

INSTRUCTIONAL DESIGN AND ASSESSMENT

Effect of Learner-Centered Teaching on Motivation and Learning Strategies in a Third-Year Pharmacotherapy Course

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Objectives. To develop, implement, and assess a learner-centered approach to teaching a third-year pharmacotherapy course in a doctor of pharmacy (PharmD) program.

Methods. The pharmacotherapy course was restructured according to the learner-centered approach. The Motivated Strategies for Learning Questionnaire (MSLQ) was administered to students before and after taking the course, and changes in MSLQ subscales from baseline were evaluated. Students' response to the learner-centered approach and characteristics associated with MSLQ scores were also evaluated.

Results. Compared to baseline, students' intrinsic goal orientation control of learning beliefs, self-efficacy, critical thinking, and metacognitive self-regulation improved after taking the course. Students responded positively to the learner-centered approach. Additionally, students with a clinical practice career orientation or who prepared frequently for classes scored higher on several MSLQ domains.

Conclusions. The learner-centered approach was effective in promoting several domains of motivation and learning strategies in a third-year pharmacotherapy course.

Keywords: learner-centered teaching, pharmacotherapy, motivation, learning, Motivated Strategies for Learning Questionnaire, therapeutics

INTRODUCTION

Given the rapid development of new technology and drugs, doctor of pharmacy (PharmD) students must be motivated to become lifelong learners rather than allowed to learn "just what is necessary to pass the test" if they are to provide quality care to their future patients.¹ Numerous factors influence student motivation. While some research findings suggest that as students progress in their curriculum, they become more intrinsically motivated (ie, they are more interested in increasing understanding and achieving competence),² others suggest that during their first year, PharmD students' motivation shifts from a mastery orientation (defined as a "desire to develop competence"³) to academic alienation (defined as "no desire to develop or demonstrate competence"³).¹ In large classes, teacher attitudes and behavior, course structure, intrinsic factors, learning environment, and course content influence motivation.⁴ However, whether specific education strategies affect students' motivation has not been studied extensively.

Learner-centered teaching is an approach in which students have control over the learning process.⁵ With the learner-centered approach, instructors function as facilitators of learning rather than lecturers. In this way, "teachers do less telling; students do more discovering."⁵ The roles of the teacher in the learner-centered approach are to design the course such that it creates a climate for optimal learning; model the appropriate expected behavior for the students; encourage students to learn from and with each other; and provide more feedback throughout the process.⁵ Usually a menu of optional activities or assignments is presented to the students. In this way, the learner-centered method also gives students more options that allow them to serve their own learning needs. Course content is still introduced and utilized but in a more individualized way. Application of the content is also emphasized and used to develop critical-thinking skills. Learner-centered teaching forces students to play an active role in their education, as opposed to the more passive role traditionally used. In other disciplines, the learner-centered approach promoted more in-depth learning and facilitated students' development into independent learners.^{6,7} Although some attributes of the learner-centered approach that are employed in problem-based learning in pharmacy education have been studied previously, evaluations of the learner-centered approach in

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pharmacy education have been limited to reports of student perceptions.⁸

We hypothesized that a learner-centered approach would be effective in a pharmacotherapy course. The primary objective of this study was to evaluate the effects of the learner-centered approach on changes in students' motivation and learning strategies in a third-year pharmacotherapy course. The secondary objectives were to evaluate the students' response to the learner-centered approach, and to evaluate student factors associated with motivation and learning strategies in a pharmacotherapy course delivered via this approach.

DESIGN

Course Restructure

The fourth and last course of the required pharmacotherapy series in the PharmD curriculum at the Virginia Commonwealth University (VCU) School of Pharmacy was redesigned using a learner-centered approach, with the purpose of shifting students' reliance on faculty's lectures to students learning on their own and from each other. Students enrolled in the third-year course during spring 2007 were randomly assigned to groups of 5 to 6 members, and each group was assigned a patient case with multiple drug-related problems designed to allow students to apply their critical-thinking skills. Each group was responsible for working through the case and writing a SOAP (Subjective, Objective, Assessment, and Plan) note that detailed a course of recommendation and alternative options. In addition, the group had to submit a list of key learning points about the case and a reading reference that provided background for others. Submitted SOAP notes, key learning points, and reading materials were then approved (or returned with comments) by the faculty discussant before distribution to the whole class. During each class session, each group would present their case and workup to the class. After a question-and-answer session, another group would be randomly chosen to critique the presenting group. This critiquing exercise was introduced such that all students, and not just the presenting group, would be prepared for the class session. Lastly, the faculty discussant would comment on the case and the group's approach. In this manner, collaborative and self-directed learning styles were employed to fully engage students in the class. The students were able to learn from each other while the course faculty member was able to serve more as a guide than a lecturer.

In addition to the required presentation, each presenting group had the option to revise and resubmit their SOAP note after the class session. Also, there were several optional assignments that students could choose to undertake, such as writing a chart documentation note for each case, keeping clinical notebooks (or "peripheral

brains"), and constructing a new patient case as a group on a given list of new disease state topics.

Survey Instrument

To assess students' motivation and strategies for learning, a previously validated instrument, the Motivated Strategies for Learning Questionnaire (MSLQ), was used.⁹⁻¹¹ The MSLQ is an instrument to measure students' motivation and approach to learning. It has been successfully used in a variety of educational research, including pharmacy education. The MSLQ consists of 6 motivational and 9 learning strategies subscales. The 6 motivation subscales measure intrinsic goal orientation (focus on learning and mastery), extrinsic goal orientation (focus on grades and approval from others), task value (students' judgments of how interesting, useful, and important the course content is), control of learning beliefs (students' beliefs that outcomes are a result of one's own effort rather than extrinsic factors such as luck or the instructor), self-efficacy, and test anxiety. The 9 learning strategy subscales measure rehearsal, elaboration, organization, critical thinking, metacognitive self-regulation (students' use of strategies to control and regulate their own cognition, which include goal setting, monitoring one's comprehension and adjusting methods depending on the task), effort regulation (persisting in the face of difficult or boring tasks), peer learning, and help seeking. The MSLQ consists of 81 questions, which the students rated using a Likert scale from "1 = not at all true of me" to "7 = very true of me." A high score in a subscale meant a student reported possessing a high degree of that particular attribute.

The MSLQ was administered before the course began and again at the end of the course to assess the change in students' motivation and learning strategies during the course. The students were instructed that completion of the questionnaires was voluntary. In addition, the students completed the questionnaires in an anonymous manner. At the end of the semester, in addition to the 81 questions contained in the MSLQ, students were asked to rate the perceived effectiveness of the learner-centered approach, the degree to which each assignment facilitated their learning, their level of preclass preparation, and demographic information (gender, career plans, prior academic degrees, self-reported cumulative grade-point average, and examination scores).

Analysis

For our primary objective to determine the effect of learner-centered teaching on student motivation and learning strategy, we first confirmed that data were normally distributed, and student's responses to the MSLQ at the end of the course were compared to those at baseline

by the unpaired 2-tailed Student *t* test. Although either a repeated measure analysis¹² or the paired Student *t* test should be used, our survey responses were anonymous; hence, we were unable to link the survey instruments completed before and after the course by any identifiers. We also treated the responses to the MSLQ as parametric data since it is usual practice to treat these data as such, as has been demonstrated in numerous published reports using the MSLQ,¹²⁻¹⁵ despite the ordinal nature of the Likert scale.

For our secondary objectives, we performed descriptive statistics on students' feedback of the course, as well as the completion rate of optional assignments. In addition, to determine the association between student characteristics and MSLQ responses, students were also stratified by gender, career plans, prior degrees, and reported level of preparation for class. Differences in MSLQ responses in students of different stratified groups were compared by the unpaired students' 2-tailed *t* test. The relationships between examination performance (examination scores) and MSLQ responses were evaluated by Pearson correlations. Statistical analyses were performed using SAS 9.1.3 (SAS Institute, Cary, NC). *P* values of < 0.05 were considered significant.

This study was approved by the VCU Institutional Review Board.

ASSESSMENT

Demographics

All of the students enrolled in the course (110; 72 female and 38 male) participated in the precourse and postcourse

surveys, although not all students provided a response to every question. Of the students, 62 (56.4%) had a prior bachelor's degree and 3 had a prior master's degree. All but 2 students provided a response regarding their career plans after graduation: 20 students (18.5%) planned to pursue 1 or more pharmacy residencies, 3 (2.8%) students planned to enter clinical practice positions without a residency, 58 students (53.7%) planned to pursue entry-level retail or hospital pharmacy positions without a residency, 6 (5.6%) desired other pharmacy positions, and 21 (19.4%) were undetermined about their career plans. One hundred six students provided a response on how frequently they prepared for class: 63 (59.4%) students reported always or often preparing for classes, while 43 (40.6%) reported never, rarely, or occasionally preparing for class.

Effect of Learner-Centered Teaching on Motivation and Learning Strategy Subscales

The effects of learner-centered teaching on students' motivation and learning strategies are summarized in Table 1. Compared to baseline, within the motivational subscale, intrinsic goal orientation (*p* < 0.001), control of learning beliefs (*p* < 0.001) and self-efficacy for learning and performance (*p* < 0.001) improved after the course. Although not significant, improvements were seen in test anxiety (*p* < 0.072) and task value (*p* = 0.09). Within the learning strategies subscales, critical thinking (*p* < 0.001) and metacognitive self-regulation (*p* = 0.013) improved significantly compared to baseline, while there was a trend toward significance in an increase in help seeking (*p* = 0.083).

Table 1. Students' Motivation and Learning Strategies Before and After a Learner-Centered Pharmacotherapy Course^a

Strategies	Precourse, Mean (SD)	Postcourse, Mean (SD)	<i>P</i>
Motivational scales			
Intrinsic goal orientation	5.1 (0.8)	5.6 (0.8)	<0.001 ^b
Extrinsic goal orientation	4.6 (1.3)	4.8 (1.2)	0.280
Task value	6.0 (0.7)	6.1 (0.7)	0.090
Control of learning beliefs	4.9 (0.9)	5.7 (0.8)	<0.001 ^b
Self-efficacy for learning and performance	5.0 (0.9)	5.7 (0.8)	<0.001 ^b
Test anxiety	4.5 (1.5)	4.1(1.5)	0.072
Learning strategies scales			
Rehearsal	4.7 (1.0)	4.8(1.1)	0.626
Elaboration	5.2 (0.9)	5.3 (0.8)	0.196
Organization	5.0 (1.2)	5.0 (1.2)	0.945
Critical thinking	3.8 (1.1)	4.4 (1.1)	<0.001 ^b
Metacognitive self-regulation	4.7 (0.8)	4.7 (0.9)	0.013 ^b
Time and study environment management	5.3 (0.8)	5.1 (0.8)	0.107
Effort regulation	5.1 (1.1)	5.0 (1.0)	0.266
Peer learning	4.1 (1.6)	4.2 (1.6)	0.437
Help seeking	4.2 (1.2)	4.4 (1.2)	0.083

^aResponses to all items were on a Likert scale, ranging from 1 = not at all true of me to 7 = very true of me. A high score in a subscale means a student reports a high degree of that particular attribute

^b*p* < 0.05

Students' Response to the Learner-Centered Approach

Feedback on the learner-centered approach. Students responded positively to the learner-centered approach (Table 2). The majority (71%) either agreed or strongly agreed that their ability to learn the material presented was enhanced. In addition, 88% either agreed or strongly agreed that they were able to learn the material *and* obtain the grade they desired. Over 60% agreed that they were able to focus on learning rather than just getting a good grade. Over 76% thought that the assignments helped to reinforce the material more than studying alone. Finally, over 75% of students indicated they would rather take a pharmacotherapy course using the learner-centered approach.

Response to optional assignments. The majority of students completed the optional assignments. All of the students completed the case construction assignment, 105 (95.5%) completed the clinical notebook assignment, 102 (92.7%) completed assignments on clinical documentation, and 83 (75.5%) submitted revised SOAP notes.

Relationship Between Student Characteristics and Motivation and Learning Strategy

We sought to determine whether relationships existed between students' motivation and learning strategy scores and their level of preparation during the course, career plans, prior degrees, gender, cumulative GPA, and examination performance.

Career Plan. Students with clinical practice career goals ($n = 22$) scored higher in intrinsic goal orientation ($p = 0.008$), task value ($p = 0.001$), and self-efficacy for learning and performance ($p = 0.034$) compared to stu-

dents who declared other types of career goals ($n = 86$) (Table 3). In addition, test anxiety trended lower in students who were contemplating clinical practice careers, but this difference was not significant ($p = 0.085$). Students who desired a clinical practice career also scored higher in several learning strategies, including elaboration ($p = 0.006$), organization, ($p = 0.025$), metacognitive self-regulation ($p = 0.019$), time and study environment management ($p = 0.058$), and effort regulation ($p = 0.016$).

Level of Preparation for Classes. We compared students' motivation and learning strategies based on their self-declared preclass preparation. Of the 110 students, 106 responded to the question regarding their level of preparation: 63 declared that they prepared always or often for classes, while 43 declared that they prepared for classes occasionally, rarely, or never. Students who declared that they prepared more frequently for classes scored higher on several motivational and learning strategies subscales (Table 4).

Student Demographic Characteristics. Other student characteristics showed less pervasive effects on motivation and learning strategies. Prior academic degrees did not affect motivation or learning strategies except in the control of learning beliefs, in which students with prior academic degrees reported a higher level of control of learning beliefs than students without prior degrees ($p = 0.002$). Gender did not affect motivation. However, male students employed more critical-thinking strategies ($p = 0.003$) and reported better time and study environment management ($p = 0.016$) than female students. Finally, no relationships were found between cumulative GPA and motivation and learning strategy indicators.

Table 2. Students' Feedback on the Learner-Centered Approach (N = 110)

Statement	Respondents, %					
	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree	Not Answered
My ability to learn the material presented was enhanced.	2.7	5.5	20.0	50.9	20.0	0.9
I felt I was able to learn the material and obtain the grade I desired.	2.7	7.3	9.1	52.7	27.3	0.9
I was able to focus on learning rather than just getting a good grade in the course.	2.7	16.4	19.1	34.6	26.4	0.9
I found that completing the assignments helped reinforce the material presented in class more than studying alone.	1.8	1.8	19.1	50.0	26.4	0.9
Course policies were transparent (i.e., clearly stated and openly available).	4.6	10.9	10.9	48.2	24.6	0.9
Course policies supported my learning in the course.	2.7	1.8	37.3	46.4	10.9	0.9
Course policies helped me to obtain the grade I desired.	1.8	5.5	27.3	46.4	18.2	0.9
I would rather take a pharmacotherapy course using a learner-centered approach.	3.6	7.3	12.7	33.6	42.7	0.0
I would rather take other courses using a learner-centered approach.	2.7	7.1	12.7	32.7	44.6	0.0

Table 3. Relationship Between Career Plans on Students' Motivation and Learning Strategies^a

	Clinical Practice Careers (n = 22) Mean (SD)	Non-Clinical Careers (n = 86) Mean (SD)	P
Motivational scales			
Intrinsic goal orientation	6.0 (0.7)	5.5 (0.8)	0.008 ^b
Extrinsic goal orientation	5.1 (1.0)	4.7 (1.2)	0.167
Task value	6.6 (0.4)	6.0 (0.7)	0.001 ^b
Control of learning beliefs	5.8 (0.8)	5.6 (0.8)	0.135
Self-efficacy for learning and performance	6.0 (0.9)	5.6 (0.8)	0.003 ^b
Test anxiety	3.6 (1.4)	4.2 (1.5)	0.085
Learning strategies scales			
Rehearsal	4.8 (1.1)	4.8 (1.1)	0.844
Elaboration	5.8 (0.8)	5.3 (0.8)	0.006 ^b
Organization	5.5 (1.1)	5.0 (1.2)	0.025 ^b
Critical thinking	4.7 (1.3)	4.4 (1.1)	0.277
Metacognitive self-regulation	5.1 (0.9)	4.7 (0.9)	0.019 ^b
Time and study environment management	5.4 (0.8)	5.1 (0.8)	0.058
Effort regulation	5.4 (1.0)	5.0 (1.0)	0.016 ^b
Peer learning	4.6 (1.7)	4.2 (1.6)	0.187
Help seeking	4.9 (1.1)	4.4 (1.2)	0.070

^aResponses to all items were on a Likert scale, ranging from 1 = not at all true of me to 7 = very true of me. A high score in a subscale means a student reports a high degree of that particular attribute

^b*p* < 0.05

Examination Performance

Since the survey was anonymous, it was not possible to link actual examination scores to students' responses on motivation and learning strategy subscales. However, students were asked to voluntarily but anonymously re-

port their 2 examination scores (as raw scores) in the course on the survey. Of 105 students who reported their examination scores, 18 (17.1%) scored at 90% or above, 63 (60.0%) scored at 80%-89.9%, 23 (21.9%) scored between 70%-79.9%, and 1 student scored below 70%, with

Table 4. Differences in Motivation and Learning Strategies in Students Stratified by Frequency of Class Preparation^a

	Prepare Often or Always (n = 63) Mean (SD)	Prepare Occasionally, Never (n = 43) Mean (SD)	P
Motivational scales			
Intrinsic goal orientation	5.8 (0.8)	5.4 (0.8)	0.014 ^b
Extrinsic goal orientation	5.0 (1.1)	4.4 (1.3)	0.008 ^b
Task value	6.2 (0.7)	6.1 (0.8)	0.400
Control of learning beliefs	5.7 (0.7)	5.5 (0.8)	0.220
Self-efficacy for learning and performance	5.9 (0.7)	5.4 (0.8)	0.001 ^b
Test anxiety	4.2 (1.6)	3.9 (1.5)	0.286
Learning strategies scales			
Rehearsal	4.8 (1.1)	4.8 (1.1)	0.744
Elaboration	5.4 (0.8)	5.1 (0.9)	0.054
Organization	5.1 (1.2)	4.8 (1.3)	0.213
Critical thinking	4.7 (1.1)	4.1 (1.1)	0.008 ^b
Metacognitive self-regulation	4.9 (0.9)	4.5 (0.8)	0.031 ^b
Time and study environment management	5.3 (0.8)	5.0 (0.9)	0.063
Effort regulation	5.2 (1.0)	4.7 (1.2)	0.037 ^b
Peer learning	4.5 (1.5)	3.8 (1.7)	0.040 ^b
Help seeking	4.5 (1.1)	4.3 (1.4)	0.257

^aResponses to all items were on a Likert scale, ranging from 1 = not at all true of me to 7 = very true of me. A high score in a subscale means a student reports a high degree of that particular attribute

^b*p* < 0.05

a class mean of $83.7\% \pm 6.0\%$. Motivation and learning strategy scores did not seem to have a relationship with examination scores except in 1 area. Students who reported better time and study environment management had higher examination scores ($p = 0.003$, $R^2=0.0724$), suggesting a significant but weak relationship.

DISCUSSION

We sought to determine whether a learner-centered approach in a pharmacotherapy course would improve students' motivation and enable students to develop more complex learning strategies. In this study, MSLQ subscale scores before and after a learner-centered pharmacotherapy course were compared. In terms of motivation, Intrinsic goal orientation (focus on learning and mastery rather than grades and approval from others), control of learning beliefs (students' beliefs that outcomes are a result of their own effort rather than extrinsic factors), and self-efficacy for learning and performance were significantly improved after the learner-centered course. Among learning strategies, critical thinking, and metacognitive self-regulation significantly improved as well.

To our knowledge, this is the first report examining the effect of learner-centered teaching on students' motivation and learning strategy in a pharmacy professional course. Learner-centered based methods have been hypothesized to develop students into autonomous, self-regulating, and in-depth learners in other disciplines.^{6,7} The results of our study were consonant with these previous suggestions. In our study, with the introduction of the learner-centered approach, students became more intrinsically goal oriented and demonstrated improvement in their learning beliefs that their personal efforts were responsible for learning outcomes. The majority of students also reported that their ability to learn was enhanced. Learner-centered teaching methodology is intended to enable students to develop learning skills and self-awareness.⁵ In our study, critical-thinking skills and, importantly, metacognitive self-regulation, improved. This improvement in metacognitive self-regulation was especially encouraging, as it suggested that students were more able to control and regulate their own cognition, monitor their own comprehension, and adjust their learning approach based on the task. As students need to become life-long learners if they are to become effective practitioners of pharmacy, improved metacognitive self-regulation was a welcomed finding.

In this study, only certain domains measured in the MSLQ improved (namely, intrinsic goal orientation, control of learning beliefs, self-efficacy, critical thinking, and metacognitive self-regulation), while others did not. We are unaware of literature that would explain this finding.

However, there are a multitude of possible explanations. Domains not significantly improved by the learner-centered teaching may be (1) domains that are not expected to change based on this approach, or (2) domains that could have had a significant improvement given a more robust analytical approach or a longer exposure to the learner-centered approach, or (3) domains that were not particularly influenced by a case-based approach in this course. For example, under the motivational subscales (Table 1), extrinsic goal orientation (focus on grades and approval from others) was not changed by the learner-centered course. Since we expected students to become more intrinsically motivated by the course, it is reasonable that extrinsic motivation, an element not targeted by the approach, remained unchanged. In terms of task value ($p = 0.09$) and test anxiety ($p = 0.072$), despite numerical improvements, there changes were shy of significance. Given a more powerful analytical method (eg, repeated measures or paired analyses), these may have been significant. However, since our questionnaires were anonymous, it is not possible to perform repeated analyses. Also, if students had been exposed to the learner-centered approach for more than just a semester, the numerical improvements in these domains may have been significant as well.

The learner-centered approach did not change rehearsal, elaboration, organization, time and study environment management, effort regulation, peer learning, and help seeking (Table 1). It is possible that these are domains that are not influenced by the learner-centered approach or by the case-based approach also used in the course. Importantly, domains targeted by the learner-centered approach improved. Based on the framework of learner-centered teaching that "students do more discovering" and using content to develop critical-thinking skills, we expected that the MSLQ critical-thinking domain would improve. Indeed, critical thinking improved significantly. In addition, metacognitive self-regulation improved as well.

The magnitude of improvement in MSLQ domains, even when significant, was all in changes of less than 1 point. Several explanations may be at play. Possibly, the learner-centered approach may have minimal effect in these motivational and learning strategy domains, even when statistically significant. Another possible explanation is that the extent of improvement demonstrated is all that could result from a single semester of a pharmacotherapy course using the learner-centered approach.

In addition to items measured in the MSLQ questionnaire, students also subjectively rated their learning experience highly. The majority of students indicated they would rather take courses that utilized a learner-centered

approach. While some assignments were optional, the majority of students completed all assignments. The students chose to use the opportunities presented to them to better help them learn. These data suggest that students responded positively to the learner-centered approach and viewed it as a valuable education method.

As expected, students who desired a clinically oriented career scored higher on motivation and learning strategy subscales. The desire for a clinical practice career may have been an intrinsic motivating factor for these students to learn. That students who prepared for classes scored higher on motivation and learning strategy items was not surprising either. Notably, the magnitude in MSLQ score differences between students with and without a clinically oriented career goal, and those who prepared frequently or less frequently for classes were all less than 1 point. Third-year pharmacy students, the group studied in this course, may be more similar than different as a group. Hence, differentiating features, such as level of class preparation and career goals, accounted for small differences in MSLQ scores, despite statistical significance.

Prior degrees, cumulative GPA, and gender minimally affected motivation and learning strategies. These observations suggest that the present course structure and environment (ie, the learner-centered teaching approach) were more important determinants of students' motivation and learning strategies than students' prior academic success or gender.

Although we expected that MSLQ subscale scores would correlate with examination performance, we did not observe this relationship in our study. A possible explanation is that the learner-centered approach may have made students less interested in their grades, as suggested by the majority of the students reporting that they focused on learning rather than just obtaining a good grade in the course. In addition, students generally performed well in examinations in this course, as evidenced by the observation that 77.1% of the students obtained a grade of 80% or above in the examinations. The nonsignificant relationship between examination scores and responses on the MSLQ survey may be due to a narrow distribution of examination scores in this class.

There were several limitations in this study. One limitation was that measurements of MSLQ were performed before and after the learner-centered pharmacotherapy course. It is possible that any improvement in motivation and learning strategies may be due to passage of time rather than the learner-centered approach. Randomization of students to a learner-centered course versus a traditional course may have yielded more valid results. However, this type of randomization is logistically difficult or

even impossible to undertake within an already approved curriculum. In addition, student buy-in is expected to be low as students may not wish to have their learning experience subjected to direct experimentation. In addition, a paired or repeated measures analysis would have been more robust. Because the questionnaires were anonymous, we were not able to perform repeated measures analysis. Possibly, some MSLQ domains that did not show a significant change with our current analysis using unpaired *t* tests would have been significant given a more robust analytical method. However, if identifiers were used on the questionnaires, the response rates would have been lower in this voluntary study.

SUMMARY

The learner-centered approach was effective in a third-year pharmacotherapy course in promoting certain domains of students' motivation and learning strategies. Specifically, the learner-centered approach seems to improve students' attitudes and intrinsic motivation, as well as critical-thinking strategy. In addition, students reported that their learning was enhanced by the learner-centered approach. Given the above data, the effect of the learner-centered approach may be further examined in other non-pharmacotherapy courses in the pharmacy curriculum. If these results are replicated, wider adoption of the learner-centered approach in the pharmacy curriculum may be justified.

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