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## Influence of course design on learning approaches and academic performance in physical therapy students

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### Abstract

This study investigated (1) changes in learning approaches and academic performance between courses designed according to lecture-based learning or problem-based learning, (2) the relationship between academic performance and learning approaches. 32 students participated in this study. Students' learning approaches were ascertained by the Approaches and Study Skills Inventory for Students. Summative results from each course indicated academic performance. The results showed that approximately 50% of students changed their learning approaches for different course designs. Furthermore, choice of learning approach influenced academic performance in a course designed according to problem-based learning but not in one designed according to lecture-based learning.

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### 1. Introduction

Problem-based learning (PBL) is a student-centered pedagogy pioneered in the field of medical education. The goal of PBL is to help students develop effective problem-solving skills for realistic problems. Students try to identify a problem and apply their previous knowledge, principles, and skills to solve it (Williams and Beattie, 2008). Students in a PBL-based course should demonstrate ability in self-directed learning, effective collaboration skills and high intrinsic motivation. It is believed that a PBL course design encourages students to adopt an active learning strategy, whereas students in a traditional lecture-based learning (LBL) course mostly participate as passive learners (Yuan et al., 2011; Oladipo et al., 2011).

The theory of student approaches to learning proposes that students will approach their studies differently depending on the perceived objectives of the course. The founders of this concept, Marton and Säljö (1976) proposed two approaches to learning: deep learning and surface learning. The types of learning approaches were later extended by Entwistle (1997) to include the strategic approach. Learning approaches are not personality traits or fixed learning styles, and students may use different learning approaches for different courses. In other words, it might be hoped that different course designs would improve the ways in which students approach their learning and studying to achieve the most efficient performance. It is assumed that a course design using the PBL principle may encourage the adoption of a deep learning strategy in physical therapy students, in contrast to a traditionally LBL-

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based course. It is further assumed that a deep learning approach will lead to better academic performance. The purposes of this study were to (1) examine changes in learning approaches when the same group of students attended a LBL-based course and a PBL-based course, and (2) investigate the relationship between academic performance and learning approaches in LBL- and PBL-based courses.

## **2. Methods**

### *2.1. Participants and study procedures*

This was a retrospective study. A convenient sample of 32 junior students attending the School of Physical Therapy at Taiwan National University volunteered to participate in this study. There were 14 male and 18 female students, with an average age of 21.68 years old. The students filled out two questionnaires on their learning approaches: one regarding their behavior during a PBL-based course, another on their behavior during a LBL-based course. The PBL-based course was a two credit-hour course named Problem-based Learning in Physical Therapy, in which students were divided in groups of eight. Each group studied four clinical scenarios following the PBL principle. The LBL-based course was named Functional Anatomy and its content included the musculoskeletal, neural, and cardiopulmonary systems. Summative course scores representing academic performance were obtained from the principal instructor of each course with the consent of students.

### *2.2. Questionnaires*

A Chinese translation of a modified and shortened version of the Approaches and Study Skills Inventory for Students (ASSIST) served as the questionnaire used to investigate learning approaches for this study (Entwistle & Ramsden, 1983; Chang, 2006). The ASSIST was modified with specific reference to the PBL-based course and the LBL-based course. The questionnaire comprises 24 questions, each scored between 1 (low) and 5 (high). The overall preferred learning approach for each course was calculated by adding up specific questions to obtain 3 subscores that represented each student's tendency to adopt either a deep, a strategic, or a surface approach to learning.

### *2.3. Statistical analysis*

All analyses were performed using SPSS version 20.0 for Windows (SPSS, Inc., Evanston, IL, USA). Descriptive statistics were used to present the data of ASSIST scores in the two courses. Differences between course scores among students adopting different learning approaches on each course were analyzed by one-way ANOVA. Independent-T testing was used to compare changes in ASSIST scores between the two courses. The relationship between course scores and ASSIST scores was determined by multiple linear regression analysis. The level of significance was set at 0.05 for all statistical tests.

## **3. Results and discussion**

All students completed both questionnaires and the course scores were obtained without missing data. The study results suggested that more than 60% of the physical therapy students investigated adopted a deep approach to learning for both a PBL-based course and a LBL-based course. The most common learning approach, as defined by the ASSIST subscores, was a deep approach, followed by strategic and then surface approaches for both courses (Table 1). There was no significant difference in academic performance among students adopting different approaches in either course (Table 2).

The results also supported the assumption that approximately 50% students may change their learning approaches depending on how a course is designed. When students were observed individually, we found 4 students who changed their learning approaches from deep to superficial, 9 students who changed their learning approaches from

superficial or strategic to deep, and 3 students who changed their learning approaches from deep to strategic while studying PBL designed course compared with LBL designed course (Table 3). There was a significant increase of ASSIST total score ( $p = 0.017$ ) and deep subscore ( $p = 0.018$ ) while taking the PBL course compared with the LBL course (Table 4). This supports our assumption that students tend to adopt a predominantly deep learning approach while studying in a course with a PBL design. This implies that a PBL-based course design might stimulate intrinsic interest more than a traditional course designed according to LBL. Similar results were reported by Castro-Sánchez et al. (Castro-Sánchez et al, 2012). They compared learning approaches between physical therapy students taught by PBL and those receiving conventional LBL on massage therapy, trauma physical therapy, and electrotherapy, hydrotherapy, and thermotherapy. The results showed that PBL facilitates the PBL students' ability of organization of course tasks in comparison to students received conventional teaching. These findings show that PBL-based course achieve the main concepts of deep learning that involves the critical analysis of new ideas, linking them to already known concepts and principles, and leads to understanding and long-term retention of concepts so that they can be used for problem solving in unfamiliar contexts.

The relationship between PBL-based course design and students' preference toward a deep learning approach was reflected in the correlation between the ASSIST subscore for those with a deep learning approach and the summative course scores. This study revealed that a higher ASSIST subscore and a deep approach correlated significantly with higher summative course scores for the PBL-based course but not for the LBL-based course ( $r = 0.56$ ,  $p = 0.031$ ) (Table 5). **Several studies have linked students' learning approaches to their learning outcomes, for example academic achievement or the Diagnostic Thinking Inventory as a measure of clinical reasoning skill. (Trigwell & Prosser, 1991; Provost & Bond, 1997; McParland, Noble & Livingston, 2004; Michele, 2005). In this study, the summative course score was selected as the indicator for academic performance which represented the main learning outcomes.**

#### 4. Conclusion

This study revealed that approximately 50% of physical therapy students changed their learning approaches when studying on courses structured according to different designs. No statistically significant difference was found between academic performance and learning approaches in either a PBL-based or a LBL-based course. A deep learning approach was related to academic performance in a PBL-based course but not in a LBL-based course. These findings demonstrated the potential influence that course design can have on students' learning approaches in physical therapy education.

#### 5. Tables

Table 1. The number and percentage of students demonstrating different learning approaches in each course

Course	Learning approach		
	Superficial	Deep	Strategic
Lecture-based Learning	6 (18.8%)	20 (62.5%)	6 (18.8%)
Problem-based Learning	7 (21.9%)	22 (68.8%)	3 (9.4%)

Table 2. Course scores (mean  $\pm$  standard deviations) among three learning approaches

Course	Learning approach			$p^\dagger$
	Superficial	Deep	Strategic	
Lecture-based Learning	81.67 $\pm$ 9.75	83.1 $\pm$ 8.47	86.83 $\pm$ 5.81	0.529
Problem-based Learning	80.57 $\pm$ 3.87	83.14 $\pm$ 3.80	84.33 $\pm$ 1.53	0.218

$\dagger$ : One-way ANOVA

Table 3. Number of students demonstrating changes in learning approaches between courses

Learning approach	Course		n	n
	Lecture-based Learning	Problem-based Learning		
No change	Superficial	Superficial	3	16
	Deep	Deep	13	
	Strategic	Strategic	0	
Change to worse	Deep	Superficial	4	4
	Strategic	Superficial	0	
Change to better	Superficial	Deep	3	12
	Strategic	Deep	6	
	Superficial	Strategic	0	
	Deep	Strategic	3	

Table 4. The changes of ASSIST scores between courses

ASSIST	Course		p†
	Lecture-based Learning	Problem-based Learning	
Total score	82.59±8.11	85.63±6.56	0.017*
Superficial subscore	26.19±4.88	26.75±3.87	0.479
Deep subscore	29.72±3.18	31.28±3.08	0.018*
Strategic subscore	26.69±3.89	27.59±3.12	0.161

†: Independent-t test

\*:  $p < 0.05$ 

Table 5. The relationship (r) between ASSIST subscores and course scores

Course	Learning approach		
	Superficial	Deep	Strategic
Lecture-based Learning	-0.303	-0.379	0.387
Problem-based Learning	0.107	0.560*	0.069

\*:  $p < 0.05$ 

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## References

- Castro-Sánchez, A. M., Aguilar-Ferrándiz, M. E., Matarán-Peñarrocha, G. A., Iglesias-Alonso, A. A., Fernández-Fernández, M. J., & Moreno-Lorenzo, C. C. (2012). Problem based learning approaches to the technology education of physical therapy students. *Medical Teacher*, 34, 29-45.
- Chang, C. I. (2006). *The study of the relationships between learning approaches and transfer of training in a state-run company* (Master Dissertation). National Chung Cheng University, Taiwan.
- Entwistle, N., & Ramsden, P. (1983). *Understanding student learning*. London: Croom Helm.
- Entwistle, N. (1987). Motivation to learn: Conceptions and practicalities. *British Journal of Educational Studies*, 25, 129-148.
- Marton, F., & Säljö, R. (1976). On qualitative differences in learning. I outcome and process. *British Journal of Educational Psychology*, 46, 4-11.
- McParland, M., Noble, L.M., & Livingston, G. (2004). The effectiveness of problem-based learning compared to traditional teaching in undergraduate psychiatry. *Medical Education*, 38, 859-867.
- Michele, G. (2005). Problem-based learning and learning approach: Is there a relationship? *Advances in Health Sciences Education*, 10, 315-326.
- Oladipo, S.E., Olowoye, B., & Adenaike, A. (2011). Comparative study of the effect of study technology mode of instruction and lecture method on the academic performance of university students in Nigeria: implication for academic staff capacity development. *Academic Leadership*, 9(1).

- Provost, S. C., & Bond, N. W. (1997). Approaches to studying and academic performance in a traditional psychology course. *Higher Education Research & Development*, 16, 309-320.
- Trigwell, K., & Prosser, M. (1991). Improving the quality of student learning: the influence of learning context and student approaches to learning on learning outcomes. *Higher Education*, 22, 251-266.
- Williams, S.M., & Beattie, H.J. (2008). Problem based learning in the clinical setting—a systematic review. *Nurse Education Today*, 28, 146–154.
- Yuan, H.B., Williams, B.A., Yin, L., Liu, M., Fang, J.B., & Pang, D. (2011). Nursing students' views on the effectiveness of problem-based learning. *Nurse Education Today*, 31, 577–581.