

# แรงจูงใจทางการเรียนของนักศึกษาเภสัชศาสตร์ไทย Learning Motivation of Thai Pharmacy Students

นิพนธ์ต้นฉบับ

Original Article

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## บทคัดย่อ

**วัตถุประสงค์:** เพื่อพัฒนาเครื่องมือสำหรับวัดแรงจูงใจทางการเรียนของนิสิตเภสัชศาสตร์ไทย และเพื่อประเมินแรงจูงใจทางการเรียนของนิสิตเภสัชศาสตร์ ชั้นปีที่ 1 - 6 ของมหาวิทยาลัยมหาสารคาม และเปรียบเทียบแรงจูงใจระหว่างต้นและปลายภาคการศึกษา **วิธีการศึกษา:** ผู้วิจัยพัฒนาแบบสำรวจแรงจูงใจทางการเรียนของนิสิตเภสัชศาสตร์โดยแปลจาก Modified Archer's Health Professions Motivation Survey (MAHPMS) ของ Perrot and Deloney (2013) รวมข้อคำถาม 62 ข้อ ประกอบด้วยตัวชี้วัดหลัก 4 ด้านได้แก่ เป้าหมายการเรียนรู้ (3 ด้านย่อย) กลยุทธ์การเรียนรู้ (2 ด้านย่อย) ปัจจัยที่ควบคุมการเรียนรู้ (2 ด้านย่อย) และความยากง่ายของงานที่เลือกทำ (2 ด้านย่อย) โดยใช้ Likert scale 5 ระดับ (1 = เห็นด้วยน้อยที่สุด, 5 = เห็นด้วยมากที่สุด) ได้ทดสอบคุณสมบัติทางจิตวิทยาของเครื่องมือ เก็บข้อมูลในภาคการศึกษา 1/2563 ที่ช่วงต้นและปลายภาคการศึกษา ได้เปรียบเทียบความต่างของคะแนนตัวชี้วัดย่อยของแต่ละตัวชี้วัดหลัก **ผลการศึกษา:** เครื่องมือมีความตรงของเนื้อหาและความเที่ยงเชิงความสอดคล้องภายในระดับยอมรับได้ ในนิสิตทุกชั้นปีนั้น คะแนนของการเรียนรู้ในด้านย่อยแบบเพื่อเรียนรู้ กลยุทธ์การเรียนรู้ด้านย่อยแบบเชิงรุก และการควบคุมการเรียนรู้ด้านย่อยแบบปัจจัยภายใน มีค่าสูงกว่าคะแนนของตัวชี้วัดย่อยอื่นในตัวชี้วัดหลักเดียวกันอย่างมีนัยสำคัญทางสถิติ ( $P$ -value < 0.05) นิสิตชั้นปีที่ 1 - 5 มีคะแนนของการเลือกงานที่มีความง่ายสูงกว่างานที่มีความยาก แต่นิสิตชั้นปีที่ 6 มีคะแนนของการเลือกงานที่มีความยากสูงกว่า ในช่วงปลายภาค นิสิตชั้นปีที่ 1, 4 และ 6 มีคะแนนเป้าหมายการเรียนรู้ด้านย่อยแบบไม่มีเป้าหมายเพิ่มสูงขึ้นจากต้นภาคอย่างมีนัยสำคัญทางสถิติ ( $P$ -value < 0.05) ขณะที่นิสิตชั้นปีที่ 2 และ 3 มีคะแนนเป้าหมายการเรียนรู้ด้านย่อยแบบเพื่อเรียนรู้ลดลงจากต้นภาคอย่างมีนัยสำคัญทางสถิติ ( $P$ -value < 0.05) **สรุป:** เครื่องมือประเมินแรงจูงใจทางการเรียนของนิสิตเภสัชศาสตร์ฉบับภาษาไทยมีคุณสมบัติทางจิตวิทยาที่ยอมรับได้และสามารถวัดแรงจูงใจได้

**คำสำคัญ:** แรงจูงใจทางการเรียน, นิสิตเภสัชศาสตร์, การศึกษาทางเภสัชศาสตร์ เครื่องมือวัดแรงจูงใจ

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## Abstract

**Objective:** To develop a questionnaire for measuring learning motivation of Thai pharmacy students, to measure learning motivation of 1<sup>st</sup> – 6<sup>th</sup> year pharmacy students of Mahasarakham University, and compare learning motivation at the beginning and the end of the semester. **Methods:** The Modified Archer's Health Professions Motivation Survey (MAHPMS) of Perrot and Deloney (2013) was translated into Thai language. Of 62 items, 4 domains or indicators consisted of goal orientation (3 sub-domains), learning strategy (2 sub-domains), locus of control (2 sub-domains) and preference for task difficulty (2 sub-domains). The response was a Likert-type ratingscale of 1-least favored, to 5-strongest preference. Psychometric properties were tested. Data were collected in the first semester of the academic year of 2020. Within each domain, scores of sub-domains were compared. **Results:** Content validity and internal consistency reliability of the questionnaire were acceptable. Scores of mastery oriented goal sub-domain of learning goal, meta-cognitive sub-domain of learning strategy, and internal sub-domain of locus of control in students in all years of study were significantly higher than other sub-domains in their respective domain ( $P$ -value < 0.05). Students in their 1<sup>st</sup> – 5<sup>th</sup> year had scores of easy task higher than difficult ones; while the opposite was true for the 6<sup>th</sup> year students. At the end of the semester, students in 1<sup>st</sup>, 4<sup>th</sup> and 6<sup>th</sup> year of study had scores of academic alienation sub-domain of learning goal increased ( $P$ -value < 0.05), and 2<sup>nd</sup> and 3<sup>rd</sup> year students had scores of mastery oriented goal sub-domain decreased ( $P$ -value < 0.05). **Conclusion:** Thai version of the questionnaire for measuring learning motivation of pharmacy students had acceptable psychometric properties and was able to measure learning motivation.

**Keywords:** learning motivation, pharmacy students, pharmacy education, motivation assessment tool

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## Introduction

To produce pharmacy graduates with lifelong learning skill, learning motivation of pharmacy students need to be enhanced. There has been no tools to measure learning motivation among Thai pharmacy students. This study aimed to develop Thai version of a learning motivation scale based

on the original English tool and assess learning motivation among Thai pharmacy students.

Learning motivation as a psychological concept suggesting the willingness of individuals to put their effort to achieve educational goals.<sup>1</sup> With the advancement in science

and technology and the leaping, continuous development in drugs and health products, lifelong learning is a skill essential for pharmacy students and pharmacy practitioners to enhance their potential in their effective professional work. Lifelong learning is one of the seven desirable characteristics of the pharmacist, called seven-star pharmacist, of the World Health Organization.<sup>2</sup>

Lifelong learning is a learning style of which the learners are willing to initiate their learning process (i.e., “active learning”) and direct their own learning process “i.e., “self-directed learning”). For lifelong learning to be substantiated and sustained, the learners need to be motivated. Therefore, learning motivation is of great concern to understand and enhance to achieve the lifelong learning. Based on Perrot and Deloney, the four indicators or domains of learning motivation include (1) goal orientation (with sub-domains of performance goal orientation, master goal orientation, and academic alienation), (2) learning strategy (with sub-domains of metacognitive learning strategy, and non-cognitive learning strategy), (3) factors that control learning or locus of control (with sub-domains of internal and external locus of control), and (4) preference for task difficulty (with sub-domains of preference for easy task and for difficult task).<sup>3</sup> These domains of learning motivation promote development of learner potential to ultimately achieve lifelong learning.<sup>1</sup>

Each of these sub-domains or individual indicators could be elaborated as follows. For goal orientation domain/indicator, sub-domain of performance goal orientation means learners learning to achieve specific outcomes such as scores, rewards and grades; while sub-domain of master goal orientation means learners having the desire to learn to improve or challenge themselves, and subdomain of academic alienation means learner having no goal or desire to learn, but only to pass the course. For learning strategy domains, sub-domains of metacognitive learning strategy mean learners examine themselves while learning and planning for their learning (e.g., whether they understand the content correctly, what they do not know or understand, what to ask for help or explanation, and how to plan for their learning process). The sub-domain of non-cognitive learning strategy, on the other hand, means all the opposite. For locus of control, the internal locus of control means the learners' perception that they could control their own learning process, and if they could not, it is because of their own failure. The external locus of control mean learners believe that various factors, but not

themselves, affect or control their learning process and learning success (e.g., luck, instructors, content difficulty, etc). For the domain of preference for task difficulty, the sub-domain of preference for difficult task refers to selecting challenging or difficult task so that they can learn from the hardships and enhance their capability. The sub-domain of performance for easy task means choosing easy task to avoid hardship or challenges, and being stressed or anxious, and to obtain better scores or grades.

To understand learning motivation, effective assessment tools are needed. Among various instruments to measure learning motivation, the Modified Archer's Health Professions Motivation Survey (MAHPMS) developed by Perrot and Deloney is an assessment tool on learning motivation among health science students including medicine, nursing, and pharmacy.<sup>3</sup> MAHPMS evaluates goal orientation, learning strategy, factors that control learning or locus of control, and preference for task difficulty. This MAHPMS was developed based on the learning motivation assessment tool for college students of Archer in 1994.<sup>4</sup> These two tools were based on the motivation theory of Carol Dweck stating that in performing activities or tasks that have no clear goals, the person might not need to be motivated; on the other hand, for activities or tasks with clear, specific goals, the motivation is definitely needed.<sup>5</sup>

Learning motivation helps students develop persistence to obstacles, performance in training, and lifelong learning skill.<sup>6</sup> Learning motivation could predict learning success because of the learner's desire for accomplishment on specific tasks, effort to overcome obstacles, responsibility on tasks, and less preference for easy tasks.

Learning motivation evaluation helps reflect the learner's learning goals, strategies and styles. Insights about learning motivation could help in curriculum development and learning plan for lifelong learning.<sup>1</sup> At present, there has been no Thai version of the assessment tool of learning motivation specific to health science students based on the concept of Perrot and Deloney.<sup>3</sup> Our present study aimed to develop Thai version learning motivation tool by translating and modifying the MAHPMS of Perrot and Deloney. The modified Thai version was used to measure learning motivation in 1<sup>st</sup> - 6<sup>th</sup> year pharmacy students of Mahasarakham University, in the first semester of the academic of 2020. Since learning motivation changed over time, between semester or even within the semester<sup>1,6</sup>, we compared learning motivation at the start with

that at the end of the semester. We hypothesized that there was a difference between learning motivation at the start and that at the end of the semester.

## Methods

In this observational study, we surveyed learning motivation of 1<sup>st</sup> to 6<sup>th</sup> year pharmacy students of Faculty of Pharmacy, Mahasarakham University in the first semester of the academic year of 2020. With no pre-pharmacy education of at least two years required before entering pharmacy schools in Thailand, the 3<sup>rd</sup> to 6<sup>th</sup> year of pharmacy study in Thailand is equivalent to the 1<sup>st</sup> to 4<sup>th</sup> year of pharmacy study in the US and some other countries. Learning motivation was assessed by using Thai version of the Modified Archer's Health Professions Motivation Survey (MAHPMS) which was translated and modified by the researcher. This study was approved by the Ethics Committee for Human Study of Mahasarakham University (approval number: 023/2563).

Study population was all pharmacy students of Mahasarakham University in the first to sixth year of their study. Study sample was 569 students of the study population who registered courses in the first semester of the academic year of 2020 and were willing to participate in the study.

### Research instruments

The questionnaire modified from the MAHPMS of Perrot and Deloney<sup>3</sup> was used in this study. This Thai version was developed by the forward translation with testing<sup>7</sup> as follows. The MAHPMS was translated into Thai by the researcher. Some content was modified to fit Thai learning context. For example, there was no tutorial session in pharmacy education in Thailand. Therefore the word "tutorials" in the statement "In general, I felt satisfied when I realized I didn't have to prepare for tutorials" was modified to Thai statement of which the word "tutorials" was modified to a Thai word referring to "regular class sessions." Certain words also needed to be modified. For example, the meaning of the word "course materials" in the original MAHPMS "Even when course material is uninteresting, I keep working at it" was elaborated referring to "class handouts or class presentation slide either MS Powerpoint™ slide handout or MS Word™ handout.

This modified MAHPMS questionnaire consisted of 68 questions, specifically 41 questions on learning goals, 15 on

learning strategies, 10 on locus of control, and 2 on preference for task difficulty (Table 1).

**Table 1** Main indicator (or domain) and its individual indicators (or sub-domains) modified from the MAHPMS of Perrot and Deloney (2013).

Main indicator (or domain) and its individual indicators (or sub-domains)	No. of questions	Definition and examples
<b>Learning goal orientation</b>		
Performance goal orientation	15	Learners learning to achieve specific outcomes such as scores, rewards and grades. Ex: In general, I'm satisfied when I'm doing better my classmates.
Mastery goal orientation	16	Learners having the desire to learn to improve or challenge themselves. Ex: In general, I'm satisfied when I'm assigned with task or work that is challenging.
Academic alienation	10	Learner having no goal or desire to learn, neither for performance nor mastery, but only to pass the course. Ex: In general, I'm satisfied when I pass the course with little effort.
<i>Subtotal</i>	<i>41</i>	
<b>Learning strategies</b>		
Metacognitive learning strategy	8	Learners examining themselves while learning and planning for their learning, such as examining outcomes from their learning strategy. For example, whether they understand the content correctly, what they do not know or understand, what to ask for help or explanation, and how to plan for their learning process. Ex: I spend time to schedule my learning.
Non-cognitive learning strategy	7	Learners not examining themselves, only aiming for the least amount of work possible. Ex: I found it difficult to follow my learning schedule.
<i>Subtotal</i>	<i>15</i>	
<b>Locus of control</b>		
Internal locus of control	6	Learners perceiving that they could control their own learning process, and if they could not, it is because of their own failure. Ex: If I do poorly this year, it could be because I do not use effective strategies in learning and completing assignment.
External locus of control	4	Learners believing that various factors, but not themselves, affect or control their learning process and success (e.g., luck, instructors, content difficulty, etc). Ex: If I do poorly this year, it could be because the content is too difficult.
<i>Subtotal</i>	<i>10</i>	
<b>Preference for task difficulty</b>		
Preference for difficult task	1	Learners selecting challenging or difficult task so that they can learn from the hardships and enhance their capability. Ex: If I have to choose, I'll choose difficult assignment which I might fail but could learn a lot from it.
Preference for easy task	1	Learners choosing easy task to avoid hardship or challenges, and being stressed or anxious, and to obtain better scores or grades. Ex: If I have to choose, I will choose the assignment that I don't have to work hard or be worried, and I could have a high score.
<i>Subtotal</i>	<i>2</i>	
<b>Total</b>	<b>68</b>	

To assure quality of the modified, translated questionnaire, content validity and reliability were examined. Content validity was evaluated by five experts including three experts in education and two experts in pharmacy. How much each question agreed with the study objectives and the agreement between Thai and English versions were rated and content validity was numerically summarized as Index of Item-Objective Congruence (IOC). An acceptable IOC value of 0.5 or higher was used to judge each question.<sup>8</sup> For reliability, the modified MAHPMS questionnaire was tested in 30 pharmacy students, five from each of the 1<sup>st</sup> to 6<sup>th</sup> year. Internal consistency reliability for the whole scale and each of the four individual dimensions was assessed using the Cronbach's alpha coefficient. An acceptable Cronbach's alpha coefficient of 0.7 - 0.95 was used to judge the overall scale and individual dimensions.<sup>9</sup>

The response for each question was a Likert-type rating scale ranging from 1-least favored, to 5-strongest preference. The score for each sub-domain was the sum of all questions and divided by the number of questions under the given sub-domain. With the possible sum score for each sub-domain was 1 - 5 points, higher scores indicated higher perception of such sub-domain concept.

The questionnaire was revised according to suggestions if any. The final form of the questionnaire was in the online format on the Google Form for online survey.

### Data collection procedure

The researcher provided information about the objectives, process, benefits, and voluntary nature of the study to prospective participants in the first week of the first semester of the academic year of 2020 both in-person meeting and online conference. Once written informed consent was obtained, the participant was directed to complete the online survey, as the first survey. The second survey was conducted during the 7-day period after the last day of the final examination of the first semester.

### Statistical data analysis

Demographic characteristics and scores of learning motivation were presented with descriptive statistics including mean with standard deviation and frequency with percentage. For main indicator (or domain) with three or more individual indicators (or sub-domains), mean scores of individual indicators were compared using one-way analysis of variance (ANOVA) or Kruskal Wallis test if not normally distributed, as appropriate. For main indicator with two individual indicators, mean scores of individual indicators were compared using independent *t*-test or Mann Whitney U test if not normally distributed, as appropriate. For each individual indicator, mean scores at the start and the end of the semester were compared using dependent sample *t*-test or Wilcoxon signed rank test, if not normally distributed, as appropriate. Statistical significance for all statistical analyses was set at a type I error of 5%. All statistical analyses were conducted using SPSS for Windows version 19.

## Results and Discussions

### Instrument development

In terms of content validity, all 68 questions were rated with IOC of more than 0.5 therefore they had acceptable

content validity (Table 1).<sup>8</sup> When tested for internal consistency reliability, 6 questions with negative item-total correlation within their respective domains were found, specifically 2 of 41 questions of learning goals domain, and 4 of 10 questions of locus of control domain.

After the 6 questions were removed, the remaining 62 questions were used in the actual sample (Table 2). In the actual survey, we found that Cronbach's alpha coefficients of 0.75 or higher were found in 5 subdomains including mastery goal orientation, performance goal orientation, academic alienation, and metacognitive learning strategy, both at the start and at the end of the semester. Based on the criteria of good and acceptable internal consistency reliability with Cronbach's alpha coefficient of 0.7 - 0.95<sup>9</sup>, these 4 sub-domains had good, acceptable internal consistency reliability. The other 3 sub-domains had Cronbach's alpha coefficient of 0.5 - 0.6, including non-cognitive learning strategy, internal locus of control and external locus of control. This seems to be disappointing, however, some scholars argued that the criteria for acceptable internal consistency reliability are relatively arbitrary. In addition to the cut-off value of 0.75, Taber reported that science journals interpreted Cronbach's alpha coefficient diversely. For example, Cronbach's alpha coefficients of 0.45 - 0.96 were considered as sufficient, and 0.45 - 0.98 as acceptable, and 0.58 - 0.97 as satisfactory.<sup>10</sup> In addition, Lamb et al asserted that Cronbach's alpha coefficient was also dependent on the respondent's interpretation capability. Internal consistency reliability obtained from students in early years of study was lower than that from those in later years.<sup>11</sup> Learning experience certainly affects Cronbach's alpha coefficient.

**Table 2** Cronbach's alpha coefficients of each individual indicators (or sub-domains) at two assessment points in the 1<sup>st</sup> semester of the academic year of 2020 (N = 569).

Individual indicators (or sub-domains)	No. of questions	Cronbach's alpha coefficients by assessment point	
		At the START of the semester	At the END of the semester
Performance goal orientation	14	0.840	0.876
Mastery goal orientation	15	0.876	0.899
Academic alienation	10	0.771	0.821
Metacognitive learning strategy	8	0.781	0.794
Non-cognitive learning strategy	7	0.549	0.586
Internal locus of control	3	0.492	0.518
External locus of control	3	0.515	0.499
Preference for difficult task	1	Not applicable	
Preference for easy task	1	Not applicable	
<b>Total</b>	<b>62</b>		

In our study, learning motivation assessment tool was developed by the forward translation with testing. This method requires only one translator, limited time and resource while the tests for correctness and reliability of the tool are allowed before use. However, forward translation with testing does not allow for the comparison of the content of the source language with that of the target language.<sup>7</sup> Our study had ascertained the tool quality of this Thai version of MAHPMS questionnaire by content validity examination by the experts on the agreement between the objective of the study and the content of the questions as well as the agreement between the Thai and English versions. In addition, internal consistency reliability was also tested in Thai pharmacy students. Therefore, we expected that this Thai learning motivation assessment tool possesses acceptable psychometric properties and comparable to its original English version.

### Learning motivation in Thai pharmacy students

With a response rate of 99.13% of all study population, data obtained from this sample could acceptably represent the study population (Table 3). The three sub-domains of learning motivation with the highest scores in all years of study and at both assessments were mastery goal orientation, metacognitive learning strategy, and internal locus of control (presented in bold numbers in Table 4). In addition, mean score of each of these three sub-domains was significantly higher than that of other sub-domains within its respective domain. For example, among all three sub-domains of

learning goal domain, mean score of mastery goal orientation mean score was significantly higher than those of performance goal orientation and academic alienation both at the start of the semester and at the end of the semester.

In the domain of learning strategies, mean score of meta-cognitive learning strategy was higher than that of non-cognitive strategy in every year of study ( $P$ -value < 0.01). In the domain of locus of control, mean scores of internal locus of control were higher than those of external locus of control in every year of study ( $P$ -value < 0.01).

This finding was consistent with the studies of Hasting *et al.*<sup>6</sup> and Perrot *et al.*<sup>12</sup> in professional doctor of pharmacy (Pharm.D.) students in the US in all years of study (i.e., years 1 - 4). These students had mastery goal orientation, meta-cognitive learning strategy and internal locus of control.<sup>6,12</sup> In the study of Hasting and colleagues, pharmacy students were followed for 4 years<sup>6</sup> (i.e., longitudinal study), but our study-

**Table 3** Demographic characteristics of pharmacy students of each year of study (N = 569).

Year	Gender		Age (mean ± SD)	GPAX (mean ± SD)	N
	Male (N, %)	Female (N, %)			
1 <sup>st</sup>	24 (23.76)	77 (76.24)	18.78±0.76	3.84±0.19	101
2 <sup>nd</sup>	31 (36.05)	55 (63.95)	19.57±1.10	3.77±0.16	86
3 <sup>rd</sup>	33 (37.50)	55 (62.50)	20.66±0.90	3.49±0.33	88
4 <sup>th</sup>	21 (21.43)	77 (78.57)	21.66±0.82	3.34±0.35	98
5 <sup>th</sup>	26 (26.00)	74 (74.00)	22.41±0.64	3.34±0.34	100
6 <sup>th</sup>	24 (25.00)	72 (75.00)	23.42±0.79	3.38±0.34	96
<b>Total</b>	159 (27.94)	410 (72.06)	21.11±1.82	3.52±0.36	569

**Table 4** Scores of learning motivation of pharmacy students (N = 569).

Year of study and assessment points		Mean scores ± SD (points) by main indicators (domains) and individual indicators (sub-domains)								
		Learning goal orientation			Learning strategy		Locus of control		Preference for task difficulty	
		Performance	Mastery	Academic alienation	Meta-cognitive	Non-cognitive	Internal	External	Difficult	Easy
1 <sup>st</sup> year	Start of semester	3.42 ± 0.53	<b>4.09 ± 0.42*</b>	2.99 ± 0.51	<b>3.70 ± 0.57*</b>	3.04 ± 0.48	<b>4.00 ± 0.64<sup>†</sup></b>	2.68 ± 0.65	3.14 ± 0.95	3.27 ± 1.01
	End of semester	3.39 ± 0.60	<b>4.04 ± 0.54*</b>	3.27 ± 0.59 <sup>‡</sup>	<b>3.72 ± 0.65*</b>	3.30 ± 0.52 <sup>‡</sup>	<b>3.87 ± 0.65<sup>†</sup></b>	2.79 ± 0.62	3.21 ± 0.98	3.53 ± 0.96 <sup>‡</sup>
2 <sup>nd</sup> year	Start of semester	3.00 ± 0.64	<b>3.93 ± 0.55*</b>	3.10 ± 0.68	<b>3.54 ± 0.66*</b>	3.13 ± 0.50	<b>3.82 ± 0.59<sup>†</sup></b>	2.93 ± 0.74	2.99 ± 1.04	3.41 ± 0.95 <sup>‡</sup>
	End of semester	2.98 ± 0.66	<b>3.81 ± 0.57*<sup>#</sup></b>	3.12 ± 0.61	<b>3.27 ± 0.58<sup>‡</sup></b>	3.22 ± 0.41	<b>3.72 ± 0.69<sup>†</sup></b>	2.94 ± 0.70	3.03 ± 0.99	3.31 ± 0.94
3 <sup>rd</sup> year	Start of semester	2.99 ± 0.57	<b>3.87 ± 0.45*</b>	3.10 ± 0.65	<b>3.38 ± 0.49*</b>	3.19 ± 0.52	<b>3.92 ± 0.69<sup>†</sup></b>	2.67 ± 0.70	2.75 ± 0.96	3.53 ± 0.91 <sup>†</sup>
	End of semester	2.99 ± 0.61	<b>3.69 ± 0.50*<sup>#</sup></b>	3.10 ± 0.66	<b>3.33 ± 0.56</b>	3.25 ± 0.51	<b>3.68 ± 0.77<sup>†</sup></b>	2.67 ± 0.67	2.91 ± 0.85	3.14 ± 0.90 <sup>‡</sup>
4 <sup>th</sup> year	Start of semester	3.01 ± 0.53	<b>3.76 ± 0.56*</b>	2.95 ± 0.60	<b>3.28 ± 0.57*</b>	3.03 ± 0.47	<b>3.87 ± 0.59<sup>†</sup></b>	2.76 ± 0.64	2.92 ± 0.92	3.36 ± 1.01 <sup>†</sup>
	End of semester	3.04 ± 0.64	<b>3.70 ± 0.59*</b>	3.15 ± 0.72 <sup>‡</sup>	<b>3.24 ± 0.60</b>	3.14 ± 0.59	<b>3.67 ± 0.65<sup>†</sup></b>	2.90 ± 0.78	3.00 ± 0.98	3.35 ± 1.01 <sup>‡</sup>
5 <sup>th</sup> year	Start of semester	3.24 ± 0.52	<b>3.90 ± 0.49*</b>	3.22 ± 0.56	<b>3.38 ± 0.59*</b>	3.19 ± 0.48	<b>3.99 ± 0.58<sup>†</sup></b>	2.81 ± 0.73	3.09 ± 0.98	3.64 ± 0.96 <sup>†</sup>
	End of semester	3.18 ± 0.56	<b>3.87 ± 0.47*</b>	3.22 ± 0.60	<b>3.32 ± 0.54<sup>‡</sup></b>	3.17 ± 0.46	<b>3.74 ± 0.56<sup>†</sup></b>	2.79 ± 0.67	2.91 ± 0.93	3.56 ± 0.95 <sup>‡</sup>
6 <sup>th</sup> year	Start of semester	3.24 ± 0.52	<b>4.03 ± 0.48*</b>	3.10 ± 0.65	<b>3.36 ± 0.64*</b>	3.15 ± 0.58	<b>3.83 ± 0.66<sup>†</sup></b>	2.64 ± 0.81	3.36 ± 1.00	3.21 ± 0.97
	End of semester	3.23 ± 0.70	<b>4.07 ± 0.54*</b>	3.26 ± 0.68 <sup>‡</sup>	<b>3.42 ± 0.65</b>	3.28 ± 0.56 <sup>‡</sup>	<b>3.87 ± 0.63<sup>†</sup></b>	2.74 ± 0.74	3.45 ± 0.95	3.38 ± 0.99

\*  $P$ -value < 0.01 comparisons between individual indicators (or sub-domains) within given indicator (or domain).

<sup>‡</sup>  $P$ -value < 0.05 comparisons between individual indicators (or sub-domains) within given indicator (or domain).

<sup>#</sup>  $P$ -value < 0.05 comparisons between the start and the end of the semester within each year of study.

used cross-sectional design to collect data from students in each year of their study. Since students in different years of study were not the same individuals, our findings do not represent the prospective learning motivation changes of over time. Other studies in the UK, New Zealand, Australia, and the Netherlands also showed the trends similar to ours of which pharmacy students had mastery learning goal orientation.<sup>13,14</sup>

Learning goals could change over time. In our study we found that 2<sup>nd</sup> and 3<sup>rd</sup> year students had their scores of mastery learning goal orientation at the end of the semester dropped from the semester start with statistical significance ( $P$ -value < 0.05 for both years). In addition, 1<sup>st</sup>, 4<sup>th</sup>, and 6<sup>th</sup> year students had their scores of academic alienation learning goal at the end of the semester increased from the start of the study with statistical significance ( $P$ -value < 0.05 for all). This finding was also consistent with the previous study of Hasting and West where scores of mastery learning goal orientation of the first year Pharm.D. students decreased while scores of academic alienation increased at the end of the semester. They also found that once the students moved up to their higher year of study (i.e., 2<sup>nd</sup> - 4<sup>th</sup>), their mastery learning goal orientation regressed.<sup>1</sup> However, these students did not have their performance learning and academic alienation changed over time.<sup>6</sup> Their finding could be due to familiarity of the question contents and social desirability among the students to avoid being labelled as having no learning goals. In the study of Kool and colleagues in medical science students including pharmacy students, learning goals had been changing over the period of 5 semesters and correlated with self-efficacy of individual students.<sup>14</sup>

In terms of learning strategy, more non-cognitive strategy had been reported at the end of the semester in all years of study with statistical significance found in years 1 and 6 ( $P$ -value < 0.05). In addition, meta-cognitive learning in 2<sup>nd</sup> students decreased from the start of the semester with statistical significance ( $P$ -value < 0.05). With a limited time studying for the final examination and the large amount of class content, students could use more non-cognitive strategy to memorize the content in a very short period of time. In addition, with the covid-19 pandemic situation during the first semester of 2020, the online learning was enforced which demanded the students to adapt their learning style within a short period of time.

For locus of control, students in the 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> years had their internal locus of control decreased at the end of the semester with statistical significance ( $P$ -value < 0.05). This change could be attributable to a large sum of content and continuous examinations and evaluations (i.e., assignments, quizzes, and midterm and final examinations). This hurdle could make the students to feel that external factors including the instructors and difficulties of quizzes and examinations had more control over their learning than did their own learning capability. Hasting and co-workers showed that learners with decreased mastery learning goal were more likely to have reduced internal locus of control.<sup>6</sup> In our present study, at the end of the semester, while scores of internal locus of control in 3<sup>rd</sup> and 4<sup>th</sup> year students decreased, score of mastery learning goal of the 3<sup>rd</sup> year students decreased and score of academic alienation in 4<sup>th</sup> year students increased with statistical significance ( $P$ -value < 0.05, for both).

For preference for task difficulty, 1<sup>st</sup> year students had more preference for easy task at the end of the semester ( $P$ -value < 0.05). This finding was consistent with the study of Hasting and co-workers revealing that within the first year of study, Pharm.D. students had the score of preference for easy task increased.<sup>6</sup> It has been shown that learner with mastery learning goal are more likely to choose difficult tasks to have an opportunity for thorough and comprehensive learning; while those with performance learning goal are more likely to choose easy tasks.<sup>15</sup> In terms of years of study, we found 6<sup>th</sup> year students were more likely to have mastery learning goal than those in early years. These 6<sup>th</sup> year students also had score of preference for difficult task than that of the easy task. With the year-round intensive professional training at hospitals and community, 6<sup>th</sup> year students could encourage them to use their basic knowledge in their practice training. While didactic courses in the first 5 years emphasize basic knowledge and some simulated applications, the actual trainings result in actual healthcare outcomes. Such actual outcomes could promote more learning for more learning. In a study among pharmacy students in Japan, professional training in hospitals and community pharmacies promoted self-determination in their study.<sup>16</sup>

Mastery learning goal orientation has been found to associate with lifelong learning which is one of the goals of pharmacy education.<sup>3,17</sup> Lifelong learning is one of skills necessary for pharmacy profession at present and in the future.<sup>1,2,17</sup> With mastery learning goal oriented mind, learners

would keep their interest in more learning even when the course is over.<sup>18</sup> This mindset leads to lifelong learning. One strategy to promote students to build up mastery learning orientation, meta-cognitive learning strategy and internal locus of control goal is the use of learner-centered teaching.<sup>19</sup> With the concept of learner-centered teaching, learners are allowed to choose assignments and to participate in all learning process. Learners are also allowed to perform tasks with difficulties suitable for their capability so that they have a fair opportunity to succeed and consequently feel that they have their control over the learning process. Instructors should emphasize how the learners' learning effort and strategies could impact their learning success and failure and could be under the learners' control than the learning outcomes. Instructors play a crucial role in promoting mastery learning goal orientation. This could be done by information feedback to learners which could promote their capability and further promote learning cooperation than competition among learners.<sup>20</sup>

Our study had certain limitations. With a short period of data collection of only one semester (i.e., 4 months) and two measurements in the semester, long-term changes of learning motivation indicators could not be captured. We studied only in one pharmacy school, therefore, generalization to Thai pharmacy students could be somewhat limited. Learning motivation could change even with a moderate duration such as when moving to the second semester. Therefore, a longitudinal study on learning motivation changes from their first to last year of study in the same group of students should be conducted. Students from more pharmacy schools should also be included in the future studies to better represent learning motivation among Thai pharmacy students. Covid-19 pandemic situation could also extort the actual learning motivation among our students. The situation forced the changes in teaching. With most online classes, it was more difficult in attending classes, completing assignments, and taking examination. Technology adjustment could also bring more difficulties in learning. The changes in teaching methods and media and related difficulties could affect the students' learning motivation. Future studies in normal situation should be conducted and the impact of this kind of pandemic on learning motivation could be compared. In addition, with a large number of learning motivation questions to answer (i.e., 62 questions), answers with deviation from the actual motivation could be expected. Despite the informed consent

and willingness to participate, attention to questions could be reduced by question burden. Furthermore, since students are familiar with researchers, their answers could also be deviated by social desirability. Lastly, in the translation to account for Thai context, there could be certain context that could not best fit the original learning motivation that need more fine tuning in the future studies.

## Conclusion

The MAHPMS of Perrot and Deloney was translated and modified to fit Thai context. Acceptable psychometric properties namely content validity and internal consistency reliability were found. Pharmacy students in all years of study had mean scores of individual indicators (or sub-domains) of mastery learning goal orientation, meta-cognitive learning strategy, and internal locus of control higher than those of other individual indicators within its own domain with statistical significance ( $P$ -value < 0.05). Students in 1<sup>st</sup> to 5<sup>th</sup> year of study were more likely to have scores of preference for easy task than difficult task; while 6<sup>th</sup> year students were more likely to have preference for difficult task. Learning motivation at the end of the semester could differ from that at the semester start.

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