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Deep approach to learning of pharmacy students: A multilevel analysis

CHAMIPA PHANUDULKITTI[1], KAREN B. FARRIS[2], PATTRAWADEE MAKMEE[3], TANATTHA KITTISOPEE[1*]

[1]*Faculty of Pharmaceutical Sciences, Chulalongkorn University, Bangkok, 10330, Thailand*

[2]*College of Pharmacy, University of Michigan, Ann Arbor, MI 48109-1065, USA.*

[3]*College of Research Methodology and Cognitive Science, Burapha University, Chonburi, 20131, Thailand*

Abstract

Introduction: A deep approach to learning (DAL) is a critical foundation for enhancing pharmacy students' academic performance and professional outcomes. This study at two universities in Thailand examined student-level and course-level factors affecting pharmacy students' DAL using the Biggs 3P model as a theoretical framework.

Methods: The measurement focused on DAL, achievement goal orientation, learning environment, appropriate workload, and assessment was sent to all 733 pharmacy students. Eight to twelve students were randomly selected to evaluate one of the 67 first semester courses available at two universities. Multilevel Structural Equation Modelling was used for analysis.

Results: There were 733 questionnaires returned of which 536 were used. Mastery approach goal (β=0.536**), performance approach goal (β=0.039**), innovation (β=0.409**), appropriate workload (β=0.349**), and task orientation (β=0.201**) had positive significant relationships with the DAL in pharmacy students.

Conclusion: Educators should increase innovative teaching approaches, optimise students' workload, provide task orientation, and encourage students to be goal striving persons to facilitate deep learning.

Keywords: *Deep Approach to Learning, Pharmacy Students, Innovative teaching, Student Workload, Task Orientation, Mastery Approach Goal*

Introduction

Pharmacists as healthcare providers need lifelong learning to continually update their professional knowledge so that they can provide valid care services to patients. The Accreditation Council for Pharmacy Education (ACPE) emphasises the development of the student as a professional to be a lifelong learner (Johnson, 2013). There have been attempts to promote continuing learning and professional development to maintain long-term healthcare expertise (Chapman & Aspin, 1997; Kuit & Fildes, 2014). A person with a deep approach to learning (DAL) is more likely to seek knowledge and more likely to get into continuing learning (Tam, 1999; Warburton, 2003; Parpala *et al*., 2010; Barros *et al*., 2013). Therefore, DAL is the essential characteristic for future development of new skills, or knowledge necessary for professional patient care. The teaching and learning methods in pharmacy schools are a key process to initiate a DAL that facilitates lifelong learning.

Many studies show that students' DAL can influence their attainment of desirable learning outcomes, which in turn heightens academic performance, lifelong learning, and desirable professional pharmacy services (Biggs, 1989; Barros *et al*., 2013; Tsingos *et al*., 2015). Other scholars also recommend that pharmacy students should be guided to develop their critical reflection skills for deep understanding and learning (McKauge et al., 2011; Johnson, 2013). A DAL is internally motivated and associated with an intention to understand, rather than to simply pass a task (Warburton, 2003). Students using a DAL seek meaning and work in depth with the task in order to get a better understanding (Trigwell & Prosser, 1991; Tam, 1999; Parpala *et al*., 2010; Barros *et al*., 2013; Salamonson *et al*., 2013). It is a critical learning process that pharmacy students must use in order to achieve good academic performance. Academic educators in pharmacy schools should pay attention to the learning and teaching processes to facilitate students' DAL.

Notably, both student characteristics and teaching characteristics simultaneously influence the use of DAL in students (Biggs *et al*., 2001). Until now, there is no study to identify the influencing factors in the student context or teaching context in Thai pharmacy students. In Thailand, high school students must pass the national entrance examination into pharmacy schools, and there are two six-year programme curricula which include

[*]Correspondence: Asst. Prof. Tanattha Kittisopee, *Faculty of Pharmaceutical Sciences, Chulalongkorn University, Bangkok, 10330, Thailand. Tel: +66 89 121 2240; Fax: +66 2 218 8386-91. Email: tanattha.k@pharm.chula.ac.th*

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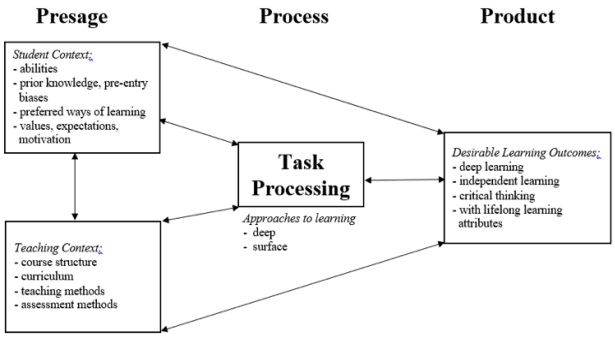
Pharmaceutical Sciences and Pharmaceutical Care. The total credits for all pharmacy curricula are at least 220 credits with 2,000 hours for professional clerkship.

In considering both the student and teaching contexts, the theory of Biggs' 3P model can be used (Figure 1). This model contends that presage includes student and teaching contexts which impact process or task processing (students' approach to learning), which in turn affect desirable learning outcomes.

Figure 1: The 3-P Model of Learning (Biggs, 1989)



In considering the literature related to DAL, achievement goal theory plays a vital role due to its high relevance to learning and instruction and the impact of goals on student performance (Was, 2006; Schunk *et al*., 2010). Achievement goal orientation has a direct positive impact on deep learning processes (Kyndt *et al*., 2012; Rithilert & Kaemkate, 2013), and it can push students toward actions. Furthermore, all actions are directed by the goal students desire (Covington, 2000).

Achievement goal orientation is composed of three components, which are mastery approach, performance approach, and performance avoidance goal orientation (Schunk *et al*., 2010; Poondej *et al*., 2013). Mastery approach goal orientation is students' internal controllable causes focusing on learning, mastering the task according to self-set standards or self-improvement, developing new skills, and trying to accomplish something challenging (Schunk *et al*., 2010; Poondej *et al*., 2013). It can increase one's competency, understanding, and appreciation for what is being learned (Covington, 2000). Performance approach goal orientation involves outperforming others (Covington, 2000). Students with performance approach goal orientation are always concerned about comparing their abilities and performance with others and are more likely to attribute success and failure to more external factors (Was, 2006). Students using this approach focus outwardly on regular outcomes such as grades, external evaluations and comparisons and view themselves as having a good deal of ability and performance (Poondej *et al*., 2013). They want to be seen as superior in ability compared to others. In contrast, performance avoidance goal oriented students view themselves as lacking ability and wishing to avoid public demonstrations of their inability (Was, 2006). They do not want to appear inferior when compared to others (Poondej *et al*., 2013).

Besides the student context, the teaching context or course-level factors also influence students' DAL (Biggs *et al*., 2001). Teaching context or course-level factors include assessment methods (Lizzio *et al*., 2002; Gijbels *et al*., 2008), workload (Varunki *et al*., 2015; Yerdelen Damar & Aydın, 2015), learning innovation (Tiwari *et al*., 2006; Chen *et al*., 2010; Laguador, 2014), task orientation (Lizzio *et al*., 2002; Wang *et al*., 2015), personalisation (Dart *et al*., 1999; Bamwesiga *et al*., 2012; Oxnevad, 2017), cooperation (Dart *et al*., 1999; Poondej, 2014), and individualisation (Dart *et al*., 1999; Warburton, 2003).

Using an appropriate assessment is one of the most salient contextual variables that influence students' approaches to learning. A clear and appropriate assessment criteria can foster students to adopt a deep approach to learning (Trigwell & Prosser, 1991). Inappropriate assessment can negatively influence students towards deep approaches to study (Lizzio *et al*., 2002). Assessments should not be based on memorising the course content, but should assess understanding and applying knowledge to real situations.

Course workload or demand of learning tasks is a major factor for making a decision on choosing an approach to learning (Lizzio *et al*., 2002; Varunki *et al*., 2015; Yerdelen Damar & Aydın, 2015). Perceptions of heavy workload influenced students to reduce deep approaches to learning in their studies (Lizzio *et al*., 2002; Varunki *et al*., 2015).

Personalisation is the extent of opportunities for individual students to interact with instructors and for students to feel concern for their personal welfare. It is significantly related to DAL (Dart *et al*., 1999; Nair & Fisher, 1999). Facilitating students' learning by being close to students, being on their side, and interacting with them can promote a DAL (Oxnevad, 2017). Effective instructor-student interaction and friendly communication can influence students to adopt DAL, and, in turn, helps them to achieve a better understanding of course content (Bamwesiga *et al*., 2012).

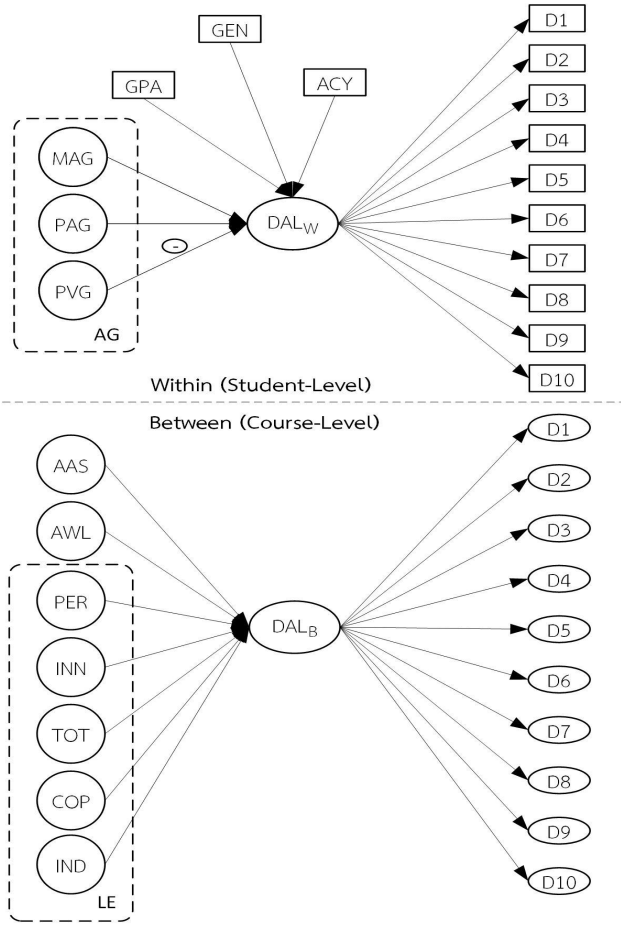
Innovation is defined as the extent to which the instructor plans new unusual activities, teaching techniques and assignments (Nair & Fisher, 1999). Creating classroom interest and active teaching methods such as problem-based learning and blended learning can increase students' DAL (Trigwell & Prosser, 1991; Garrison & Kanuka, 2004; Tiwari *et al*., 2006).

Task orientation is defined as the extent to which class activities are clear and well-organised (Nair & Fisher, 1999). Students' DAL is positively influenced by clear and well-organised class instruction and activities (Lizzio *et al*., 2002; Wang *et al*., 2015). Cooperation is the extent to which students cooperate on learning tasks with others rather than competing with classmates (Nair & Fisher, 1999). Cooperative classroom learning environments have a positive relationship with a DAL (Poondej, 2014).

Individualisation or independence to learning is defined as allowing students to make their own decisions and to be treated according to their abilities, working rates, and interests (Nair & Fisher, 1999). More independence in learning is positively associated with a DAL (Dart *et al*., 1999). Academic departments that provide individual student supports, choices of content, and individual study methods, are more likely to induce students to adopt deep learning approaches (Warburton, 2003).

In summary, few studies have been conducted to examine pharmacy students' DAL, and found that most of pharmacy students adopted a DAL (Smith *et al*., 2007; Smith *et al*., 2010). Amongst achievement goal orientation, mastery-approach goal is the most prominent influencing factor on the DAL (Diseth, 2011; Kyndt *et al*., 2012; Rithilert & Kaemkate, 2013; Poondej, 2014; Yerdelen Damar & Aydın, 2015). Thus, this study aimed to identify influencing factors at both student and course levels that encourage DAL (Figure 2). Since student-level factors and course-level factors were structured hierarchically, a Multilevel Structural Equation Model was used to provide more accuracy for the data analysis (Kelloway, 2014)

Figure 2: Conceptual Framework



GEN - Gender
ACY - Academic Year
GPA - Grade Point Average
MAG - Mastery-Approach Goal
PAG - Performance-Approach Goal
PVG - Performance -Avoidance Goal
AAS - Appropriate Assessment
AWL - Appropriate Workload
PER - Personalisation
INN - Innovation
TOT - Task Orientation
COP - Cooperation
IND - Individualisation
DAL-Deep Approach to Learning
B - Between
W - Within

Methods

Design

A survey design with a self-administered questionnaire was used for this study. A participant information sheet that informed respondents that their answers were confidential and did not affect their grades/scores was distributed with the questionnaire. Data were collected anonymously from pharmacy students of two universities, Chulalongkorn University and Burapha University.

Questionnaire development

There were 12 items for measuring student-level factors. Three of them were demographic questions including gender, grade point average, and academic year. The other nine items measured achievement goal orientation and were adapted from Achievement Goal Questionnaire-Revised (AGQ-R) for Thai college students and the Asian context (Ratsameemonthon, 2015).

There were seven factors in the course-level section of the questionnaire that can influence students' deep approach to learning. These sections included appropriate assessment, appropriate workload, personalisation, innovation, task orientation, cooperation, and individualisation. Five items for measuring appropriate assessment and four items for measuring appropriate workload were developed from the Course Experience Questionnaire (CEQ) (Graduate Careers Australia, 2013). The other 32 items that measured personalisation, innovation, task orientation, cooperation, and individualisation were adapted from the modified College and University Classroom Environment Inventory (CUCEI) (Nair & Fisher, 2000) and CUCEI Thai version (Charik, 2006).

Students' DAL can be measured by ten items from the revised two-factor study process questionnaire (R-SPQ-2F) (Biggs *et al*., 2001). In this study, the ten items for measuring pharmacy students' DAL were adapted from the Thai version of the revised two-factor study process questionnaire (R-SPQ-2F) to fit with the pharmacy education and Thai context (Kusalanont, 2006). All items were measured using a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

The study instrument was reviewed by three experts in pharmaceutical sciences and educational measurement. Both item content validity index (I-CVI) and content validity for scale (S-CVI) of this instrument equal 1.00. Both values were accepted as good content validity (Polit & Beck, 2008).

Sample & Data Collection

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 a total of 67 courses in the first semester of 2nd to 5th year pharmacy curricula from the two universities, and this number of courses meets the between-level criteria.

According to Hair *et al*. (2003), the sample size for multilevel analysis should be 400-500 as the minimum in the student-level or within-level (Hair *et al*., 2003; Boomsma, cited in Schumacker & Lomax, 2010). The sample size calculation of structural equation modelling should be five-ten times of the observed variables in the study. There were 63 items or observed variables in the questionnaire. Using this formula, the study's sample size should be between 400 and 630. Eight to twelve students were randomly selected to evaluate one of the 67 courses, and questionnaires were sent to 733 pharmacy students.

Data Analysis

All descriptive analyses were performed using SPSS statistic software version 22. An intra-class correlation (ICC) coefficient, Confirmatory Factor Analysis (CFA), and Multilevel Structural Equation Modelling (MSEM) were completed using Mplus 7.4 Programme (Muthén & Muthén, 1998-2015).

Results

Descriptive Analysis

All students returned the questionnaires. For multilevel structural equation modelling, number of samples in the within-levels should be balanced in all between-levels (Hox *et al*., 2010). There were 16 courses of the total of 67 where only eight students evaluated the courses and completed the questionnaires, so we randomly selected eight questionnaires from all other courses to give a total of 536 questionnaires for the analysis. The majority of the respondents were female (69%) (Table I), and the average score of deep approach to learning was 3.17 of 5 (Table II). At the student-level, performance approach goal orientation had the lowest average score among students' achievement goal orientation. Cooperation and working or studying with friends had the highest average score among factors in course-level.

Correlation Analysis

Among the student-level factors, mastery approach goal orientation had the highest significant correlation with deep approach to learning. Innovation had the highest correlation with deep approach to learning at the course-level factors (Table III).

Table I: Descriptive statistics of demographic variables

Variables	Frequency (%)
Gender	
Male	31.00
Female	69.00
Academic year	
2	25.40
3	26.90
4	32.80
5	14.90
University	
Chulalongkorn	55.20
Burapha	44.80
Grade Point Average (GPA)	
2.00 – 2.74	13.43
2.75 – 3.24	46.64
3.25 – 4.00	39.93

Table II: Descriptive statistics of DAL, student-level factors, and course-level factors

Variables	M	SD	CV	SK	KU
DAL Deep Approach to Learning	3.17	0.58	18.33	-0.27	-0.05
MAG Mastery-Approach Goal	3.67	0.66	17.99	-0.47	0.43
PAG Performance-Approach Goal	3.31	0.69	20.75	-0.28	0.09
PVG Performance-Avoidance Goal	3.64	0.65	17.85	-0.90	1.33
AAS Appropriate Assessment	2.79	0.61	21.96	0.25	0.27
AWL Appropriate Workload	3.31	0.89	26.73	-0.28	-0.38
PER Personalisation	3.47	0.61	17.47	-0.30	1.31
INN Innovation	2.97	0.72	24.14	0.09	0.06
TOT Task Orientation	3.61	0.48	13.35	-0.19	-0.17
COP Cooperation	3.70	0.55	14.97	-0.82	1.65
IND Individualisation	3.06	0.50	16.23	-0.06	0.57

M=Mean; SD=Standard Deviation; CV=Coefficient of Variance; SK=Skewness; KU=Kurtosis

Confirmatory Factor Analysis and Multilevel Confirmatory Factor Analysis

Confirmatory factor analysis of each latent factor at both student-level and course-level were tested before the multilevel analysis. All ten measurement models passed the tests of goodness of fit with x^2 p-value > 0.05, x^2/df < 2.00, RMSEA < 0.07, CFI > 0.95, TLI > 0.95, SRMR < 0.08 (Hoope *et al*., 2008). Factor loadings of each measurement component and percentage of variation in all constructs are shown in Tables IV and V.

Table III: Correlation Matrix and Cronbach's Alpha (*α*)

	DAL	MAG	PAG	PVG	AAS	AWL	PER	INN	TOT	COP	IND
DAL (*α* = 0.805)	1										
MAG (α = 0.697)	0.527**	1									
PAG (α = 0.796)	0.259**	0.391**	1								
PVG (α = 0.740)	0.122**	0.116**	0.418**	1							
AAS (α = 0.708)	0.224**	0.074	-0.038	0.017	1						
AWL (α = 0.755)	0.208**	0.146**	-0.028	0.067	0.138**	1					
PER (α = 0.845)	0.358**	0.296**	0.186**	0.073	0.164**	0.108*	1				
INN (α = 0.850)	0.452**	0.250**	0.173**	-0.024	0.185**	-0.002	0.488**	1			
TOT (α = 0.711)	0.435**	0.352**	0.160**	0.168**	0.236**	0.235**	0.411**	0.270**	1		
COP (α = 0.777)	0.201**	0.187**	0.148**	0.158**	0.053	-0.087*	0.272**	0.248**	0.198**	1	
IND (α = 0.708)	0.307**	0.153**	0.152**	0.076	0.186**	0.270**	0.327**	0.352**	0.303**	0.052	1

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

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

Table IV: Test of confirmatory factor analysis of student-level factors

Components of Measurement Model	Factor Loading		R^2
	b	SE	
Mastery-Approach Goal (MAG)			
My goal is to fully understand the contents taught in class.	0.694**	0.037	0.482**
My goal is to learn as much as I can.	0.609**	0.027	0.371**
I try very hard to understand as deep as possible in this subject matter.	0.772**	0.036	0.596**
Performance-Approach Goal (PAG)			
I am determined to do well when compared to other students.	0.700**	0.033	0.491**
My goal is to behave well when compared to other students.	0.680**	0.022	0.462**
My goal is to produce a better work than other students.	0.792**	0.030	0.627**
Performance-Avoidance Goal (PVG)			
My goal is to avoid having bad work when compared to other students.	0.630**	0.025	0.397**
I try hard to avoid producing worse work than others.	0.885**	0.028	0.782**
My goal is to avoid producing worse work than other students.	0.709**	0.031	0.502**

Multilevel confirmatory factor analysis for deep approach to learning in both within and between levels also passed the criteria of goodness of fit indices. In order to properly run the multilevel model, intra-class correlation (ICC) should be equal or higher than 0.05 (Snijders & Bosker, 2011; Ntoumanis & Myers, 2016), and ICC of all items ranged from 0.05 to 0.17 (Table VI).

Multilevel Structural Equation Model Analysis

Testing of the model fit as shown in Figure 3 was performed by multilevel analysis and its goodness of fit indices were $X^2 = 468.23$, df = 279, X^2 /df = 1.68, *p*-value = 0.00, RMSEA = 0.04, CFI = 0.90, TLI = 0.90, SRMRw = 0.07, and SRMRb = 0.22, $R^2DAL_W = 0.309^{**}$, $R^2DAL_B = 0.422^{**}$. The multilevel model validation result showed a reasonable fit with empirical data of 67 courses and 536 students (Hu & Bentler, 1999; Hooper *et al*., 2008; Al-Mamary *et al*., 2015; Kenny, 2015; Chotima & Blauw, 2016; Fackler & Malmberg, 2016; Machado *et al*., 2016; Makmee, 2016).

Mastery approach goal was the most important predictor at student-level because it had the highest relationship with a deep approach to learning ($\beta = 0.536^{**}$). Even though the performance approach goal, gender, academic year, and 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 (Figure 3). Female students adopted a deep approach to learning more than male students (β=0.001). 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. Students with medium to high grade point average (2.75-4.00) employed deep approach to learning more than students with lower grade point average. Performance avoidance goal (β=0.006) had no significant relationship with DAL.

Table V: Test of confirmatory factor analysis of course-level factors

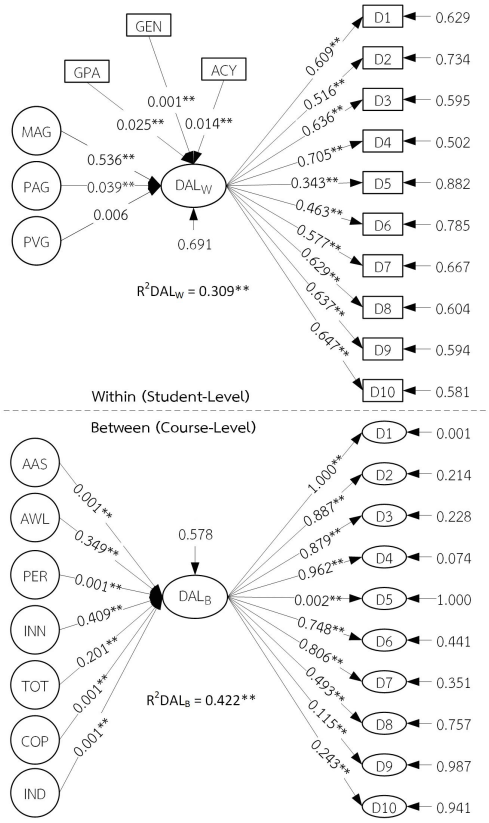
Components of Measurement Model	Factor Loading		R^2
	b	SE	
Appropriate Assessment (AAS)			
If I want to get good marks, I have to precisely memorise all course contents.	0.515**	0.034	0.265**
The instructor seems more interested in testing what I have memorised than what I have understood.	0.705**	0.021	0.497**
The instructor asks me only the course contents.	0.547**	0.032	0.299**
I find that most exam questions asked too much details of the course contents.	0.643**	0.025	0.413**
I find that if my answers are not exactly same as what in the course materials provided, I will get less marks.	0.484**	0.038	0.234**
Appropriate Workload (AWL)			
There are a lot of assignments in class, so I am not able to comprehensively understand all course contents.	0.843**	0.010	0.711**
There are too many assignments in this course.	0.879**	0.008	0.772**
I have to submit both individual and group assignments at the same time.	0.653**	0.023	0.426**
I usually spend my personal time after classes with too many assignments from this course.	0.606**	0.026	0.367**
Personalisation (PER)			
The instructor in this class concerns my feelings.	0.726**	0.018	0.527**
The instructor in this class is friendly and talks to me.	0.757**	0.016	0.574**
The instructor in this class goes out of his/her way to help me.	0.595**	0.027	0.354**
The instructor in this class helps me when I am having trouble with my work.	0.702**	0.020	0.493**
The instructor in this class moves around the classroom to talk with me.	0.422**	0.038	0.178**
The instructor in this class is interested in my problems.	0.750**	0.017	0.563**
The instructor in this class is unfriendly and inconsiderate towards me.	0.555**	0.031	0.308**
Innovation (INN)			
The instructor in this class uses new and different ways of teaching.	0.790**	0.021	0.625**
The instructor in this class thinks up innovative activities for me to do.	0.801**	0.020	0.641**
The teaching approaches used in this class are characterised by innovation and variety.	0.806**	0.020	0.650**
The instructor in this class often thinks of unusual activities.	0.759**	0.022	0.576**
I seem to do the same type of activities in every class.	0.470**	0.037	0.221**
Task Orientation (TOT)			
I know exactly what has to be done in this class.	0.532**	0.032	0.282**
Getting a certain amount of work done is important in the class.	0.348**	0.042	0.121**
I often get sidetracked in this class instead of sticking to the point.	0.351**	0.042	0.123**
This class is always disorganised.	0.611**	0.027	0.373**
Class assignments are clear and I know what to do.	0.667**	0.023	0.445**
This class seldom starts on time.	0.440**	0.038	0.193**
Activities in this class are clearly and carefully planned.	0.648**	0.025	0.420**
Cooperation (COP)			
I cooperate with other students when doing assignment work.	0.710**	0.019	0.504**
I share my books and resources with other students when doing assignments.	0.458**	0.035	0.210**
I work with other students on projects in this class.	0.546**	0.030	0.299**
I learn from other students in this class.	0.457**	0.035	0.209**
I work with other students in this class.	0.772**	0.015	0.596**
I cooperate with other students on class activities.	0.792**	0.014	0.628**
Students work with me to achieve class goals.	0.740**	0.017	0.548**
Individualisation (IND)			
I am expected to do the same work as all the students in the class, in the same way and in the same time.	0.286**	0.043	0.082**
I am generally allowed to work at my own pace in this class.	0.640**	0.025	0.410**
I am allowed to choose activities and how I will work.	0.793**	0.014	0.628**
Teaching approaches in this class allow me to proceed at my own pace.	0.735**	0.018	0.540**
I have little opportunity to pursue my particular interests in this class.	0.458**	0.036	0.210**
My instructor decides what I will do in this class.	0.263**	0.044	0.069**

Among course-level factors, innovation had the highest impact (β=0.409**) on deep approach to learning, followed by appropriate workload (β=0.349**) and task orientation (β=0.201**). Although appropriate assessment, personalisation, cooperation, and individualisation had significant relationships with the DAL, their effect sizes (β=0.001**) were smaller than the top three factors. The predictor variables at student and course levels accounted for 30.90% and 42.20% variance, respectively, in pharmacy students' DAL.

Table VI: Test of multilevel confirmatory factor analysis of deep approaches to learning

Components	Within 536 Samples			Between 67 Groups			ICC
	Factor Loading		R^2	Factor Loading		R^2	
	β	SE		β	SE		
D1 I find that at times studying gives me a feeling of deep personal satisfaction.	0.656**	0.034	0.430	0.968**	0.008	0.937	0.25
D2 I feel that virtually any topic can be highly interesting once I get into it.	0.629**	0.035	0.396	0.912**	0.029	0.831	0.10
D3 I find that studying academic topics can at times be as exciting as a good novel or movie.	0.693**	0.032	0.480	0.960**	0.012	0.922	0.17
D4 I work hard at my studies because I find the material interesting.	0.619**	0.035	0.383	0.960**	0.011	0.921	0.19
D5 I come to most classes with questions in mind that I want answering.	0.364**	0.047	0.133	0.180**	0.022	0.032	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.	0.450**	0.044	0.203	0.965**	0.009	0.932	0.24
D7 I find most new topics interesting and often spend extra time trying to obtain more information about them.	0.495**	0.041	0.245	0.939**	0.019	0.882	0.15
D8 I test myself on important topics until I understand them completely.	0.472**	0.042	0.223	0.812**	0.054	0.659	0.17
D9 I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes.	0.485**	0.043	0.235	0.615**	0.087	0.378	0.17
D10 I make a point of looking at most of the suggested readings that go with the lectures.	0.542**	0.040	0.294	0.700**	0.045	0.491	0.09

Figure 3: Measurement model of Multilevel Structural Equation Modelling of DAL



** p<0.01

X^2 = 468.23, df = 279, X^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^2DAL_W = 0.309, R^2DAL_B = 0.422**.**

Discussion & Recommendations

As in the theory of Biggs' 3P model, presage including student-level and teaching-level factors impacts task processing (pharmacy students' approach to learning). The study results were confirmed with the theory. Amongst achievement goal orientation, mastery approach goal which is attention to understand study contents and assignments had the highest significant effect on pharmacy students' DAL. This result was similar to many studies where students who have mastery approach goal tend to adopt DAL (Diseth, 2011; Kyndt *et al*., 2012; Rithilert & Kaemkate, 2013; Poondej, 2014; Yerdelen Damar & Aydın, 2015). 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.

Many studies have found that performance approach goal orientation is a positive predictor of DAL (Liem *et al.*, 2008; Diseth, 2011; Poondej, 2014), and these results support this finding. The relationship of performance approach goal orientation on a DAL was smaller than mastery approach goal orientation. Thus, students' attention to understand study content and assignments influenced DAL much more than students' comparing abilities and performance with others. Some studies found that females were more likely to adopt DAL while males mostly preferred a surface approach (Elias, 2005; Halawi *et al*., 2009; Salamonson *et al*., 2013), and the results of this study were similar. The current study results showed the same trend with a number of studies that indicated that students who were in higher academic

years had more of a DAL than students who were in lower years (Elias, 2005; Mansouri, 2009; Baeten *et al*., 2010; Smith *et al.*, 2010; Karagiannopoulou *et al*., 2014). Certain studies showed that students in other disciplines with medium to high grade point average employed a DAL more than students with low grade point average (Elias, 2005; Rithilert & Kaemkate, 2013), and this 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 DAL (Liem *et al*., 2008; Poondej, 2014; Yerdelen Damar & Aydın, 2015; Poondej & Lerdpornkulrat, 2016), and these results were similar to this study's findings.

At the course-level, the top three influencing factors on DAL 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). This study showed the same trend, in that innovation had the highest impact on pharmacy students' DAL. Thus, to increase DAL, 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 (Junco *et al*., 2011; Han & Finkelstein, 2013; Lim & Hew, 2014). The Pharmacy Education Consortium of Thailand (PECT) and the National Health Professional Education Foundation of Thailand 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. The results here supported this paradigm shift in pharmacy education in Thailand.

Course workload or demands of learning tasks was the major factor for making a decision on choosing an approach to learning (Yerdelen Damar & Aydın, 2015). This study supported these finding in which students tend to employ a deep approach if their workload was considered as appropriate or manageable (Struyven *et al.*, 2006; Baeten *et al*., 2010; Varunki *et al*., 2015).

There was significant relationship between clear and well-organised instruction and activities in class and pharmacy students' DAL. This finding was in line with studies that showed students exposed to clear and organised instruction or clarification tended to employ DAL (Baeten *et al*., 2010; Pascarella & Blaich, 2013; Wang *et al*., 2015).

The remainder of the influencing factors which were appropriate assessment, personalisation, cooperation, and individualisation had small relationships with a deep approach to learning. Even though implementing innovative teaching, providing appropriate workload, and giving well-organised and clear instruction in class would increase pharmacy students' DAL, 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 ignored.

Implications for practice and research

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

This study had limitations. It would be better to sample pharmacy students from all universities in Thailand, but the collaboration of all universities was not possible at this time. However, the authors compared descriptive data of all variables between the two universities and found that there 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.

Conclusion

Both student- and course-level factors predicted DAL. In order to increase pharmacy students' DAL, motivating students to fully understand contents taught as deep as possible in class and outperform others were the important issues at student-level. Pharmacy schools should emphasise innovative teaching, appropriate student workload, well-organised 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 students individually for increasing pharmacy students' DAL. Ultimately, the DAL will strengthen pharmacy students' academic and desirable professional outcomes.

Conflict of interest

The authors declare that they have no conflict of interest.

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