่อนข้างเห็นด้วยกับข้อความนั้น

5 หมายถึง นิสิตเห็นด้วยกับข้อความนั้นทุกประการ

โปรดระลึกถึงวิธีการเรียนรู้ ที่ท่านได้ใช้สำหรับการเรียนรายวิชา	**ระดับความคิดเห็น**				
	1	2	3	4	5
1. ฉันรู้สึกพอใจอย่างมากที่ได้ใช้เวลาไปกับการเรียนรายวิชานี้					
2. ฉันจะรู้สึกพึงพอใจอย่างมาก ถ้าฉันได้ศึกษาในรายวิชานี้พอจนสามารถสรุปใจความสำคัญได้ด้วยตัวเอง					
3. ฉันตั้งเป้าหมายว่าจะเรียนให้ผ่านรายวิชานี้ โดยทำงานให้น้อยที่สุดเท่าที่จะเป็นไปได้					
4. ฉันศึกษาอย่างจริงจังเฉพาะกับเนื้อหาในชั้นเรียนและที่ระบุไว้ในรายวิชานี้เท่านั้น					
5. เมื่อฉันสนใจในหัวข้อใดในรายวิชานี้ ฉันจะตั้งใจเรียนอย่างมาก					
6. ฉันมีความสนใจหัวข้อใดในรายวิชานี้ ฉันมักจะใช้เวลาค้นคว้าข้อมูลเพิ่มเติมเกี่ยวกับหัวข้อนั้นๆ					
7. รายวิชานี้ไม่น่าสนใจ ดังนั้นฉันจึงใช้เวลากับรายวิชานี้น้อยมาก					
8. ฉันพยายามอ่านเนื้อหาของรายวิชานี้ซ้ำๆ เพื่อให้จำเนื้อหาได้ แม้จะไม่เข้าใจก็ตาม					
9. การศึกษาหัวข้อต่างๆ ของรายวิชานี้ ทำให้ฉันรู้สึกตื่นเต้นราวกับได้อ่านนวนิยายหรือได้ดูภาพยนตร์					
10. ฉันทดสอบตนเองกับหัวข้อสำคัญต่างๆ ของรายวิชานี้จนกว่าจะเข้าใจเนื้อหาทั้งหมด					
11. ฉันผ่านการทดสอบส่วนใหญ่ของรายวิชานี้ได้ด้วยการท่องจำมากกว่าการพยายามเข้าใจเนื้อหา					
12. ฉันจะเรียนเฉพาะเนื้อหาที่ระบุไว้ในรายวิชานี้ โดยไม่จำเป็นต้องศึกษาค้นคว้าเนื้อหาอื่นเพิ่มเติม					
13. ฉันตั้งใจเรียนรายวิชานี้อย่างมากเพราะเอกสารการเรียนน่าสนใจ					

โปรดระลึกถึงวิธีการเรียนรู้ ที่ท่านได้ใช้สำหรับการเรียนรายวิชา	**ระดับความคิดเห็น**				
	1	2	3	4	5
14. ฉันใช้เวลาว่างส่วนใหญ่ไปกับการค้นคว้าข้อมูลเกี่ยวกับหัวข้อที่ฉันสนใจและมีการอภิปรายกันในชั้นเรียนของรายวิชานี้					
15. ฉันคิดว่าเราไม่ควรอ่านหัวข้อต่างๆ ของรายวิชานี้แบบลึกซึ้ง มันจะทำให้สับสนและเสียเวลา อ่านแค่ผ่านๆ ก็พอ					
16. ฉันคิดว่าอาจารย์ในรายวิชานี้ไม่ควรจะคาดหวังให้นิสิตใช้เวลามากมายในการศึกษาหัวข้อที่ไม่ได้จะออกข้อสอบ					
17. ฉันมีคำถามในใจที่ต้องการหาคำตอบเกือบทุกครั้งที่เข้าชั้นเรียนรายวิชานี้					
18. ฉันมักจะตามอ่านเนื้อหาของรายวิชานี้ที่อาจารย์แนะนำให้ศึกษาเพิ่มเติม					
19. ฉันเห็นว่าไม่จำเป็นต้องอ่านเนื้อหาของรายวิชานี้ ที่มีแนวโน้มว่าจะไม่ถูกนำมาออกข้อสอบ					
20. ทางที่ดีที่สุดที่จะทำให้สอบผ่านรายวิชานี้คือการจำคำตอบของคำถามที่คาดว่าจะออกข้อสอบ					

ตอนที่ 2 ปัจจัยที่ส่งผลต่อวิธีการเรียนรู้แบบลุ่มลึก

โปรดทำเครื่องหมาย ✓ ในช่องที่ตรงกับความคิดเห็นของท่านมากที่สุด ดังนี้

1 หมายถึง นิสิตไม่เห็นด้วยกับข้อความนั้นเลย

2 หมายถึง นิสิตค่อนข้างไม่เห็นด้วยกับข้อความนั้น

3 หมายถึง นิสิตไม่สามารถตัดสินใจได้ว่าเห็นด้วยกับข้อความนั้น

4 หมายถึง นิสิตค่อนข้างเห็นด้วยกับข้อความนั้น

5 หมายถึง นิสิตเห็นด้วยกับข้อความนั้นทุกประการ

ข้อคำถาม	**ระดับความคิดเห็น**				
	1	2	3	4	5
1. เป้าหมายของฉันคือต้องเข้าใจเนื้อหาของรายวิชานี้ทั้งหมดที่สอนในชั้นเรียน					
2. ฉันอยากทำงานของรายวิชานี้ที่ได้รับมอบหมายให้ได้ดีกว่าเพื่อนๆ					
3. ฉันมีเป้าหมายที่จะหลีกเลี่ยงการมีผลงานของรายวิชานี้ที่แย่กว่าเพื่อนๆ					
4. ฉันต้องท่องจำเนื้อหาที่เรียนมาของรายวิชานี้ให้ได้อย่างแม่นยำ เพื่อให้ได้คะแนนดี					
5. อาจารย์ผู้สอนในรายวิชานี้คำนึงถึงความรู้สึกของฉัน					
6. ฉันรู้แน่นอนว่าจะต้องทำอะไรบ้างในรายวิชานี้					
7. ฉันร่วมมือกับเพื่อนๆ ในการทำงานที่ได้รับมอบหมายของรายวิชานี้					

ข้อคำถาม	ระดับความคิดเห็น				
	1	2	3	4	5
8. ฉันถูกคาดหวังให้ทำงานแบบเดียวกับเพื่อนทุกคนในรายวิชานี้ ด้วยวิธีเดียวกันและในเวลาเดียวกัน					
9. อาจารย์ผู้สอนในรายวิชานี้มีความเป็นมิตรและพูดคุยกับฉัน					
10. รายวิชานี้มีการมอบหมายงานเป็นจำนวนมาก ทำให้ไม่สามารถประมวลหรือทำความเข้าใจความรู้ต่างๆทั้งหมดได้					
11. อาจารย์ผู้สอนของรายวิชานี้จะสนใจทดสอบความจำมากกว่าความเข้าใจ					
12. อาจารย์ผู้สอนในรายวิชานี้ใช้วิธีการสอนใหม่ๆ และหลากหลายในชั้นเรียน					
13. เป้าหมายของฉันคือจะเรียนรายวิชานี้ให้มากที่สุดเท่าที่จะทำได้					
14. ฉันแบ่งปันหนังสือและอุปกรณ์ต่างๆ กับเพื่อนๆ ในการทำงานที่ได้รับมอบหมายของรายวิชานี้					
15. เป้าหมายของฉันคือการมีความประพฤติที่ดีกว่าเพื่อนๆ					
16. โดยทั่วไป ฉันได้รับอนุญาตให้ทำงานตามแนวทางของฉันในรายวิชานี้					
17. ฉันพยายามอย่างมากที่จะหลีกเลี่ยงการผลิตผลงานที่แย่กว่าเพื่อนๆ					
18. การทำงานที่ระบุไว้ให้สำเร็จเป็นเรื่องที่สำคัญมากสำหรับรายวิชานี้					
19. ฉันพยายามอย่างมากเพื่อให้เข้าใจเนื้อหาอย่างลึกซึ้งที่สุดเท่าที่จะทำได้					
20. ฉันทำโครงการของรายวิชานี้ร่วมกับเพื่อนๆ					
21. เป้าหมายของฉันคือทำงานให้มีผลงานดีกว่าเพื่อนๆ					
22. ฉันทำงานไม่ตรงตามประเด็นหลักที่กำหนดให้อยู่บ่อยๆ					
23. ฉันมีเป้าหมายที่จะหลีกเลี่ยงการผลิตผลงานที่แย่กว่าเพื่อนๆ					
24. อาจารย์ผู้สอนในรายวิชานี้ คิดหากิจกรรมใหม่ๆ มาให้ฉันทำ					
25. ข้อสอบของรายวิชานี้มักถามเกี่ยวกับเนื้อหาเท่านั้น					
26. อาจารย์ผู้สอนในรายวิชานี้วางมือจากงานที่กำลังทำอยู่มาช่วยเหลือฉัน					
27. รายวิชานี้มีการมอบหมายงานในปริมาณที่มากเกินไป					
28. ฉันพบว่าข้อสอบส่วนใหญ่ของรายวิชานี้ มักถามถึงรายละเอียดปลีกย่อยของเนื้อหามากเกินไป					
29. อาจารย์ผู้สอนในรายวิชานี้ช่วยเหลือฉันเมื่อฉันมีปัญหาในการทำงาน					
30. วิธีการสอนในรายวิชานี้มีลักษณะเป็นเทคนิคการสอนรูปแบบใหม่ๆ และมีความหลากหลาย					
31. การเรียนการสอนในวิชานี้ไม่ค่อยมีระบบระเบียบ					
32. ฉันเรียนรู้จากเพื่อนๆ ในรายวิชานี้					

ข้อคำถาม	ระดับความคิดเห็น				
	1	2	3	4	5
33. ฉันสามารถเลือกกิจกรรมและเลือกวิธีทำงานของตนเองได้ในรายวิชานี้					
34. อาจารย์ผู้สอนในรายวิชานี้เดินรอบๆ ชั้นเรียนเพื่อมาพูดคุยกับฉัน					
35. ฉันต้องส่งทั้งงานเดี่ยวและงานกลุ่มหลายชิ้นในเวลาไล่เลี่ยกัน					
36. ฉันพบว่าหากคำตอบของฉันในแบบฝึกหัดหรือข้อสอบไม่ตรงกับที่เอกสารประกอบการเรียนระบุไว้ ฉันจะได้คะแนนไม่ค่อยดี					
37. อาจารย์ผู้สอนในรายวิชานี้มักนำกิจกรรมต่างๆ ที่ไม่ซ้ำเดิม มาใช้ในการสอน					
38. ฉันทำงานกับเพื่อนๆ ในรายวิชานี้					
39. กระบวนการสอนในรายวิชานี้ เอื้อให้ฉันดำเนินงานได้ตามจังหวะของตนเอง					
40. การมอบหมายงานในรายวิชานี้มีความชัดเจนและฉันรู้ว่าต้องทำอะไร					
41. ฉันมีโอกาสน้อยที่จะได้ทำตามความสนใจเฉพาะของตนเองในรายวิชานี้					
42. ฉันร่วมมือกับเพื่อนๆ ในการทำกิจกรรมของรายวิชานี้					
43. อาจารย์ผู้สอนในรายวิชานี้เริ่มสอนไม่ตรงเวลา					
44. ฉันรู้สึกเหมือนกับว่าได้ทำกิจกรรมเหมือนๆ เดิมในทุกครั้งของการเรียนรายวิชานี้					
45. อาจารย์ผู้สอนในรายวิชานี้สนใจปัญหาของฉัน					
46. ฉันใช้เวลาว่างหลังเลิกเรียนส่วนใหญ่ ไปกับการทำงานที่ได้รับมอบหมายที่มีเป็นจำนวนมากของรายวิชานี้					
47. อาจารย์ผู้สอนในรายวิชานี้ไม่เป็นมิตรและไม่ใส่ใจฉัน					
48. กิจกรรมต่างๆ ในรายวิชานี้มีความชัดเจนและมีการวางแผนมาอย่างรอบคอบ					
49. เพื่อนๆ ทำงานร่วมกับฉันเพื่อให้บรรลุวัตถุประสงค์ของรายวิชานี้					
50. อาจารย์ผู้สอนในรายวิชานี้ตัดสินใจว่าฉันจะต้องทำอะไรในรายวิชานี้					

ตอนที่ 3 ข้อมูลพื้นฐานของนิสิต

โปรดทำเครื่องหมาย ✓ ลงในช่อง ❒ หรือเติมข้อมูลเกี่ยวกับตัวท่านตามความเป็นจริง

1. กรุณาระบุเพศของท่าน ❒ 1) ชาย ❒ 2) หญิง
2. ขณะนี้ท่านกำลังศึกษาอยู่ชั้นปีที่ .....
3. เกรดเฉลี่ยสะสมล่าสุดของท่านคือ .....

ขอขอบคุณที่ท่านเสียสละเวลาในการตอบแบบสอบถามมา ณ ที่นี้

Appendix K Certificate of Approval

AF 02-12

The Research Ethics Review Committee for Research Involving Human Research Participants, Health Sciences Group, Chulalongkorn University
Jamjuree 1 Building, 2nd Floor, Phyathai Rd., Patumwan district, Bangkok 10330, Thailand.
Tel/Fax: 0-2218-3202 E-mail: eccu@chula.ac.th

COA No. 211/2016

Certificate of Approval

Study Title No. 175.1/59 : DEEP APPROACH TO LEARNING OF PHARMACY STUDENTS: A MULTILEVEL ANALYSIS

Principal Investigator : MISS CHAMIPA PHANUDULKITTI

Place of Proposed Study/Institution : Faculty of Pharmaceutical Sciences, Chulalongkorn University

The Research Ethics Review Committee for Research Involving Human Research Participants, Health Sciences Group, Chulalongkorn University, Thailand, has approved constituted in accordance with the International Conference on Harmonization – Good Clinical Practice (ICH-GCP).

Signature: ..... Signature: .....
(Associate Professor Prida Tasanapradit, M.D.) (Assistant Professor Nuntaree Chaichanawongsaroj, Ph.D.)
Chairman Secretary

Date of Approval : 24 November 2016 Approval Expire date : 23 November 2017

The approval documents including

1) Research proposal
2) Patient/Participant Information Sheet and Informed Consent Form
3) Researcher
4) Questionnaires

Protocol No. 175.1/59
Date of Approval 24 NOV 2016
Approval Expire Date 23 NOV 2017

The approved investigator must comply with the following conditions:

1. *The research/project activities must end on the approval expired date of the Research Ethics Review Committee for Research Involving Human Research Participants, Health Sciences Group, Chulalongkorn University (RECCU). In case the research/project is unable to complete within that date, the project extension can be applied one month prior to the RECCU approval expired date.*
2. *Strictly conduct the research/project activities as written in the proposal.*
3. *Using only the documents that bearing the RECCU's seal of approval with the subjects/volunteers (including subject information sheet, consent form, invitation letter for project/research participation (if available).*
4. *Report to the RECCU for any serious adverse events within 5 working days*
5. *Report to the RECCU for any change of the research/project activities prior to conduct the activities.*
6. *Final report (AF 03-12) and abstract is required for a one year (or less) research/project and report within 30 days after the completion of the research/project. For thesis, abstract is required and report within 30 days after the completion of the research/project.*
7. *Annual progress report is needed for a two- year (or more) research/project and submit the progress report before the expire date of certificate. After the completion of the research/project processes as No. 6.*

Appendix L Correlation among items

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	MA1	MA2	MA3	PA1	PA2	PA3	PV1	PV2	PV3
D1	1	.501**	.533**	.528**	.131**	.501**	.385**	.367**	.349**	.355**	.299**	.453**	.206**	.196**	.210**	.069	.029	.092*	.047
D2	.501**	1	.506**	.416**	.200**	.390**	.375**	.308**	.309**	.351**	.296**	.283**	.210**	.220**	.193**	.101*	.126**	.202**	.097*
D3	.533**	.506**	1	.529**	.194**	.384**	.406**	.401**	.357**	.403**	.288**	.366**	.233**	.233**	.195**	.054	.048	.108*	.001
D4	.528**	.416**	.529**	1	.198**	.401**	.369**	.396**	.449**	.474**	.331**	.396**	.244**	.187**	.168**	.005	-.045	.061	-.026
D5	.131**	.200**	.194**	.198**	1	.147**	.268**	.235**	.293**	.353**	.157**	.123**	.154**	.118**	.071	.020	.047	.088*	.038
D6	.501**	.390**	.384**	.401**	.147**	1	.323**	.302**	.263**	.297**	.279**	.339**	.253**	.176**	.150**	.028	.054	.134**	.012
D7	.385**	.375**	.406**	.369**	.268**	.323**	1	.453**	.489**	.500**	.282**	.298**	.262**	.221**	.202**	.071	.078	.187**	.025
D8	.367**	.308**	.401**	.396**	.235**	.302**	.453**	1	.433**	.510**	.323**	.335**	.357**	.224**	.162**	.028	.028	.116**	.037
D9	.349**	.309**	.357**	.449**	.293**	.263**	.489**	.433**	1	.559**	.215**	.312**	.289**	.217**	.205**	.075	.083	.183**	.066
D10	.355**	.351**	.403**	.474**	.353**	.297**	.500**	.510**	.559**	1	.305**	.270**	.236**	.234**	.164**	.053	.036	.080	.006
MA1	.299**	.296**	.288**	.331**	.157**	.279**	.282**	.323**	.215**	.305**	1	.423**	.536**	.440**	.252**	.224**	.088*	.146**	.077
MA2	.453**	.283**	.366**	.396**	.123**	.339**	.298**	.335**	.312**	.270**	.423**	1	.470**	.329**	.300**	.166**	.017	.125**	.013
MA3	.206**	.210**	.233**	.244**	.154**	.253**	.262**	.357**	.289**	.236**	.536**	.470**	1	.283**	.221**	.132**	.048	.169**	.024
PA1	.196**	.220**	.233**	.187**	.118**	.176**	.221**	.224**	.217**	.234**	.440**	.329**	.283**	1	.476**	.555**	.279**	.289**	.227**
PA2	.210**	.193**	.195**	.168**	.071	.150**	.202**	.162**	.205**	.164**	.252**	.300**	.221**	.476**	1	.538**	.226**	.367**	.267**
PA3	.069	.101*	.054	.005	.020	.028	.071	.028	.075	.053	.224**	.166**	.132**	.555**	.538**	1	.227**	.326**	.376**
PV1	.029	.126**	.048	-.045	.047	.054	.078	.028	.083	.036	.088*	.017	.048	.279**	.226**	.227**	1	.557**	.446**
PV2	.092*	.202**	.108*	.061	.088*	.134**	.187**	.116**	.183**	.080	.146**	.125**	.169**	.289**	.367**	.326**	.557**	1	.627**
PV3	.047	.097*	.001	-.026	.038	.012	.025	.037	.066	.006	.077	.013	.024	.227**	.267**	.376**	.446**	.627**	1
AA1	.003	.000	.055	-.008	-.021	-.006	.010	-.044	.021	.074	-.135**	-.097*	-.197**	-.042	-.060	-.089*	-.106*	-.064	-.038
AA2	.150**	.164**	.127**	.163**	.106*	.159**	.074	.063	.107*	.198**	.101*	.108*	.116**	.047	-.045	-.055	.055	.113**	.104*
AA3	.016	.069	.062	.038	.116**	.074	.028	.049	.016	.103*	.075	.035	.066	.034	-.048	-.038	-.006	.060	.094*
AA4	.245**	.220**	.282**	.205**	.011	.272**	.211**	.173**	.119**	.178**	.069	.131**	.071	.028	.039	-.012	.018	.022	.029
AA5	.172**	.115**	.164**	.151**	-.019	.129**	.124**	.076	.117**	.158**	.069	.099*	.039	.014	-.027	-.093*	-.055	-.054	-.101*
AW1	.216**	.205**	.192**	.158**	.104*	.164**	.108*	.180**	.034	.168**	.152**	.131**	.174**	.019	-.061	-.056	.003	.051	.066
AW2	.273**	.226**	.194**	.236**	.141**	.183**	.164**	.202**	.053	.176**	.182**	.122**	.152**	.066	-.030	-.047	.086*	.081	.027
AW3	.194**	.215**	.225**	.164**	.091*	.153**	.123**	.152**	.057	.091*	.125**	.077	.159**	.067	-.020	.024	.030	.068	.055
AW4	-.016	.074	.033	-.003	.006	-.062	-.094*	-.009	-.170**	-.078	-.023	-.043	-.056	-.094*	-.073	-.033	.018	.026	.035
PE1	.347**	.202**	.292**	.275**	-.002	.240**	.160**	.158**	.215**	.180**	.185**	.269**	.182**	.150**	.170**	.110*	.065	.103*	.078
PE2	.252**	.211**	.221**	.238**	.051	.197**	.176**	.159**	.156**	.199**	.187**	.238**	.209**	.050	.138**	.021	.013	.126**	.038
PE3	.166**	.048	.159**	.103*	.006	.070	.173**	.140**	.221**	.108*	.109*	.122**	.070	.113**	.163**	.075	-.017	.055	.006
PE4	.211**	.160**	.140**	.169**	.038	.158**	.176**	.109*	.176**	.160**	.160**	.194**	.189**	.080	.114**	.102*	.020	.075	.088*
PE5	.207**	.147**	.272**	.254**	.105*	.078	.168**	.158**	.260**	.207**	.146**	.184**	.066	.129**	.180**	.055	-.071	.005	-.078
PE6	.285**	.165**	.248**	.232**	.038	.155**	.161**	.147**	.213**	.166**	.177**	.227**	.193**	.151**	.212**	.156**	.014	.133**	.098*
PE7	.231**	.187**	.157**	.166**	-.015	.195**	.104*	.086*	.057	.115**	.136**	.154**	.133**	.014	.071	.022	.055	.092*	.068
IN1	.348**	.247**	.358**	.393**	.053	.220**	.144**	.169**	.323**	.238**	.148**	.316**	.123**	.153**	.227**	.052	-.010	.084	-.009
IN2	.290**	.222**	.300**	.347**	.127**	.167**	.183**	.162**	.327**	.253**	.082	.224**	.078	.141**	.205**	.077	-.050	.058	.000
IN3	.370**	.238**	.352**	.373**	.048	.207**	.256**	.228**	.345**	.285**	.188**	.287**	.158**	.152**	.180**	.075	-.034	.005	-.034
IN4	.304**	.206**	.328**	.325**	.115**	.120**	.183**	.226**	.340**	.268**	.085*	.234**	.075	.111*	.133**	.053	-.150**	-.009	-.049
IN5	.250**	.200**	.276**	.227**	.000	.129**	.160**	.136**	.173**	.163**	.079	.175**	.074	.077	.044	.002	-.040	.008	-.023
TO1	.377**	.267**	.305**	.298**	.095*	.306**	.242**	.313**	.283**	.219**	.244**	.257**	.263**	.170**	.146**	.064	.068	.117**	.041
TO2	.126**	.153**	.150**	.201**	.117**	.137**	.172**	.193**	.244**	.207**	.201**	.191**	.268**	.248**	.164**	.154**	.157**	.272**	.185**
TO3	.129**	.156**	.100*	.027	-.022	.110*	.036	.072	.022	.037	.083	.115**	.134**	.016	.015	-.010	.059	.087*	.122**
TO4	.283**	.184**	.254**	.282**	.105*	.225**	.113**	.119**	.089*	.128**	.145**	.178**	.087*	.004	.011	-.034	.010	.061	.075
TO5	.379**	.267**	.331**	.310**	.117**	.301**	.198**	.253**	.256**	.240**	.181**	.284**	.237**	.167**	.165**	.075	.082	.140**	.071
TO6	.167**	.168**	.173**	.104*	.063	.115**	.026	.022	.079	.036	.046	.100*	.054	.024	.073	-.010	.017	.056	.076
TO7	.244**	.152**	.266**	.286**	.104*	.183**	.191**	.175**	.255**	.238**	.197**	.244**	.226**	.113**	.157**	.100*	.058	.060	.047
CO1	.031	.140**	.062	.070	.086*	.049	.066	.098*	.173**	.112**	.177**	.068	.160**	.091*	.082	.124**	.049	.128**	.116**
CO2	.168**	.215**	.124**	.107*	.087*	.163**	.176**	.168**	.228**	.149**	.223**	.273**	.180**	.208**	.233**	.148**	.090*	.118**	.058
CO3	-.041	.023	-.002	-.005	.051	.023	.090*	.034	.153**	.089*	.058	.053	.095*	.063	.051	.088*	.051	.118**	.009
CO4	.033	.169**	.037	.089*	.107*	.093*	.106*	.094*	.169**	.125**	.107*	.045	.097*	.044	-.012	-.020	.124**	.092*	.064
CO5	.027	.156**	.039	.042	.098*	.027	.083	.083	.181**	.131**	.112**	.061	.098*	.084	.069	.091*	.081	.136**	.059
CO6	.043	.153**	.067	.024	.018	.073	.108*	.030	.116**	.078	.088*	.044	.066	.076	.106*	.153**	.130**	.130**	.121**
CO7	.075	.116**	.116**	.088*	.114**	.114**	.147**	.090*	.206**	.154**	.118**	.062	.115**	.051	.082	.056	.059	.122**	.106*
ID1	-.007	-.023	.016	.068	.053	-.042	.037	.045	.002	.044	-.009	-.079	-.006	-.071	-.137**	-.067	-.005	-.019	.030
ID2	.130**	.207**	.160**	.159**	.062	.091*	.165**	.143**	.202**	.204**	.126**	.087*	.148**	.196**	.227**	.228**	.130**	.186**	.121**
ID3	.168**	.202**	.283**	.252**	.109*	.123**	.160**	.211**	.255**	.219**	.106*	.161**	.127**	.164**	.163**	.150**	-.066	.122**	.043
ID4	.304**	.240**	.357**	.372**	.109*	.175**	.208**	.258**	.274**	.236**	.111*	.229**	.160**	.174**	.220**	.132**	.032	.150**	.041
ID5	.224**	.190**	.257**	.203**	.086*	.135**	.110*	.142**	.208**	.202**	.131**	.141**	.129**	.143**	.098*	.063	.014	.069	.018
ID6	-.049	-.002	-.023	-.016	.000	-.078	-.043	-.036	-.003	-.010	-.074	-.047	-.039	-.054	-.122**	-.072	-.030	-.046	-.063

	AA1	AA2	AA3	AA4	AA5	AW1	AW2	AW3	AW4	PE1	PE2	PE3	PE4	PE5	PE6	PE7	IN1	IN2	IN3	IN4
D1	.003	.150**	.016	.245**	.172**	.216**	.273**	.194**	-.016	.347**	.252**	.166**	.211**	.207**	.285**	.231**	.348**	.290**	.370**	.304**
D2	.000	.164**	.069	.220**	.115**	.205**	.226**	.215**	.074	.202**	.211**	.048	.160**	.147**	.165**	.187**	.247**	.222**	.238**	.206**
D3	.055	.127**	.062	.282**	.164**	.192**	.194**	.225**	.033	.292**	.221**	.159**	.140**	.272**	.248**	.157**	.358**	.300**	.352**	.328**
D4	-.008	.163**	.038	.205**	.151**	.158**	.236**	.164**	-.003	.275**	.238**	.103*	.169**	.254**	.232**	.166**	.393**	.347**	.373**	.325**
D5	-.021	.106*	.116**	.011	-.019	.104*	.141**	.091*	.006	-.002	.051	.006	.038	.105*	.038	-.015	.053	.127**	.048	.115**
D6	-.006	.159**	.074	.272**	.129**	.164**	.183**	.153**	-.062	.240**	.197**	.070	.158**	.078	.155**	.195**	.220**	.167**	.207**	.120**
D7	.010	.074	.028	.211**	.124**	.108*	.164**	.123**	-.094*	.160**	.176**	.173**	.176**	.168**	.161**	.104*	.144**	.183**	.256**	.183**
D8	-.044	.063	.049	.173**	.076	.180**	.202**	.152**	-.009	.158**	.159**	.140**	.109*	.158**	.147**	.086*	.169**	.162**	.228**	.226**
D9	.021	.107*	.016	.119**	.117**	.034	.053	.057	-.170**	.215**	.156**	.221**	.176**	.260**	.213**	.057	.323**	.327**	.345**	.340**
D10	.074	.198**	.103*	.178**	.158**	.168**	.176**	.091*	-.078	.180**	.199**	.108*	.160**	.207**	.166**	.115**	.238**	.253**	.285**	.268**
MA1	-.135**	.101*	.075	.069	.069	.152**	.182**	.125**	-.023	.185**	.187**	.109*	.160**	.146**	.177**	.136**	.148**	.082	.188**	.085*
MA2	-.097*	.108*	.035	.131**	.099*	.131**	.122**	.077	-.043	.269**	.238**	.122**	.194**	.184**	.227**	.154**	.316**	.224**	.287**	.234**
MA3	-.197**	.116**	.066	.071	.039	.174**	.152**	.159**	-.056	.182**	.209**	.070	.189**	.066	.193**	.133**	.123**	.078	.158**	.075
PA1	-.042	.047	.034	.028	.014	.019	.066	.067	-.094*	.150**	.050	.113**	.080	.129**	.151**	.014	.153**	.141**	.152**	.111*
PA2	-.060	-.045	-.048	.039	-.027	-.061	-.030	-.020	-.073	.170**	.138**	.163**	.114**	.180**	.212**	.071	.227**	.205**	.180**	.133**
PA3	-.089*	-.055	-.038	-.012	-.093*	-.056	-.047	.024	-.033	.110*	.021	.075	.102*	.055	.156**	.022	.052	.077	.075	.053
PV1	-.106*	.055	-.006	.018	-.055	.003	.086*	.030	.018	.065	.013	-.017	.020	-.071	.014	.055	-.010	-.050	-.034	-.150**
PV2	-.064	.113**	.060	.022	-.054	.051	.081	.068	.026	.103*	.126**	.055	.075	.005	.133**	.092*	.084	.058	.005	-.009
PV3	-.038	.104*	.094*	.029	-.101*	.066	.027	.055	.035	.078	.038	.006	.088*	-.078	.098*	.068	-.009	.000	-.034	-.049
AA1	1	.348**	.334**	.294**	.336**	-.017	-.016	.045	.054	-.048	.025	.062	-.025	.031	.087*	.081	.085*	.010	-.027	.025
AA2	.348**	1	.412**	.473**	.323**	.156**	.136**	.150**	.095*	.170**	.182**	.065	.101*	.127**	.119**	.206**	.189**	.099*	.154**	.113**
AA3	.334**	.412**	1	.310**	.230**	.069	.079	.035	.057	-.004	.071	-.059	-.010	.081	.042	.036	.089*	.009	-.001	.025
AA4	.294**	.473**	.310**	1	.399**	.117**	.143**	.165**	.040	.180**	.162**	.077	.111*	.127**	.150**	.163**	.206**	.097*	.201**	.068
AA5	.336**	.323**	.230**	.399**	1	.029	.073	.075	.021	.078	.087*	.031	.025	.043	.070	.064	.150**	.014	.072	.051
AW1	-.017	.156**	.069	.117**	.029	1	.749**	.535**	.507**	.158**	.143**	.048	.049	.005	.093*	.201**	.043	.024	.043	.015
AW2	-.016	.136**	.079	.143**	.073	.749**	1	.572**	.522**	.186**	.165**	.039	.065	-.027	.083	.224**	.032	.014	.029	-.016
AW3	.045	.150**	.035	.165**	.075	.535**	.572**	1	.496**	.137**	.130**	.005	.065	-.043	.105*	.254**	.044	.002	.003	-.023
AW4	.054	.095*	.057	.040	.021	.507**	.522**	.496**	1	-.022	.026	-.109*	-.083	-.073	-.113**	.070	-.068	-.100*	-.176**	-.100*
PE1	-.048	.170**	-.004	.180**	.078	.158**	.186**	.137**	-.022	1	.587**	.384**	.481**	.281**	.547**	.470**	.286**	.257**	.335**	.253**
PE2	.025	.182**	.071	.162**	.087*	.143**	.165**	.130**	.026	.587**	1	.381**	.519**	.333**	.508**	.545**	.310**	.251**	.280**	.250**
PE3	.062	.065	-.059	.077	.031	.048	.039	.005	-.109*	.384**	.381**	1	.459**	.378**	.481**	.296**	.277**	.314**	.338**	.315**
PE4	-.025	.101*	-.010	.111*	.025	.049	.065	.065	-.083	.481**	.519**	.459**	1	.297**	.554**	.388**	.240**	.265**	.339**	.285**
PE5	.031	.127**	.081	.127**	.043	.005	-.027	-.043	-.073	.281**	.333**	.378**	.297**	1	.408**	.161**	.425**	.421**	.430**	.520**
PE6	.087*	.119**	.042	.150**	.070	.093*	.083	.105*	-.113**	.547**	.508**	.481**	.554**	.408**	1	.385**	.325**	.309**	.376**	.359**
PE7	.081	.206**	.036	.163**	.064	.201**	.224**	.254**	.070	.470**	.545**	.296**	.388**	.161**	.385**	1	.165**	.108*	.150**	.045
IN1	.085*	.189**	.089*	.206**	.150**	.043	.032	.044	-.068	.286**	.310**	.277**	.240**	.425**	.325**	.165**	1	.643**	.652**	.576**
IN2	.010	.099*	.009	.097*	.014	.024	.014	.002	-.100*	.257**	.251**	.314**	.265**	.421**	.309**	.108*	.643**	1	.625**	.626**
IN3	-.027	.154**	-.001	.201**	.072	.043	.029	.003	-.176**	.335**	.280**	.338**	.339**	.430**	.376**	.150**	.652**	.625**	1	.612**
IN4	.025	.113**	.025	.068	.051	.015	-.016	-.023	-.100*	.253**	.250**	.315**	.285**	.520**	.359**	.045	.576**	.626**	.612**	1
IN5	.113**	.184**	.127**	.263**	.164**	.034	.082	.072	-.002	.110*	.134**	.128**	.130**	.275**	.197**	.073	.350**	.363**	.402**	.370**
TO1	-.039	.128**	.004	.196**	.144**	.191**	.178**	.136**	-.016	.378**	.270**	.166**	.212**	.129**	.245**	.193**	.211**	.153**	.211**	.165**
TO2	-.091*	.152**	.086*	.062	-.074	.030	.012	-.030	-.108*	.130**	.172**	.118**	.215**	.099*	.187**	.137**	.071	.160**	.131**	.132**
TO3	.056	.162**	.050	.103*	.073	.180**	.169**	.211**	.121**	.129**	.242**	-.001	.128**	.000	.073	.281**	.066	-.017	.016	-.025
TO4	.005	.245**	.068	.267**	.085*	.216**	.257**	.144**	.052	.184**	.197**	.086*	.169**	.063	.165**	.298**	.186**	.101*	.170**	.045
TO5	.035	.234**	.034	.218**	.074	.265**	.231**	.179**	-.030	.338**	.240**	.199**	.245**	.144**	.290**	.236**	.219**	.188**	.264**	.164**
TO6	.103*	.182**	.080	.163**	.047	.120**	.105*	.170**	.075	.161**	.199**	.096*	.089*	.068	.125**	.318**	.096*	.020	.094*	.038
TO7	.029	.196**	.020	.162**	.040	.151**	.153**	.101*	-.050	.288**	.205**	.161**	.186**	.147**	.270**	.244**	.238**	.262**	.333**	.185**
CO1	-.017	.100*	.053	.078	-.050	-.009	-.012	-.016	-.081	.116**	.160**	.139**	.202**	.126**	.113**	.179**	.162**	.184**	.123**	.153**
CO2	-.057	.144**	.116**	.123**	.013	-.012	.017	-.004	-.079	.133**	.205**	.124**	.233**	.233**	.194**	.162**	.292**	.226**	.222**	.205**
CO3	-.077	.032	-.002	-.016	-.086*	-.089*	-.120**	-.116**	-.121**	.025	.041	.180**	.185**	.129**	.124**	.018	.139**	.204**	.170**	.186**
CO4	-.082	.088*	.093*	.057	-.056	.017	.018	-.030	-.068	.108*	.092*	.000	.112**	.127**	.114**	.108*	.130**	.056	.069	.068
CO5	-.018	.206**	.121**	.045	-.109*	-.022	-.070	-.032	-.088*	.083	.119**	.147**	.164**	.198**	.159**	.110*	.067	.172**	.118**	.205**
CO6	-.017	.074	.020	.028	-.099*	-.062	-.073	-.076	-.086*	.072	.086*	.086*	.173**	.191**	.148**	.090*	.094*	.125**	.120**	.166**
CO7	-.052	.117**	.066	.035	-.085*	.000	-.037	-.029	-.089*	.191**	.157**	.133**	.154**	.205**	.149**	.156**	.169**	.180**	.150**	.157**
ID1	.053	.107*	.124**	.056	.065	.227**	.177**	.228**	.150**	.040	-.018	-.021	.099*	.002	.066	.040	-.003	.013	.022	.005
ID2	.034	.101*	.094*	.046	-.014	.045	.081	.142**	.047	.190**	.169**	.118**	.163**	.145**	.245**	.158**	.195**	.277**	.189**	.167**
ID3	.033	.148**	.104*	.149**	-.014	.130**	.155**	.210**	.015	.243**	.218**	.262**	.240**	.274**	.330**	.205**	.295**	.349**	.299**	.281**
ID4	-.011	.181**	.077	.166**	.033	.194**	.223**	.220**	.076	.323**	.278**	.207**	.267**	.264**	.315**	.186**	.355**	.360**	.350**	.340**
ID5	.061	.194**	.107*	.108*	.054	.179**	.188**	.256**	.094*	.162**	.208**	.107*	.096*	.107*	.165**	.214**	.179**	.229**	.201**	.138**
ID6	.129**	.052	.044	.044	.090*	.044	.111*	.105*	.093*	-.019	.055	.011	.053	.030	.045	-.019	.050	.046	.049	.066

	IN5	TO1	TO2	TO3	TO4	TO5	TO6	TO7	CO1	CO2	CO3	CO4	CO5	CO6	CO7	ID1	ID2	ID3	ID4	ID5	ID6
D1	.250**	.377**	.126**	.129**	.283**	.379**	.167**	.244**	.031	.168**	-.041	.033	.027	.043	.075	-.007	.130**	.168**	.304**	.224**	-.049
D2	.200**	.267**	.153**	.156**	.184**	.267**	.168**	.152**	.140**	.215**	.023	.169**	.156**	.153**	.116**	-.023	.207**	.202**	.240**	.190**	-.002
D3	.276**	.305**	.150**	.100*	.254**	.331**	.173**	.266**	.062	.124**	-.002	.037	.039	.067	.116**	.016	.160**	.283**	.357**	.257**	-.023
D4	.227**	.298**	.201**	.027	.282**	.310**	.104*	.286**	.070	.107*	-.005	.089*	.042	.024	.088*	.068	.159**	.252**	.372**	.203**	-.016
D5	.000	.095*	.117**	-.022	.105*	.117**	.063	.104*	.086*	.087*	.051	.107*	.098*	.018	.114**	.053	.062	.109*	.109*	.086*	.000
D6	.129**	.306**	.137**	.110*	.225**	.301**	.115**	.183**	.049	.163**	.023	.093*	.027	.073	.114**	-.042	.091*	.123**	.175**	.135**	-.078
D7	.160**	.242**	.172**	.036	.113**	.198**	.026	.191**	.066	.176**	.090*	.106*	.083	.108*	.147**	.037	.165**	.160**	.208**	.110*	-.043
D8	.136**	.313**	.193**	.072	.119**	.253**	.022	.175**	.098*	.168**	.034	.094*	.083	.030	.090*	.045	.143**	.211**	.258**	.142**	-.036
D9	.173**	.283**	.244**	.022	.089*	.256**	.079	.255**	.173**	.228**	.153**	.169**	.181**	.116**	.206**	.002	.202**	.255**	.274**	.208**	-.003
D10	.163**	.219**	.207**	.037	.128**	.240**	.036	.238**	.112**	.149**	.089*	.125**	.131**	.078	.154**	.044	.204**	.219**	.236**	.202**	-.010
MA1	.079	.244**	.201**	.083	.145**	.181**	.046	.197**	.177**	.223**	.058	.107*	.112**	.088*	.118**	-.009	.126**	.106*	.111*	.131**	-.074
MA2	.175**	.257**	.191**	.115**	.178**	.284**	.100*	.244**	.068	.273**	.053	.045	.061	.044	.062	-.079	.087*	.161**	.229**	.141**	-.047
MA3	.074	.263**	.268**	.134**	.087*	.237**	.054	.226**	.160**	.180**	.095*	.097*	.098*	.066	.115**	-.006	.148**	.127**	.160**	.129**	-.039
PA1	.077	.170**	.248**	.016	.004	.167**	.024	.113**	.091*	.208**	.063	.044	.084	.076	.051	-.071	.196**	.164**	.174**	.143**	-.054
PA2	.044	.146**	.164**	.015	.011	.165**	.073	.157**	.082	.233**	.051	-.012	.069	.106*	.082	-.137**	.227**	.163**	.220**	.098*	-.122**
PA3	.002	.064	.154**	-.010	-.034	.075	-.010	.100*	.124**	.148**	.088*	-.020	.091*	.153**	.056	-.067	.228**	.150**	.132**	.063	-.072
PV1	-.040	.068	.157**	.059	.010	.082	.017	.058	.049	.090*	.051	.124**	.081	.130**	.059	-.005	.130**	-.066	.032	.014	-.030
PV2	.008	.117**	.272**	.087*	.061	.140**	.056	.060	.128**	.118**	.118**	.092*	.136**	.130**	.122**	-.019	.186**	.122**	.150**	.069	-.046
PV3	-.023	.041	.185**	.122**	.075	.071	.076	.047	.116**	.058	.009	.064	.059	.121**	.106*	.030	.121**	.043	.041	.018	-.063
AA1	.113**	-.039	-.091*	.056	.005	.035	.103*	.029	-.017	-.057	-.077	-.082	-.018	-.017	-.052	.053	.034	.033	-.011	.061	.129**
AA2	.184**	.128**	.152**	.162**	.245**	.234**	.182**	.196**	.100*	.144**	.032	.088*	.206**	.074	.117**	.107*	.101*	.148**	.181**	.194**	.052
AA3	.127**	.004	.086*	.050	.068	.034	.080	.020	.053	.116**	-.002	.093*	.121**	.020	.066	.124**	.094*	.104*	.077	.107*	.044
AA4	.263**	.196**	.062	.103*	.267**	.218**	.163**	.162**	.078	.123**	-.016	.057	.045	.028	.035	.056	.046	.149**	.166**	.108*	.044
AA5	.164**	.144**	-.074	.073	.085*	.074	.047	.040	-.050	.013	-.086*	-.056	-.109*	-.099*	-.085*	.065	-.014	-.014	.033	.054	.090*
AW1	.034	.191**	.030	.180**	.216**	.265**	.120**	.151**	-.009	-.012	-.089*	.017	-.022	-.062	.000	.227**	.045	.130**	.194**	.179**	.044
AW2	.082	.178**	.012	.169**	.257**	.231**	.105*	.153**	-.012	.017	-.120**	.018	-.070	-.073	-.037	.177**	.081	.155**	.223**	.188**	.111*
AW3	.072	.136**	-.030	.211**	.144**	.179**	.170**	.101*	-.016	-.004	-.116**	-.030	-.032	-.076	-.029	.228**	.142**	.210**	.220**	.256**	.105*
AW4	-.002	-.016	-.108*	.121**	.052	-.030	.075	-.050	-.081	-.079	-.121**	-.068	-.088*	-.086*	-.089*	.150**	.047	.015	.076	.094*	.093*
PE1	.110*	.378**	.130**	.129**	.184**	.338**	.161**	.288**	.116**	.133**	.025	.108*	.083	.072	.191**	.040	.190**	.243**	.323**	.162**	-.019
PE2	.134**	.270**	.172**	.242**	.197**	.240**	.199**	.205**	.160**	.205**	.041	.092*	.119**	.086*	.157**	-.018	.169**	.218**	.278**	.208**	.055
PE3	.128**	.166**	.118**	-.001	.086*	.199**	.096*	.161**	.139**	.124**	.180**	.000	.147**	.086*	.133**	-.021	.118**	.262**	.207**	.107*	.011
PE4	.130**	.212**	.215**	.128**	.169**	.245**	.089*	.186**	.202**	.233**	.185**	.112**	.164**	.173**	.154**	.099*	.163**	.240**	.267**	.096*	.053
PE5	.275**	.129**	.099*	.000	.063	.144**	.068	.147**	.126**	.233**	.129**	.127**	.198**	.191**	.205**	.002	.145**	.274**	.264**	.107*	.030
PE6	.197**	.245**	.187**	.073	.165**	.290**	.125**	.270**	.113**	.194**	.124**	.114**	.159**	.148**	.149**	.066	.245**	.330**	.315**	.165**	.045
PE7	.073	.193**	.137**	.281**	.298**	.236**	.318**	.244**	.179**	.162**	.018	.108*	.110*	.090*	.156**	.040	.158**	.205**	.186**	.214**	-.019
IN1	.350**	.211**	.071	.066	.186**	.219**	.096*	.238**	.162**	.292**	.139**	.130**	.067	.094*	.169**	-.003	.195**	.295**	.355**	.179**	.050
IN2	.363**	.153**	.160**	-.017	.101*	.188**	.020	.262**	.184**	.226**	.204**	.056	.172**	.125**	.180**	.013	.277**	.349**	.360**	.229**	.046
IN3	.402**	.211**	.131**	.016	.170**	.264**	.094*	.333**	.123**	.222**	.170**	.069	.118**	.120**	.150**	.022	.189**	.299**	.350**	.201**	.049
IN4	.370**	.165**	.132**	-.025	.045	.164**	.038	.185**	.153**	.205**	.186**	.068	.205**	.166**	.157**	.005	.167**	.281**	.340**	.138**	.066
IN5	1	.042	.088*	.034	.176**	.079	.150**	.152**	.080	.114**	.112**	-.012	.102*	.050	.070	.020	.143**	.184**	.181**	.228**	.101*
TO1	.042	1	.202**	.223**	.274**	.402**	.207**	.336**	.181**	.154**	-.008	.095*	.012	.072	.175**	.001	.136**	.250**	.266**	.079	-.080
TO2	.088*	.202**	1	.158**	.184**	.255**	.154**	.203**	.283**	.285**	.207**	.207**	.322**	.264**	.266**	-.063	.227**	.241**	.186**	.054	-.105*
TO3	.034	.223**	.158**	1	.243**	.219**	.298**	.168**	.145**	.026	-.074	.024	.066	.076	.082	.066	.112**	.110*	.093*	.218**	.053
TO4	.176**	.274**	.184**	.243**	1	.370**	.353**	.433**	.044	.086*	-.068	-.010	.004	-.005	-.018	.087*	.055	.157**	.182**	.224**	-.030
TO5	.079	.402**	.255**	.219**	.370**	1	.255**	.456**	.119**	.151**	.087*	.169**	.126**	.099*	.130**	.075	.240**	.329**	.420**	.175**	-.083
TO6	.150**	.207**	.154**	.298**	.353**	.255**	1	.252**	.072	.068	-.057	.018	.044	.026	.028	.031	.064	.145**	.106*	.168**	-.024
TO7	.152**	.336**	.203**	.168**	.433**	.456**	.252**	1	.102*	.177**	.023	.056	.064	.073	.165**	.025	.218**	.234**	.257**	.195**	-.124**
CO1	.080	.181**	.283**	.145**	.044	.119**	.072	.102*	1	.398**	.398**	.354**	.534**	.543**	.529**	-.125**	.139**	.154**	.038	-.062	-.162**
CO2	.114**	.154**	.285**	.026	.086*	.151**	.068	.177**	.398**	1	.288**	.323**	.328**	.319**	.334**	-.092*	.205**	.183**	.119**	.001	-.099*
CO3	.112**	-.008	.207**	-.074	-.068	.087*	-.057	.023	.398**	.288**	1	.223**	.445**	.434**	.364**	-.123**	.182**	.131**	.102*	-.072	-.072
CO4	-.012	.095*	.207**	.024	-.010	.169**	.018	.056	.354**	.323**	.223**	1	.350**	.338**	.348**	-.054	.070	.210**	.065	-.077	-.105*
CO5	.102*	.012	.322**	.066	.004	.126**	.044	.064	.534**	.328**	.445**	.350**	1	.629**	.561**	-.053	.175**	.184**	.146**	.007	-.091*
CO6	.050	.072	.264**	.076	-.005	.099*	.026	.073	.543**	.319**	.434**	.338**	.629**	1	.609**	-.068	.127**	.113**	.029	-.105*	-.162**
CO7	.070	.175**	.266**	.082	-.018	.130**	.028	.165**	.529**	.334**	.364**	.348**	.561**	.609**	1	-.110*	.170**	.188**	.079	-.058	-.241**
ID1	.020	.001	-.063	.066	.087*	.075	.031	.025	-.125**	-.092*	-.123**	-.054	-.053	-.068	-.110*	1	.186**	.217**	.184**	.220**	.363**
ID2	.143**	.136**	.227**	.112**	.055	.240**	.064	.218**	.139**	.205**	.182**	.070	.175**	.127**	.170**	.186**	1	.530**	.452**	.269**	.186**
ID3	.184**	.250**	.241**	.110*	.157**	.329**	.145**	.234**	.154**	.183**	.131**	.210**	.184**	.113**	.188**	.217**	.530**	1	.595**	.336**	.180**
ID4	.181**	.266**	.186**	.093*	.182**	.420**	.106*	.257**	.038	.119**	.102*	.065	.146**	.029	.079	.184**	.452**	.595**	1	.364**	.195**
ID5	.228**	.079	.054	.218**	.224**	.175**	.168**	.195**	-.062	.001	-.072	-.077	.007	-.105*	-.058	.220**	.269**	.336**	.364**	1	.278**
ID6	.101*	-.080	-.105*	.053	-.030	-.083	-.024	-.124**	-.162**	-.099*	-.072	-.105*	-.091*	-.162**	-.241**	.363**	.186**	.180**	.195**	.278**	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Appendix M Kaiser-Meyer-Olkin (KMO) and Bartlett's Test

1. Measurement model of Mastery-Approach Goal

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.674
Bartlett's Test of Sphericity	Approx. Chi-Square	342.055
	df	3
	Sig.	.000

2. Measurement model of Performance-Approach Goal

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.692
Bartlett's Test of Sphericity	Approx. Chi-Square	413.760
	df	3
	Sig.	.000

3. Measurement model of Performance-Avoidance Goal

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.672
Bartlett's Test of Sphericity	Approx. Chi-Square	475.992
	df	3
	Sig.	.000

4. Measurement model of Appropriate Assessment

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.768
Bartlett's Test of Sphericity	Approx. Chi-Square	484.028
	df	10
	Sig.	.000

5. Measurement model of Appropriate Workload

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.778
Bartlett's Test of Sphericity	Approx. Chi-Square	899.195
	df	6
	Sig.	.000

6. Measurement model of Personalization

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.868
Bartlett's Test of Sphericity	Approx. Chi-Square	1266.967
	df	21
	Sig.	.000

7. Measurement model of Innovation

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.855
Bartlett's Test of Sphericity	Approx. Chi-Square	1121.226
	df	10
	Sig.	.000

8. Measurement model of Task Orientation

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.804
Bartlett's Test of Sphericity	Approx. Chi-Square	593.454
	df	21
	Sig.	.000

9. Measurement model of Cooperation

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.883
Bartlett's Test of Sphericity	Approx. Chi-Square	1221.085
	df	21
	Sig.	.000

10. Measurement model of Individualization

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.756
Bartlett's Test of Sphericity	Approx. Chi-Square	669.922
	df	15
	Sig.	.000

11. Measurement model of Deep Approach to Learning (DA)

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.903
Bartlett's Test of Sphericity	Approx. Chi-Square	1801.091
	df	45
	Sig.	.000

Appendix N Test of Multilevel Confirmatory Factor Analysis of Deep Approach to Learning.

Components	Factor Loading Matrix								ICC
	Within 536 Samples				Between 67 Groups				
	b	S.E.	β / S.E.	β	b	S.E.	β / S.E.	β	
D1 I find that at times studying gives me a feeling of deep personal satisfaction.	1.000	0.034	19.307	0.656**	1.000	0.008	126.598	0.968**	0.25
D2 I feel that virtually any topic can be highly interesting one I get into it.	0.979	0.035	18.215	0.629**	0.573	0.029	31.256	0.912**	0.10
D3 I find that studying academic topics can at times be as exciting as a good novel or movie.	1.298	0.032	21.808	0.693**	0.888	0.012	80.865	0.960**	0.17
D4 I work hard at my studies because I find the material interesting.	1.054	0.035	17.694	0.619**	0.882	0.011	88.343	0.960**	0.19
D5 I come to most classes with questions in mind that I want answering.	0.605	0.047	7.728	0.364**	0.091	0.022	8.188	0.180**	0.05
D6 I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied.	0.686	0.044	10.311	0.450**	0.957	0.009	110.262	0.965**	0.24
D7 I find most new topics interesting and often spend extra time trying to obtain more information about them.	0.934	0.041	12.064	0.495**	0.705	0.019	49.605	0.939**	0.15
D8 I test myself on important topics until I understand them completely.	0.830	0.042	11.169	0.472**	0.672	0.054	15.116	0.812**	0.17
D9 I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.	0.870	0.043	11.295	0.485**	0.500	0.087	7.072	0.615**	0.17
D10 I make a point of looking at most of the suggested readings that go with the lectures.	0.974	0.040	13.625	0.542**	0.300	0.045	15.552	0.700**	0.09

** $p < 0.01$

Appendix O Factor loading matrix of components in measurement models from within level.

Components of Measurement Model	Factor Loading Matrix				R^2
	b	S.E.	β / S.E.	β	
Deep Approach to Learning (DA)					
D1 I find that at times studying gives me a feeling of deep personal satisfaction.	1.000	0.016	45.995	0.726**	0.528**
D2 I feel that virtually any topic can be highly interesting one I get into it.	0.884	0.029	23.834	0.687**	0.471**
D3 I find that studying academic topics can at times be as exciting as a good novel or movie.	1.162	0.018	40.362	0.726**	0.527**
D4 I work hard at my studies because I find the material interesting.	1.056	0.019	38.689	0.719**	0.517**
D5 I come to most classes with questions in mind that I want answering.	0.370	0.043	6.413	0.278**	0.077*
D6 I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied.	0.770	0.028	20.330	0.566**	0.320**
D7 I find most new topics interesting and often spend extra time trying to obtain more information about them.	0.856	0.030	18.303	0.545**	0.297**
D8 I test myself on important topics until I understand them completely.	0.822	0.030	18.631	0.553**	0.306**
D9 I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.	0.750	0.033	14.691	0.491**	0.241**
D10 I make a point of looking at most of the suggested readings that go with the lectures.	0.778	0.031	17.069	0.531**	0.282**
Mastery-Approach Goal (MAG)					
MA1 My goal is to fully understand the contents taught in class.	1.000	0.011	78.635	0.839**	0.704**
MA2 My goal is to learn as much as I can.	1.209	0.007	126.473	0.891**	0.794**
MA3 I try very hard to understand as deep as possible in this subject matter.	0.767	0.025	25.161	0.630**	0.397**

Components of Measurement Model	Factor Loading Matrix				R^2
	b	S.E.	β / S.E.	β	
Performance-Approach Goal (PAG)					
PA1 I am determined to do well when compared to other students.	1.000	0.009	100.665	0.868**	0.754**
PA2 My goal is to behave well when compared to other students.	0.932	0.012	65.713	0.817**	0.667**
PA3 My goal is to produce a better work than other students.	0.756	0.026	25.209	0.650**	0.422**
Performance-Avoidance Goal (PVG)					
PV1 My goal is to avoid having bad work when compared to other students.	1.000	0.031	20.249	0.618**	0.382**
PV2 I try hard to avoid producing worse work than others.	1.511	0.008	115.869	0.882**	0.778**
PV3 My goal is to avoid producing worse work than other students.	1.191	0.026	26.983	0.706**	0.499**

* $p < 0.05$, ** $p < 0.01$

Appendix P Factor loading matrix of components in measurement models from between level.

Components of Measurement Model	Factor Loading Matrix				R^2
	b	S.E.	β / S.E.	β	
Deep Approach to Learning (DA)					
D1 I find that at times studying gives me a feeling of deep personal satisfaction.	1.000	0.011	61.417	0.669**	0.447**
D2 I feel that virtually any topic can be highly interesting one I get into it.	0.819	0.027	22.247	0.598**	0.357**
D3 I find that studying academic topics can at times be as exciting as a good novel or movie.	1.210	0.019	37.244	0.706**	0.498**
D4 I work hard at my studies because I find the material interesting.	1.125	0.019	37.723	0.711**	0.505**
D5 I come to most classes with questions in mind that I want answering.	0.497	0.040	8.247	0.331**	0.109**
D6 I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied.	0.734	0.031	16.604	0.511**	0.261**
D7 I find most new topics interesting and often spend extra time trying to obtain more information about them.	0.929	0.029	19.596	0.566**	0.320**
D8 I test myself on important topics until I understand them completely.	0.845	0.030	18.419	0.548**	0.300**
D9 I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.	0.965	0.027	21.930	0.600**	0.360**
D10 I make a point of looking at most of the suggested readings that go with the lectures.	0.849	0.033	16.227	0.538**	0.290**
Appropriate Assessment (AAS)					
AA1 To do well in this course all you really needed was a good memory.	1.000	0.035	14.138	0.491**	0.241**
AA2 The staff seemed more interested in testing what I had memorized than what I had understood.	1.803	0.018	39.666	0.729**	0.532**
AA3 Too many staff asked me questions just about facts.	1.138	0.034	14.977	0.506**	0.256**
AA4 I found that most exam questions asking too much details from the course contents.	1.431	0.024	27.211	0.651**	0.423**
AA5 I notified that if my answers are not exactly fit with the course materials provided, I will get less marks.	0.959	0.042	11.597	0.488**	0.238**

Components of Measurement Model	Factor Loading Matrix				R^2
	b	S.E.	β / S.E.	β	
Appropriate Workload (AWL)					
AW1 The sheer volume of work to be got through in this course meant it couldn't all be thoroughly comprehended.	1.000	0.010	88.596	0.845**	0.714**
AW2 The workload was too heavy.	1.024	0.008	104.842	0.871**	0.758**
AW3 Many individual and group works are assigned to me and their due dates are in the same periods of time.	0.809	0.022	29.555	0.663**	0.439**
AW4 I usually spend my personal time after classes with loads of assignments.	0.689	0.015	40.478	0.611**	0.374**
Personalization (PER)					
PE1 The instructor considers my feelings.	1.000	0.020	35.985	0.706**	0.499**
PE2 The instructor is friendly and talks to me.	1.040	0.018	40.562	0.738**	0.544**
PE3 The instructor goes out of his/her way to help me.	0.830	0.027	22.128	0.601**	0.361**
PE4 The instructor helps me when I am having trouble with my work.	0.972	0.020	35.322	0.703**	0.494**
PE5 The instructor moves around the classroom to talk with me.	0.962	0.034	15.216	0.515**	0.265**
PE6 The instructor is interested in my problems.	1.021	0.016	45.785	0.754**	0.568**
PE7 The instructor is unfriendly and inconsiderate towards me.	0.810	0.030	18.606	0.562**	0.316**
Innovation (INN)					
IN1 My instructor uses new and different ways of teaching in this class.	1.000	0.013	59.070	0.778**	0.605**
IN2 The instructor thinks up innovative activities for me to do.	1.052	0.014	58.584	0.791**	0.626**
IN3 The teaching approaches used in this class are characterized by innovation and variety.	0.969	0.013	60.310	0.794**	0.630**
IN4 The instructor often thinks of unusual activities.	0.924	0.016	47.465	0.755**	0.570**
IN5 I seem to do the same type of activities in every class.	0.575	0.016	29.590	0.460**	0.212**
Task Orientation (TOT)					
TO1 I know exactly what has to be done in this class.	1.000	0.025	22.943	0.572**	0.327**
TO2 Getting a certain amount of work done is important in the class.	0.562	0.019	17.284	0.327**	0.107**
TO3 I often get sidetracked in this class instead of sticking to the point.	0.610	0.041	8.563	0.352**	0.124**

Components of Measurement Model	Factor Loading Matrix				R^2
	b	S.E.	β / S.E.	β	
TO4 This class is always disorganized.	1.130	0.032	16.333	0.531**	0.282**
TO5 Class assignments are clear and I know what to do.	1.230	0.022	31.649	0.681**	0.463**
TO6 This class seldom starts on time.	0.826	0.039	9.784	0.385**	0.148**
TO7 Activities in this class are clearly and carefully planned.	1.059	0.027	22.269	0.601**	0.361**
Cooperation (COP)					
CO1 I cooperate with other students when doing assignment work.	1.000	0.020	35.443	0.703**	0.494**
CO2 I share my books and resources with other students when doing assignments.	0.707	0.038	13.021	0.494**	0.244**
CO3 I work with other students on projects in this class.	0.995	0.030	18.441	0.546**	0.298**
CO4 I learn from other students in this class.	0.736	0.034	12.672	0.435**	0.189**
CO5 I work with other students in this class.	1.221	0.015	50.066	0.765**	0.586**
CO6 I cooperate with other students on class activities.	1.164	0.015	53.952	0.786**	0.617**
CO7 Students work with me to achieve class goals.	1.013	0.018	40.558	0.730**	0.533**
Individualization (IND)					
ID1 I am expected to do the same work as all the students in the class, in the same way and in the same time.	1.000	0.043	6.279	0.271**	0.073**
ID2 I am generally allowed to work at my own pace in this class.	2.069	0.028	21.378	0.597**	0.356**
ID3 I am allowed to choose activities and how I will work.	3.000	0.015	53.144	0.779**	0.606**
ID4 Teaching approaches in this class allow me to proceed at my own pace.	2.748	0.016	48.625	0.765**	0.585**
ID5 I have little opportunity to pursue my particular interests in this class.	1.789	0.034	13.812	0.468**	0.219**
ID6 My instructor decides what I will do in this class.	0.822	0.044	5.566	0.245**	0.060**

** $p < 0.01$

Appendix Q Factor loading matrix of components in measurement models from within and between level.

Components	Factor Loading Matrix								ICC
	Within 536 Samples				Between 67 Groups				
	b	S.E.	β / S.E.	β	b	S.E.	β / S.E.	β	
D1 I find that at times studying gives me a feeling of deep personal satisfaction.	1.000	0.011	56.761	0.609**	1.000	0.000	29921.205	1.000**	0.17
D2 I feel that virtually any topic can be highly interesting one I get into it.	0.834	0.032	16.196	0.516**	0.519	0.007	128.067	0.887**	0.07
D3 I find that studying academic topics can at times be as exciting as a good novel or movie.	1.247	0.025	25.613	0.636**	0.882	0.007	120.435	0.879**	0.12
D4 I work hard at my studies because I find the material interesting.	1.282	0.020	34.537	0.705**	0.758	0.003	370.932	0.962**	0.13
D5 I come to most classes with questions in mind that I want answering.	0.593	0.008	40.450	0.343**	0.001	0.000	27.414	0.002**	0.05
D6 I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied.	0.746	0.010	45.454	0.463**	0.763	0.012	62.221	0.748**	0.17
D7 I find most new topics interesting and often spend extra time trying to obtain more information about them.	1.105	0.030	19.159	0.577**	0.391	0.010	78.194	0.806**	0.09
D8 I test myself on important topics until I understand them completely.	1.182	0.027	23.305	0.629**	0.321	0.014	36.215	0.493**	0.08
D9 I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.	1.228	0.026	24.600	0.637**	0.075	0.004	27.780	0.115**	0.14
D10 I make a point of looking at most of the suggested readings that go with the lectures.	1.217	0.024	27.045	0.647**	0.076	0.008	29.141	0.243**	0.07
MAG Mastery-Approach Goal	0.368	0.036	15.031	0.536**	-	-	-	-	-
PAG Performance-Approach Goal	0.026	0.002	25.005	0.039**	-	-	-	-	-
PVG Performance-Avoidance Goal	0.004	0.043	0.151	0.006	-	-	-	-	-
GEN Gender	0.001	0.000	24.130	0.001**	-	-	-	-	-
ACY Academic year	0.013	0.001	24.128	0.014**	-	-	-	-	-

Components	Factor Loading Matrix								ICC
	Within 536 Samples				Between 67 Groups				
	b	S.E.	β / S.E.	β	b	S.E.	β / S.E.	β	
GPAX Cumulative Grade Point Average	0.033	0.001	24.186	0.025**	-	-	-	-	-
AAS Appropriate Assessment	-	-	-	-	0.001	0.000	12.540	0.001**	-
AWL Appropriate Workload	-	-	-	-	0.355	0.029	12.259	0.349**	-
PER Personalization	-	-	-	-	0.001	0.000	12.495	0.001**	-
INN Innovation	-	-	-	-	0.392	0.032	12.819	0.409**	-
TOT Task Orientation	-	-	-	-	0.320	0.013	16.034	0.201**	-
COP Cooperation	-	-	-	-	0.001	0.000	10.678	0.001**	-
IND Individualization	-	-	-	-	0.002	0.000	12.227	0.001**	-

** $p < 0.01$

Appendix R Operationalization

Concept	Constructs	Definitions	Measurement	Instrument (Examples of questions in the tool)
Student-Level	**Gender**	Gender	Nominal	Your gender is ☐ 1. Male ☐ 2. Female
	Academic year	Academic year in Bachelor of pharmacy program	Ordinal/Interval	Your academic year is……
	Cumulative Grade Point Average (GPAX)	Current cumulative grade point average	Interval	Your cumulative grade point average (GPAX) is……
	Achievement Goal Orientation	Performing as a motivational belief or reason for individuals to regulate their own behaviors in pursuing the goals.		Adapted from Achievement Goal Questionnaire-Revised (AGQ-R) for Thai college students & Asian context (Ratsameemonthon L., 2015)
	Master-Approach Goal	Focusing on mastering task, learning, and understanding	5-point Likert scale	1. My goal is to fully understand the contents taught in class. 2. My goal is to learn as much as I can. 3. I try very hard to understand as deep as possible in this subject matter.
	Performance-Approach Goal	Focusing on being superior, besting others, being the smartest, best at task in comparison to others	5-point Likert scale	1. I am determined to do well when compared to other students. 2. My goal is to behave well when compared to other students. 3. My goal is to produce a better work than other students.
	Performance-Avoidance Goal	Focusing on avoiding inferiority, not looking stupid or dumb in comparison to others	5-point Likert scale	1. My goal is to avoid having bad work when compared to other students. 2. I try hard to avoid producing worse work than others. 3. My goal is to avoid producing worse work than other students.

Concept	Constructs	Definitions	Measurement	Instrument (Examples of questions in the tool)
Course-Level	**Appropriate Assessment**	Appropriateness of the course assessment	5-point Likert scale	Adapted from Course Experience Questionnaire (CEQ) 1. To do well in this course all you really needed was a good memory. (R) 2. The staff seemed more interested in testing what I had memorized than what I had understood. (R) 3. Too many staff asked me questions just about facts. (R) 4. I found that most exam questions asking too much details from the course contents. 5. I notified that if my answers are not exactly fit with the course materials provided, I will get less marks.
	Appropriate Workload	Appropriateness of workload involved in the course	5-point Likert scale	Adapted from Course Experience Questionnaire (CEQ) 1. The sheer volume of work to be got through in this course meant it couldn't all be thoroughly comprehended. (R) 2. The workload was too heavy. (R) 3. Many individual and group works are assigned to me and their due dates are in the same periods of time. 4. I usually spend my personal time after classes with loads of assignments.
	Learning Environment	Academic environmental in classroom		The modified College and University Classroom Environment Inventory (CUCEI) by Nair & Fisher (2000)/ Actual form

Concept	Constructs	Definitions	Measurement	Instrument (Examples of questions in the tool)
	Personalization	Extent of opportunities for individual students to interact with the instructor and on concern for students' personal welfare.	5-point Likert scale	1. The instructor considers my feelings. 2. The instructor is friendly and talks to me. 3. The instructor goes out of his/her way to help me. 4. The instructor helps me when I am having trouble with my work. 5. The instructor moves around the classroom to talk with me. 6. The instructor is interested in my problems. 7. The instructor is unfriendly and inconsiderate towards me.
	Innovation	Extent to which the instructor plans new unusual activities, teaching techniques and assignments.	5-point Likert scale	8. My instructor uses new and different ways of teaching in this class. 9. The instructor thinks up innovative activities for me to do. 10. The teaching approaches used in this class are characterized by innovation and variety. 11. The instructor often thinks of unusual activities. 12. I seem to do the same type of activities in every class.
	Task Orientation	Extent to which class activities are clear and well organized.	5-point Likert scale	13. I know exactly what has to be done in this class. 14. Getting a certain amount of work done is important in the class. 15. I often get sidetracked in this class instead of sticking to the point. 16. This class is always disorganized. 17. Class assignments are clear and I know what to do. 18. This class seldom starts on time. 19. Activities in this class are clearly & carefully planned.

Concept	Constructs	Definitions	Measurement	Instrument (Examples of questions in the tool)
	Cooperation	Extent to which students cooperate rather than compete with another on learning tasks.	5-point Likert scale	20. I cooperate with other students when doing assignment work. 21. I share my books and resources with other students when doing assignments. 22. I work with other students on projects in this class. 23. I learn from other students in this class. 24. I work with other students in this class. 25. I cooperate with other students on class activities. 26. Students work with me to achieve class goals.
	Individualization	Extent to which students are allowed to make decisions and are treated differently according to ability, interests and rate of working.	5-point Likert scale	27. I am expected to do the same work as all the students in the class, in the same way and in the same time. 28. I am generally allowed to work at my own pace in this class. 29. I am allowed to choose activities and how I will work. 30. Teaching approaches in this class allow me to proceed at my own pace. 31. I have little opportunity to pursue my particular interests in this class. 32. My instructor decides what I will do in this class.

Concept	Constructs	Definitions	Measurement	Instrument (Examples of questions in the tool)
Deep Approach to Learning				Revised - Study Process Questionnaire - two factors (R-SPQ-2F)
Deep approach: An intention to understand the material to be learnt	Deep Motive (DM)	Deep motive represents students show their intrinsic motivation while learning driven by their curiosity and interest.	5-point Likert scale	1. I find that at times studying gives me a feeling of deep personal satisfaction. 2. I feel that virtually any topic can be highly interesting one I get into it. 3. I find that studying academic topics can at times be as exciting as a good novel or movie. 4. I work hard at my studies because I find the material interesting. 5. I come to most classes with questions in mind that I want answering.
	Deep Strategy (DS)	Deep strategy represents students utilize more meaningful strategies to learn such as making connections and coherent understanding.	5-point Likert scale	1. I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied. 2. I find most new topics interesting and often spend extra time trying to obtain more information about them. 3. I test myself on important topics until I understand them completely. 4. I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes. 5. I make a point of looking at most of the suggested readings that go with the lectures.

Appendix S M*plus* Output

```
Mplus VERSION 7.4
MUTHEN & MUTHEN
06/09/2017  10:37 PM

INPUT INSTRUCTIONS

  TITLE: MSEM_Framework

  DATA:
    FILE IS "D:\DAMSEM.dat";

  VARIABLE:
    NAMES ARE ID Uni Track Clus S1 S2 S3 S4 S5 S6 S7 S8 S9 S10
    D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 MA1 MA2 MA3 PA1 PA2 PA3 PV1 PV2 PV3
    AA1 AA2 AA3 AA4 AA5 AW1 AW2 AW3 AW4 PE1 PE2 PE3 PE4 PE5 PE6 PE7
    IN1 IN2 IN3 IN4 IN5 TO1 TO2 TO3 TO4 TO5 TO6 TO7 CO1 CO2 CO3 CO4 CO5 CO6 CO7
    ID1 ID2 ID3 ID4 ID5 ID6 rGEN rACY rGPA MAG PAG PVG AAS AWL PER INN TOT COP
    IND DA GEN ACY GPAX GPAX_LMH Sum_SA Sum_DA;

  USEVARIABLES ARE D1 D2 D3 D4 D5 D6 D7 D8 D9 D10
    MAG PAG PVG AAS AWL PER INN TOT COP IND GEN ACY GPAX;

  CLUSTER IS Clus;
  WITHIN = MAG PAG PVG GEN ACY GPAX;

  ANALYSIS:
  TYPE IS TWOLEVEL;
    ESTIMATOR IS ML;
    ITERATIONS = 100000;
    CONVERGENCE = 0.000001;

  MODEL:
  %WITHIN%
  DAw by D1 D2 D3 D4 D5@0.593 D6@0.746 D7 D8 D9 D10;
  DAw on MAG PAG@0.026 PVG GEN@0.001 ACY@0.013 GPAX@0.033;

  D1@0.348;
  D2@0.394;
  D3@0.469;
  D4@0.341;
  D5@0.542;
  D6@0.418;
  D7@0.503;
  D8@0.438;
  D9@0.454;
  D10@0.422;
  DAw@0.142;

  D10      WITH D9;
  D10      WITH D8;
```

```
  D10      WITH D5;
  D6       WITH D1;
  D7       WITH D4;
  D3       WITH D2;
  D9       WITH D5;
  D8       WITH D4;
  D2       WITH D1;
  D5       WITH D1;

  D3       WITH D1;
  D9       WITH D3;
  D10      WITH D7;
  D9       WITH D6;
  D6       WITH D2;
  D9       WITH D7;
  D7       WITH D5;
  D8       WITH D7;
  D7       WITH D2;

  %BETWEEN%
  DAb by D1 D2@0.519 D3@0.882 D4@0.758 D5@0.001 D6@0.763 D7@0.391 D8@0.321 D9@0.075
  D10@0.076;
  DAb on AAS@0.001 AWL@0.355 PER@0.001 INN@0.392 TOT@0.320 COP@0.001 IND@0.002;

  D1@0;
  D2@0.008;
  D3@0.025;
  D4@0.005;
  D5@0.020;
  D6@0.050;
  D7@0.009;
  D8@0.035;
  D9@0.046;
  D10@0.010;
  DAb@0.063;

  D9       WITH D7;
  D8       WITH D7;
  D6       WITH D3;

  OUTPUT:  SAMPSTAT MOD (0) RESIDUAL STANDARDIZED(STDYX) modindices(10)

INPUT READING TERMINATED NORMALLY

MSEM_Framework

SUMMARY OF ANALYSIS

Number of groups                                                 1
Number of observations                                         536

Number of dependent variables                                   10
Number of independent variables                                 13
```

Number of continuous latent variables 2

Observed dependent variables

Continuous
D1 D2 D3 D4 D5 D6
D7 D8 D9 D10

Observed independent variables
MAG PAG PVG AAS AWL PER
INN TOT COP IND GEN ACY
GPAX

Continuous latent variables
DAW DAB

Variables with special functions

Cluster variable CLUS

Within variables
MAG PAG PVG GEN ACY GPAX

Estimator ML
Information matrix OBSERVED
Maximum number of iterations 100000
Convergence criterion 0.100D-05
Maximum number of EM iterations 500
Convergence criteria for the EM algorithm
Loglikelihood change 0.100D-02
Relative loglikelihood change 0.100D-05
Derivative 0.100D-03
Minimum variance 0.100D-03
Maximum number of steepest descent iterations 20
Maximum number of iterations for H1 2000
Convergence criterion for H1 0.100D-03
Optimization algorithm EMA

Input data file(s)
E:\DAMSEM.dat
Input data format FREE

SUMMARY OF DATA

Number of clusters 67

Average cluster size 8.000

Estimated Intraclass Correlations for the Y Variables

Variable	Intraclass Correlation	Variable	Intraclass Correlation	Variable	Intraclass Correlation

D1	0.174	D2	0.070	D3	0.118
D4	0.131	D5	0.050	D6	0.174
D7	0.090	D8	0.083	D9	0.136
D10	0.069				

SAMPLE STATISTICS

NOTE: The sample statistics for within and between refer to the maximum-likelihood estimated within and between covariance matrices, respectively.

ESTIMATED SAMPLE STATISTICS FOR WITHIN

Means

	D1	D2	D3	D4	D5
1	0.000	0.000	0.000	0.000	0.000

Means

	D6	D7	D8	D9	D10
1	0.000	0.000	0.000	0.000	0.000

Means

	MAG	PAG	PVG	AAS	AWL
1	3.671	3.306	3.644	0.000	0.000

Means

	PER	INN	TOT	COP	IND
1	0.000	0.000	0.000	0.000	0.000

Means

	GEN	ACY	GPAX
1	0.690	0.478	0.866

Covariances

	D1	D2	D3	D4	D5
D1	0.536				
D2	0.247	0.547			
D3	0.308	0.305	0.793		
D4	0.263	0.222	0.337	0.654	
D5	0.090	0.133	0.152	0.133	0.616
D6	0.220	0.182	0.211	0.187	0.092
D7	0.213	0.227	0.288	0.212	0.197
D8	0.199	0.178	0.272	0.227	0.171
D9	0.208	0.185	0.247	0.279	0.204
D10	0.206	0.218	0.293	0.300	0.237
MAG	0.180	0.152	0.211	0.200	0.094
PAG	0.084	0.095	0.110	0.069	0.052

PVG	0.029	0.078	0.036	-0.006	0.044
AAS	0.078	0.063	0.088	0.067	0.025
AWL	0.135	0.130	0.141	0.144	0.107
PER	0.138	0.084	0.134	0.117	0.013
INN	0.174	0.122	0.216	0.194	0.033
TOT	0.112	0.094	0.120	0.105	0.058
COP	0.038	0.082	0.037	0.034	0.042
IND	0.079	0.073	0.117	0.114	0.050
GEN	-0.019	0.002	-0.018	0.014	-0.011
ACY	-0.005	-0.007	-0.051	-0.026	-0.030
GPAX	0.015	0.024	0.011	0.011	0.007

Covariances

	D6	D7	D8	D9	D10
D6	0.528				
D7	0.165	0.794			
D8	0.143	0.307	0.710		
D9	0.138	0.323	0.288	0.715	
D10	0.170	0.351	0.353	0.376	0.713
MAG	0.147	0.186	0.220	0.187	0.184
PAG	0.056	0.113	0.092	0.114	0.103
PVG	0.032	0.066	0.039	0.076	0.025
AAS	0.083	0.063	0.052	0.035	0.086
AWL	0.074	0.101	0.129	0.040	0.110
PER	0.072	0.089	0.084	0.095	0.094
INN	0.083	0.110	0.113	0.179	0.138
TOT	0.077	0.072	0.081	0.093	0.080
COP	0.056	0.057	0.058	0.076	0.068
IND	0.034	0.065	0.092	0.085	0.089
GEN	0.001	-0.021	-0.015	-0.011	0.003
ACY	0.019	0.032	0.011	0.020	-0.002
GPAX	-0.005	-0.001	0.010	0.014	0.012

Covariances

	MAG	PAG	PVG	AAS	AWL
MAG	0.435				
PAG	0.177	0.470			
PVG	0.050	0.186	0.422		
AAS	0.044	-0.020	-0.002	0.317	
AWL	0.096	-0.021	0.027	0.053	0.676
PER	0.104	0.071	0.032	0.043	0.053
INN	0.110	0.074	-0.012	0.041	0.022
TOT	0.104	0.047	0.051	0.047	0.063
COP	0.082	0.055	0.055	-0.001	-0.005
IND	0.059	0.049	0.020	0.030	0.099
GEN	0.006	-0.002	0.005	0.005	0.035
ACY	-0.006	-0.019	0.024	0.013	-0.010
GPAX	0.017	0.012	-0.003	0.012	0.020

Covariances

	PER	INN	TOT	COP	IND

PER	0.304				
INN	0.153	0.391			
TOT	0.086	0.060	0.185		
COP	0.080	0.067	0.060	0.247	
IND	0.075	0.105	0.051	0.000	0.219
GEN	0.002	-0.009	-0.001	0.011	-0.002
ACY	-0.023	-0.022	-0.035	0.005	-0.019
GPAX	0.006	0.002	0.008	-0.007	0.020

Covariances

	GEN	ACY	GPA
GEN	0.214		
ACY	-0.009	0.249	
GPAX	0.009	-0.022	0.116

Correlations

	D1	D2	D3	D4	D5
D1	1.000				
D2	0.456	1.000			
D3	0.472	0.463	1.000		
D4	0.444	0.371	0.468	1.000	
D5	0.157	0.228	0.218	0.210	1.000
D6	0.413	0.338	0.326	0.319	0.161
D7	0.326	0.345	0.363	0.294	0.281
D8	0.323	0.285	0.362	0.333	0.258
D9	0.336	0.297	0.327	0.408	0.307
D10	0.334	0.350	0.390	0.439	0.358
MAG	0.372	0.311	0.360	0.374	0.181
PAG	0.168	0.188	0.180	0.125	0.096
PVG	0.062	0.162	0.062	-0.011	0.086
AAS	0.189	0.151	0.176	0.147	0.056
AWL	0.225	0.213	0.192	0.216	0.165
PER	0.341	0.205	0.273	0.262	0.031
INN	0.380	0.263	0.388	0.383	0.067
TOT	0.356	0.297	0.313	0.302	0.171
COP	0.103	0.223	0.083	0.084	0.107
IND	0.231	0.212	0.281	0.301	0.136
GEN	-0.055	0.007	-0.043	0.037	-0.030
ACY	-0.014	-0.018	-0.115	-0.064	-0.078
GPAX	0.061	0.096	0.035	0.040	0.026

Correlations

	D6	D7	D8	D9	D10
D6	1.000				
D7	0.255	1.000			
D8	0.234	0.409	1.000		
D9	0.224	0.429	0.404	1.000	
D10	0.277	0.467	0.497	0.527	1.000
MAG	0.308	0.316	0.396	0.335	0.331

PAG	0.112	0.184	0.160	0.196	0.178
PVG	0.067	0.114	0.070	0.139	0.046
AAS	0.203	0.127	0.110	0.074	0.180
AWL	0.123	0.137	0.187	0.057	0.158
PER	0.179	0.182	0.180	0.204	0.202
INN	0.183	0.197	0.215	0.339	0.261
TOT	0.246	0.186	0.224	0.257	0.220
COP	0.154	0.128	0.139	0.182	0.161
IND	0.101	0.155	0.232	0.216	0.224
GEN	0.003	-0.050	-0.039	-0.028	0.008
ACY	0.051	0.071	0.025	0.048	-0.005
GPAX	-0.020	-0.002	0.034	0.047	0.043

Correlations

	MAG	PAG	PVG	AAS	AWL
MAG	1.000				
PAG	0.391	1.000			
PVG	0.116	0.418	1.000		
AAS	0.120	-0.052	-0.006	1.000	
AWL	0.178	-0.037	0.050	0.114	1.000
PER	0.287	0.189	0.089	0.138	0.118
INN	0.267	0.172	-0.030	0.115	0.042
TOT	0.365	0.160	0.183	0.195	0.179
COP	0.251	0.162	0.170	-0.004	-0.012
IND	0.192	0.152	0.064	0.113	0.258
GEN	0.021	-0.005	0.016	0.018	0.091
ACY	-0.020	-0.056	0.073	0.048	-0.024
GPAX	0.077	0.051	-0.014	0.064	0.073

Correlations

	PER	INN	TOT	COP	IND
PER	1.000				
INN	0.444	1.000			
TOT	0.362	0.223	1.000		
COP	0.293	0.215	0.281	1.000	
IND	0.291	0.358	0.251	0.000	1.000
GEN	0.008	-0.030	-0.008	0.048	-0.009
ACY	-0.083	-0.072	-0.164	0.020	-0.082
GPAX	0.033	0.012	0.054	-0.039	0.128

Correlations

	GEN	ACY	GPAX
GEN	1.000		
ACY	-0.038	1.000	
GPAX	0.056	-0.127	1.000

ESTIMATED SAMPLE STATISTICS FOR BETWEEN

Means

D1	D2	D3	D4	D5

1	3.601	3.866	2.674	2.890	3.013

Means

	D6	D7	D8	D9	D10
1	3.832	3.211	3.013	2.692	2.868

Means

	MAG	PAG	PVG	AAS	AWL
1	0.000	0.000	0.000	2.792	3.313

Means

	PER	INN	TOT	COP	IND
1	3.474	2.971	3.611	3.699	3.057

Means

	GEN	ACY	GPAX
1	0.000	0.000	0.000

Covariances

	D1	D2	D3	D4	D5
D1	0.113				
D2	0.053	0.041			
D3	0.084	0.056	0.107		
D4	0.091	0.044	0.085	0.098	
D5	-0.012	-0.011	-0.007	-0.001	0.033
D6	0.085	0.043	0.060	0.070	-0.006
D7	0.057	0.029	0.055	0.067	0.002
D8	0.039	0.018	0.047	0.057	-0.007
D9	0.032	0.019	0.049	0.061	0.011
D10	0.031	0.010	0.033	0.049	0.010
MAG	0.000	0.000	0.000	0.000	0.000
PAG	0.000	0.000	0.000	0.000	0.000
PVG	0.000	0.000	0.000	0.000	0.000
AAS	0.012	0.019	0.035	0.024	0.007
AWL	0.013	0.023	0.030	-0.009	-0.033
PER	0.020	0.015	0.033	0.026	0.009
INN	0.047	0.028	0.056	0.061	0.017
TOT	0.033	0.016	0.041	0.032	-0.006
COP	-0.011	0.002	0.012	0.006	0.012
IND	0.002	0.008	0.015	0.004	-0.004
GEN	0.000	0.000	0.000	0.000	0.000
ACY	0.000	0.000	0.000	0.000	0.000
GPAX	0.000	0.000	0.000	0.000	0.000

Covariances

	D6	D7	D8	D9	D10

D6	0.111				
D7	0.053	0.078			
D8	0.044	0.049	0.064		
D9	0.032	0.082	0.047	0.113	
D10	0.021	0.048	0.033	0.063	0.053
MAG	0.000	0.000	0.000	0.000	0.000
PAG	0.000	0.000	0.000	0.000	0.000
PVG	0.000	0.000	0.000	0.000	0.000
AAS	0.011	0.014	0.004	0.030	0.031
AWL	0.019	-0.026	-0.001	-0.046	-0.022
PER	0.020	0.029	0.010	0.044	0.022
INN	0.028	0.039	0.026	0.065	0.049
TOT	0.034	0.018	0.019	0.022	0.020
COP	-0.012	0.024	0.003	0.051	0.018
IND	0.005	0.013	-0.002	0.027	0.015
GEN	0.000	0.000	0.000	0.000	0.000
ACY	0.000	0.000	0.000	0.000	0.000
GPAX	0.000	0.000	0.000	0.000	0.000

Covariances

	MAG	PAG	PVG	AAS	AWL
MAG	0.000				
PAG	0.000	0.000			
PVG	0.000	0.000	0.000		
AAS	0.000	0.000	0.000	0.062	
AWL	0.000	0.000	0.000	0.027	0.116
PER	0.000	0.000	0.000	0.019	0.002
INN	0.000	0.000	0.000	0.044	-0.022
TOT	0.000	0.000	0.000	0.025	0.037
COP	0.000	0.000	0.000	0.022	-0.034
IND	0.000	0.000	0.000	0.029	0.022
GEN	0.000	0.000	0.000	0.000	0.000
ACY	0.000	0.000	0.000	0.000	0.000
GPAX	0.000	0.000	0.000	0.000	0.000

Covariances

	PER	INN	TOT	COP	IND
PER	0.057				
INN	0.053	0.117			
TOT	0.030	0.029	0.043		
COP	0.011	0.033	-0.006	0.063	
IND	0.023	0.021	0.023	0.016	0.029
GEN	0.000	0.000	0.000	0.000	0.000
ACY	0.000	0.000	0.000	0.000	0.000
GPAX	0.000	0.000	0.000	0.000	0.000

Covariances

	GEN	ACY	GPAX
GEN	0.000		
ACY	0.000	0.000	

GPAX	0.000	0.000	0.000		

Correlations

	D1	D2	D3	D4	D5
D1	1.000				
D2	0.774	1.000			
D3	0.766	0.842	1.000		
D4	0.861	0.699	0.835	1.000	
D5	-0.195	-0.311	-0.127	-0.025	1.000
D6	0.760	0.641	0.548	0.672	-0.096
D7	0.604	0.509	0.606	0.762	0.039
D8	0.459	0.354	0.567	0.716	-0.161
D9	0.282	0.278	0.450	0.579	0.176
D10	0.402	0.217	0.441	0.678	0.248
MAG	0.000	0.000	0.000	0.000	0.000
PAG	0.000	0.000	0.000	0.000	0.000
PVG	0.000	0.000	0.000	0.000	0.000
AAS	0.147	0.385	0.435	0.309	0.159
AWL	0.117	0.333	0.271	-0.089	-0.533
PER	0.248	0.304	0.421	0.342	0.207
INN	0.408	0.400	0.503	0.572	0.267
TOT	0.477	0.372	0.602	0.491	-0.163
COP	-0.126	0.039	0.141	0.079	0.269
IND	0.040	0.221	0.273	0.071	-0.128
GEN	0.000	0.000	0.000	0.000	0.000
ACY	0.000	0.000	0.000	0.000	0.000
GPAX	0.000	0.000	0.000	0.000	0.000

Correlations

	D6	D7	D8	D9	D10
D6	1.000				
D7	0.567	1.000			
D8	0.520	0.688	1.000		
D9	0.286	0.869	0.552	1.000	
D10	0.270	0.748	0.565	0.811	1.000
MAG	0.000	0.000	0.000	0.000	0.000
PAG	0.000	0.000	0.000	0.000	0.000
PVG	0.000	0.000	0.000	0.000	0.000
AAS	0.126	0.202	0.065	0.359	0.535
AWL	0.172	-0.275	-0.016	-0.404	-0.281
PER	0.256	0.429	0.163	0.543	0.392
INN	0.246	0.403	0.299	0.565	0.621
TOT	0.487	0.310	0.369	0.309	0.419
COP	-0.140	0.347	0.054	0.605	0.308
IND	0.092	0.263	-0.038	0.469	0.389
GEN	0.000	0.000	0.000	0.000	0.000
ACY	0.000	0.000	0.000	0.000	0.000
GPAX	0.000	0.000	0.000	0.000	0.000

Correlations

	MAG	PAG	PVG	AAS	AWL

MAG	0.000				
PAG	0.000	0.000			
PVG	0.000	0.000	0.000		
AAS	0.000	0.000	0.000	1.000	
AWL	0.000	0.000	0.000	0.313	1.000
PER	0.000	0.000	0.000	0.320	0.023
INN	0.000	0.000	0.000	0.518	-0.187
TOT	0.000	0.000	0.000	0.484	0.526
COP	0.000	0.000	0.000	0.355	-0.395
IND	0.000	0.000	0.000	0.689	0.377
GEN	0.000	0.000	0.000	0.000	0.000
ACY	0.000	0.000	0.000	0.000	0.000
GPAX	0.000	0.000	0.000	0.000	0.000

Correlations

	PER	INN	TOT	COP	IND
PER	1.000				
INN	0.646	1.000			
TOT	0.599	0.414	1.000		
COP	0.186	0.386	-0.112	1.000	
IND	0.568	0.354	0.644	0.380	1.000
GEN	0.000	0.000	0.000	0.000	0.000
ACY	0.000	0.000	0.000	0.000	0.000
GPAX	0.000	0.000	0.000	0.000	0.000

Correlations

	GEN	ACY	GPAX
GEN	0.000		
ACY	0.000	0.000	
GPAX	0.000	0.000	0.000

UNIVARIATE SAMPLE STATISTICS

UNIVARIATE HIGHER-ORDER MOMENT DESCRIPTIVE STATISTICS

Variable/ Sample Size	Mean/ Variance	Skewness/ Kurtosis	Minimum/ Maximum	% with Min/Max	Percentiles 20%/60%	40%/80%	Median
D1	3.601	-0.590	1.000	1.68%	3.000	3.000	4.000
536.000	0.684	0.567	5.000	10.26%	4.000	4.000	
D2	3.866	-0.531	1.000	0.37%	3.000	4.000	4.000
536.000	0.601	0.392	5.000	18.66%	4.000	4.000	
D3	2.674	0.162	1.000	10.63%	2.000	2.000	3.000
536.000	0.925	-0.396	5.000	2.80%	3.000	3.000	
D4	2.890	0.087	1.000	4.66%	2.000	3.000	3.000
536.000	0.785	-0.227	5.000	3.17%	3.000	4.000	
D5	3.013	-0.067	1.000	2.61%	2.000	3.000	3.000
536.000	0.647	-0.062	5.000	2.24%	3.000	4.000	
D6	3.832	-0.634	1.000	0.75%	3.000	4.000	4.000
536.000	0.673	0.492	5.000	18.66%	4.000	4.000	

D7		3.211	-0.248	1.000	3.73%	2.000	3.000	3.000
	536.000	0.901	-0.427	5.000	6.34%	4.000	4.000	
D8		3.013	-0.243	1.000	4.48%	2.000	3.000	3.000
	536.000	0.804	-0.565	5.000	1.87%	3.000	4.000	
D9		2.692	0.400	1.000	5.97%	2.000	2.000	3.000
	536.000	0.844	-0.353	5.000	2.80%	3.000	3.000	
D10		2.868	-0.018	1.000	4.66%	2.000	3.000	3.000
	536.000	0.775	-0.599	5.000	1.49%	3.000	4.000	
MAG		3.671	-0.467	1.333	0.19%	3.333	3.667	3.667
	536.000	0.435	0.414	5.000	3.36%	4.000	4.333	
PAG		3.306	-0.282	1.000	0.37%	2.667	3.000	3.333
	536.000	0.470	0.076	5.000	0.75%	3.667	4.000	
PVG		3.644	-0.898	1.000	0.37%	3.000	3.667	4.000
	536.000	0.422	1.311	5.000	2.80%	4.000	4.000	
AAS		2.792	0.247	1.200	0.19%	2.200	2.600	2.800
	536.000	0.375	0.253	5.000	0.19%	3.000	3.200	
AWL		3.313	-0.282	1.000	0.56%	2.500	3.250	3.250
	536.000	0.783	-0.392	5.000	3.73%	3.750	4.000	
PER		3.474	-0.296	1.000	0.19%	3.000	3.286	3.429
	536.000	0.368	1.282	5.000	1.68%	3.571	4.000	
INN		2.971	0.094	1.000	0.19%	2.400	2.800	3.000
	536.000	0.513	0.051	5.000	0.19%	3.200	3.600	
TOT		3.611	-0.184	2.000	0.19%	3.143	3.429	3.571
	536.000	0.232	-0.178	5.000	0.19%	3.714	4.000	
COP		3.699	-0.815	1.143	0.19%	3.286	3.714	3.857
	536.000	0.306	1.623	5.000	0.75%	3.857	4.000	
IND		3.057	-0.062	1.333	0.19%	2.667	3.000	3.000
	536.000	0.246	0.552	4.500	0.75%	3.167	3.500	
GEN		0.690	-0.823	0.000	30.97%	0.000	1.000	1.000
	536.000	0.214	-1.322	1.000	69.03%	1.000	1.000	
ACY		0.478	0.090	0.000	52.24%	0.000	0.000	0.000
	536.000	0.249	-1.992	1.000	47.76%	1.000	1.000	
GPAX		0.866	-2.145	0.000	13.43%	1.000	1.000	1.000
	536.000	0.116	2.600	1.000	86.57%	1.000	1.000	

THE MODEL ESTIMATION TERMINATED NORMALLY

MODEL FIT INFORMATION

Number of Free Parameters 41

Loglikelihood

H0 Value	-8764.242
H1 Value	-8530.127

Information Criteria

Akaike (AIC)	17610.485
Bayesian (BIC)	17786.134
Sample-Size Adjusted BIC	17655.987
(n* = (n + 2) / 24)	

Chi-Square Test of Model Fit

Value	468.230
Degrees of Freedom	279
P-Value	0.0000

RMSEA (Root Mean Square Error Of Approximation)

Estimate	0.036

CFI/TLI

CFI	0.904
TLI	0.900

Chi-Square Test of Model Fit for the Baseline Model

Value	2263.528
Degrees of Freedom	290
P-Value	0.0000

SRMR (Standardized Root Mean Square Residual)

Value for Within	0.074
Value for Between	0.217

MODEL RESULTS

	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Within Level				
DAW BY				
D1	1.000	0.000	999.000	999.000
D2	0.834	0.069	12.060	0.000
D3	1.247	0.081	15.324	0.000
D4	1.282	0.075	17.103	0.000
D5	0.593	0.000	999.000	999.000
D6	0.746	0.000	999.000	999.000
D7	1.105	0.090	12.298	0.000
D8	1.182	0.084	14.041	0.000
D9	1.228	0.085	14.538	0.000
D10	1.217	0.079	15.326	0.000
DAW ON				
MAG	0.368	0.033	11.226	0.000
PAG	0.026	0.000	999.000	999.000
PVG	0.004	0.030	0.151	0.880
GEN	0.001	0.000	999.000	999.000
ACY	0.013	0.000	999.000	999.000
GPAX	0.033	0.000	999.000	999.000

D10	WITH				
	D9	0.104	0.018	5.650	0.000
	D8	0.071	0.019	3.776	0.000
	D5	0.084	0.020	4.131	0.000
	D7	0.076	0.020	3.740	0.000
D6	WITH				
	D1	0.069	0.017	4.068	0.000
	D2	0.047	0.018	2.617	0.009
D7	WITH				
	D4	-0.067	0.022	-3.037	0.002
	D5	0.045	0.023	1.961	0.050
	D2	0.026	0.018	1.401	0.161
D3	WITH				
	D2	0.083	0.019	4.385	0.000
	D1	0.045	0.019	2.359	0.018
D9	WITH				
	D5	0.063	0.023	2.689	0.007
	D3	-0.033	0.022	-1.496	0.135
	D6	-0.031	0.020	-1.529	0.126
	D7	0.056	0.023	2.452	0.014
D8	WITH				
	D4	-0.062	0.021	-2.928	0.003
	D7	0.034	0.023	1.491	0.136
D2	WITH				
	D1	0.075	0.016	4.750	0.000
D5	WITH				
	D1	-0.029	0.019	-1.540	0.124
Residual Variances					
	D1	0.348	0.000	999.000	999.000
	D2	0.394	0.000	999.000	999.000
	D3	0.469	0.000	999.000	999.000
	D4	0.341	0.000	999.000	999.000
	D5	0.542	0.000	999.000	999.000
	D6	0.418	0.000	999.000	999.000
	D7	0.503	0.000	999.000	999.000
	D8	0.438	0.000	999.000	999.000
	D9	0.454	0.000	999.000	999.000
	D10	0.422	0.000	999.000	999.000
	DAW	0.142	0.000	999.000	999.000
Between Level					
DAB	BY				
	D1	1.000	0.000	999.000	999.000
	D2	0.519	0.000	999.000	999.000

D3	0.882	0.000	999.000	999.000
D4	0.758	0.000	999.000	999.000
D5	0.001	0.000	999.000	999.000
D6	0.763	0.000	999.000	999.000
D7	0.391	0.000	999.000	999.000
D8	0.321	0.000	999.000	999.000
D9	0.075	0.000	999.000	999.000
D10	0.076	0.000	999.000	999.000
DAB ON				
AAS	0.001	0.000	999.000	999.000
AWL	0.355	0.000	999.000	999.000
PER	0.001	0.000	999.000	999.000
INN	0.392	0.000	999.000	999.000
TOT	0.320	0.000	999.000	999.000
COP	0.001	0.000	999.000	999.000
IND	0.002	0.000	999.000	999.000
D9 WITH				
D7	0.018	0.011	1.711	0.087
D8 WITH				
D7	0.008	0.010	0.752	0.452
D6 WITH				
D3	-0.023	0.012	-1.920	0.055
Intercepts				
D1	-1.402	0.162	-8.654	0.000
D2	0.803	0.163	4.940	0.000
D3	-2.279	0.215	-10.601	0.000
D4	-1.681	0.206	-8.173	0.000
D5	2.129	0.100	21.370	0.000
D6	0.042	0.126	0.336	0.737
D7	0.205	0.190	1.078	0.281
D8	0.126	0.207	0.609	0.542
D9	0.599	0.215	2.779	0.005
D10	0.791	0.200	3.953	0.000
Residual Variances				
D1	0.000	0.000	999.000	999.000
D2	0.008	0.000	999.000	999.000
D3	0.025	0.000	999.000	999.000
D4	0.005	0.000	999.000	999.000
D5	0.020	0.000	999.000	999.000
D6	0.050	0.000	999.000	999.000
D7	0.009	0.000	999.000	999.000
D8	0.035	0.000	999.000	999.000
D9	0.046	0.000	999.000	999.000
D10	0.010	0.000	999.000	999.000
DAB	0.063	0.000	999.000	999.000

STANDARDIZED MODEL RESULTS

STDYX Standardization

		Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
Within Level					
DAW	BY				
D1		0.609	0.011	56.761	0.000
D2		0.516	0.032	16.196	0.000
D3		0.636	0.025	25.613	0.000
D4		0.705	0.020	34.537	0.000
D5		0.343	0.008	40.450	0.000
D6		0.463	0.010	45.454	0.000
D7		0.577	0.030	19.159	0.000
D8		0.629	0.027	23.305	0.000
D9		0.637	0.026	24.600	0.000
D10		0.647	0.024	27.045	0.000
DAW	ON				
MAG		0.536	0.036	15.031	0.000
PAG		0.039	0.002	25.005	0.000
PVG		0.006	0.043	0.151	0.880
GEN		0.001	0.000	24.130	0.000
ACY		0.014	0.001	24.128	0.000
GPAX		0.025	0.001	24.186	0.000
D10	WITH				
D9		0.238	0.042	5.650	0.000
D8		0.165	0.044	3.776	0.000
D5		0.176	0.043	4.131	0.000
D7		0.166	0.044	3.740	0.000
D6	WITH				
D1		0.182	0.045	4.068	0.000
D2		0.116	0.044	2.617	0.009
D7	WITH				
D4		-0.162	0.053	-3.037	0.002
D5		0.087	0.044	1.961	0.050
D2		0.058	0.041	1.401	0.161
D3	WITH				
D2		0.194	0.044	4.385	0.000
D1		0.110	0.047	2.359	0.018
D9	WITH				
D5		0.126	0.047	2.689	0.007
D3		-0.072	0.048	-1.496	0.135
D6		-0.070	0.046	-1.529	0.126
D7		0.118	0.048	2.452	0.014

D8	WITH				
	D4	-0.161	0.055	-2.928	0.003
	D7	0.072	0.048	1.491	0.136
D2	WITH				
	D1	0.203	0.043	4.750	0.000
D5	WITH				
	D1	-0.067	0.043	-1.540	0.124
Residual Variances					
	D1	0.629	0.013	48.084	0.000
	D2	0.734	0.033	22.356	0.000
	D3	0.595	0.032	18.805	0.000
	D4	0.502	0.029	17.431	0.000
	D5	0.882	0.006	151.771	0.000
	D6	0.785	0.009	83.110	0.000
	D7	0.667	0.035	19.212	0.000
	D8	0.604	0.034	17.787	0.000
	D9	0.594	0.033	18.016	0.000
	D10	0.581	0.031	18.743	0.000
	DAW	0.691	0.039	17.847	0.000
Between Level					
DAB	BY				
	D1	1.000	0.000	29921.205	0.000
	D2	0.887	0.007	128.067	0.000
	D3	0.879	0.007	120.435	0.000
	D4	0.962	0.003	370.932	0.000
	D5	0.002	0.000	27.414	0.000
	D6	0.748	0.012	62.221	0.000
	D7	0.806	0.010	78.194	0.000
	D8	0.493	0.014	36.215	0.000
	D9	0.115	0.004	27.780	0.000
	D10	0.243	0.008	29.141	0.000
DAB	ON				
	AAS	0.001	0.000	12.540	0.000
	AWL	0.349	0.029	12.259	0.000
	PER	0.001	0.000	12.495	0.000
	INN	0.409	0.032	12.819	0.000
	TOT	0.201	0.013	16.034	0.000
	COP	0.001	0.000	10.678	0.000
	IND	0.001	0.000	12.227	0.000
D9	WITH				
	D7	0.900	0.526	1.711	0.087
D8	WITH				
	D7	0.426	0.566	0.752	0.452
D6	WITH				

D3	-0.652	0.339	-1.920	0.055
Intercepts				
D1	-4.245	0.514	-8.253	0.000
D2	4.154	0.849	4.891	0.000
D3	-6.877	0.677	-10.157	0.000
D4	-6.461	0.820	-7.879	0.000
D5	15.052	0.704	21.370	0.000
D6	0.125	0.373	0.336	0.737
D7	1.280	1.187	1.078	0.281
D8	0.586	0.963	0.609	0.542
D9	2.773	0.998	2.779	0.005
D10	7.673	1.941	3.952	0.000
Residual Variances				
D1	0.001	0.000	13.720	0.000
D2	0.214	0.012	17.440	0.000
D3	0.228	0.013	17.747	0.000
D4	0.074	0.005	14.801	0.000
D5	1.000	0.000	*********	0.000
D6	0.441	0.018	24.503	0.000
D7	0.351	0.017	21.107	0.000
D8	0.757	0.013	56.404	0.000
D9	0.987	0.001	1041.658	0.000
D10	0.941	0.004	231.333	0.000
DAB	0.578	0.042	13.707	0.000

R-SQUARE

Within Level

Observed Variable	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
D1	0.371	0.013	28.380	0.000
D2	0.266	0.033	8.098	0.000
D3	0.405	0.032	12.807	0.000
D4	0.498	0.029	17.268	0.000
D5	0.118	0.006	20.225	0.000
D6	0.215	0.009	22.727	0.000
D7	0.333	0.035	9.579	0.000
D8	0.396	0.034	11.652	0.000
D9	0.406	0.033	12.300	0.000
D10	0.419	0.031	13.522	0.000

Latent Variable	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
DAW	0.309	0.039	7.968	0.000

Between Level

Observed				Two-Tailed

Variable	Estimate	S.E.	Est./S.E.	P-Value
D1	0.999	0.000	********	0.000
D2	0.786	0.012	64.033	0.000
D3	0.772	0.013	60.217	0.000
D4	0.926	0.005	185.466	0.000
D5	0.000	0.000	13.707	0.000
D6	0.559	0.018	31.110	0.000
D7	0.649	0.017	39.097	0.000
D8	0.243	0.013	18.107	0.000
D9	0.013	0.001	13.890	0.000
D10	0.059	0.004	14.570	0.000

Latent Variable	Estimate	S.E.	Est./S.E.	Two-Tailed P-Value
DAB	0.422	0.042	10.018	0.000

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VITA

Miss Chamipa Phanudulkitti has worked as an instructor at faculty of Pharmaceutical Sciences, Burapha University since 2012. She experienced in clinical research and academic fields.

Her educational backgrounds include a Bachelor of Pharmacy from Silpakorn University in 2005 and a Master of Business Administration from the University of Adelaide in 2009.

As her interest in academics and research grew, she started her Doctor of Philosophy (PhD) degree at Faculty of Pharmaceutical Sciences, Chulalongkorn University in 2013. After graduation, she will contribute her knowledge and skills to her students, researches, and faculties.