

# ***Implementing Blended Learning to Increase Information Capabilities and Self-Learning Ability***

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**Abstract:** A quasi-experimental pretest-posttest nonequivalent control group design was used. A total of 67 students participated in this study. The blended learning (BL) group received teaching through blended learning. The nursing information awareness and information capabilities and study motivation presented statistically significant differences in BL group after three consecutive semesters ( $p < 0.05$ ). The study motivation in the BL group were significantly higher than the Lecture-Based learning group ( $p < 0.05$ ). These findings showed that the blended learning is a meaningful, effective educational strategy.

## **1.Introduction**

The current trend to supplement Lecture-Based learning (LBL) with Internet technology is known as “blended learning (BL)“. It offers an active learning exercise and has been reported to have solid acceptance in higher education institutions [1,2]. It emphasizes the active participation of students and the need for instructor to play a facilitator role, creating effective learning environments that allow students to learn themselves [2, 3].

The flipped classroom (FC) play a crucial role in blended learning [4]. It is characterized by using Internet technology to move the didactic content to online materials, thus classroom time can be used for other learning activities to promote higher-order thinking, such as case-based learning (CBL) and problem-based learning (PBL) [5, 6]. CBL is an interactive strategy which uses authentic clinical cases or simulated cases to prepare students for clinical practice [7], and PBL makes students with a situation or scene with problems, enables the students to explore cooperatively in small groups applying previous knowledge [8]. It is quite well-founded to expect that mixing them together could help students to attain meaningful learning.

Up to now, most reported that engage students in the intervention process through only a single course, it is unclear whether the blended learning can make a difference in course group. Because course group supports longer interventions in an active educational environment, it is reasonable to expect that using course group could have a positive, cumulative impact [9]. Therefore, we conducted the study to investigate the effects of blended learning after three consecutive semesters.

## 2. Methods

### (1) Setting and Participants

This study used a quasi-experimental pretest-posttest nonequivalent control group design. This study was performed at Tianjin University of Traditional Chinese Medicine between spring 2017 and spring 2018. In spring 2017 and fall 2017, all 274 students enrolled in the evidence-based nursing and surgical nursing (147 at BL and 127 at LBL). In spring 2018, 81 students signed for the organ transplantation nursing (38 at BL and 43 at LBL).

### (2) Instruments

We used the Assessment of Nursing Information Awareness and Information Capabilities questionnaire, which includes two dimensions: information awareness (14 items) and information capabilities (11 items). Cronbach's alpha coefficient was 0.78 [10]. The Self-Regulated learning ability scale consisted of 30 items, which was developed for Nursing Undergraduates by Zhang [11]. This scale was divided into the following four dimensions: study motivation, ability of study self-managed, ability of study cooperation and information literacy. The Cronbach's alpha coefficient was 0.82. The Beck-Srivastava Stress Inventory was developed by Beck [12]. The scale that was used in this study was translated from the English version into Chinese by He [13]. The stress levels questionnaire is a 40-item, and it contains four different dimensions of learning stress, economic stress, interpersonal stress and clinical practice stress. The Chinese version questionnaire has the range of 0.82 to 0.90 for Cronbach's alpha for each subscale [13].

### (3) Intervention

The first stage was faculty preparation, including minilectures, online quizzes database and the design of PBL and CBL cases. A crucial component of the FC was the minilectures, lectured by the associate professor and instructor. In the implementation stage, instructor provided students in two groups with the same course syllabus and textbook. Prior to class, participants in BL group were required to view the minilectures and complete online quiz. Participants were also given both individual and group tasks. They had to share their thinking and give each other feedback by participating in the face-to-face discussion. During class, each group had a presentation. The length of presentation for each group was 5 minutes. Instructor put questions about the presentation and group members to answers. Then, the instructor conducted a targeted explanation. After class, we also made great use of the Blackboard Learning System (BB) and QQ to answer the remaining questions. LBL group received traditional teaching assisted by Power Point that contained the same content as the BL group.

### (4) Data Analysis

SPSS software version 20.0 was conducted for all statistical analyses. The general characteristics of participants were analyzed using descriptive statistics. Independent sample *t*-tests, Chi-squared tests and Mann-Whitney nonparametric U tests were used to compare the differences between two groups. Analysis of covariance (ANCOVA) was used to compare mean differences between the groups. Pre-tests and post-tests of data were compared using paired *t*-test. Two-sided *P* values were applied and the significance level was set at *P* value < 0.05.

## 3. Results

### (1) Participants and homogeneity test

A total of 67 students with a mean age of 20.93 years were included. The homogeneity tests showed that almost all the outcomes showed no significant difference, except the scores of organ transplantation nursing ( $p = 0.004$ ). Data not displayed.

### (2) Questionnaires score

Compared with baseline, the total scores of nursing information awareness and information

capabilities in BL group significantly improved after blended learning ( $p = 0.041$ ). The scores of study motivation domain significantly increased in the BL group ( $p = 0.039$ ). Compared with the LBL group, the post-test in study motivation in the BL group was significantly greater ( $p = 0.041$ ). The scores of learning stress, economic stress, interpersonal stress and total scores for BL group were higher after intervention, while clinical practice stress scores were lower than baseline. However, there was no significant difference (Table 1).

*Table 1 Changes of Information Awareness and Information Capabilities, Self-Regulated Learning Ability and Stress of the Participants*

Variable	Group	(Mean $\pm$ SD)		t-value	p-value <sup>a</sup>
		Pre-test	Post-test		
<b>Information Awareness and Information Capabilities</b>					
Information awareness	BL	55.27 $\pm$ 11.56	60.09 $\pm$ 8.48	-1.868	0.071
	LBL	58.09 $\pm$ 13.05	57.09 $\pm$ 8.43	0.424	0.674
	<i>P</i> value <sup>b</sup>	0.354	0.151		
Information capabilities	BL	33.45 $\pm$ 8.66	36.64 $\pm$ 7.06	-1.888	0.068
	LBL	34.15 $\pm$ 9.46	35.21 $\pm$ 6.26	-0.538	0.594
	<i>P</i> value <sup>b</sup>	0.756	0.383		
total scores	BL	88.73 $\pm$ 17.65	96.73 $\pm$ 12.23	-2.132	0.041
	LBL	92.24 $\pm$ 20.98	92.29 $\pm$ 12.29	-0.015	0.988
	<i>P</i> value <sup>b</sup>	0.462	0.144		
<b>Self-Regulated Learning Ability</b>					
Study motivation	BL	28.30 $\pm$ 4.56	29.88 $\pm$ 4.77	-2.156	0.039
	LBL	28.26 $\pm$ 5.32	27.74 $\pm$ 3.60	0.468	0.643
	<i>P</i> value <sup>b</sup>	0.975	0.041		
Ability of study self-managed	BL	38.24 $\pm$ 5.95	38.12 $\pm$ 6.59	0.110	0.913
	LBL	36.79 $\pm$ 7.47	38.41 $\pm$ 5.07	-1.020	0.315
	<i>P</i> value <sup>b</sup>	0.384	0.840		
Ability of study cooperation	BL	16.39 $\pm$ 2.52	17.06 $\pm$ 2.16	-1.278	0.210
	LBL	17.47 $\pm$ 2.81	16.65 $\pm$ 1.65	1.395	0.172
	<i>P</i> value <sup>b</sup>	0.104	0.381		
Information literacy	BL	19.91 $\pm$ 2.84	19.58 $\pm$ 3.21	0.473	0.640
	LBL	19.76 $\pm$ 3.99	19.44 $\pm$ 2.85	0.401	0.691
	<i>P</i> value <sup>b</sup>	0.144	0.857		
total scores	BL	102.85 $\pm$ 12.65	104.64 $\pm$ 14.56	-0.726	0.473
	LBL	102.29 $\pm$ 15.96	102.24 $\pm$ 10.08	0.018	0.986
	<i>P</i> value <sup>b</sup>	0.876	0.434		
<b>Stress levels</b>					
Learning stress	BL	59.33 $\pm$ 10.69	59.82 $\pm$ 11.53	-0.194	0.847
	LBL	57.50 $\pm$ 13.56	61.06 $\pm$ 8.67	-1.378	0.178
	<i>P</i> value <sup>b</sup>	0.542	0.620		
Economic stress	BL	10.27 $\pm$ 2.66	10.64 $\pm$ 3.03	-0.672	0.507
	LBL	10.00 $\pm$ 3.26	10.71 $\pm$ 2.80	-1.190	0.243
	<i>P</i> value <sup>b</sup>	0.709	0.923		
Interpersonal stress	BL	11.97 $\pm$ 2.94	12.42 $\pm$ 2.82	-0.636	0.530
	LBL	11.91 $\pm$ 3.77	13.15 $\pm$ 4.69	-1.331	0.192
	<i>P</i> value <sup>b</sup>	0.944	0.449		
Clinical practice stress	BL	29.88 $\pm$ 6.98	29.36 $\pm$ 7.63	0.296	0.769
	LBL	29.00 $\pm$ 8.55	30.47 $\pm$ 7.15	-0.779	0.442
	<i>P</i> value <sup>b</sup>	0.647	0.542		
total scores	BL	111.45 $\pm$ 17.65	112.24 $\pm$ 20.77	-0.175	0.863
	LBL	108.41 $\pm$ 25.34	115.38 $\pm$ 16.92	-1.336	0.191
	<i>P</i> value <sup>b</sup>	0.571	0.499		

<sup>a</sup> The paired-sample *t*-test; <sup>b</sup> The independent sample *t*-test; BL, Blended Learning; LBL, Lecture-Based learning.

#### 4. Discussion

Our study found that the total scores of information awareness and information capabilities in BL group significantly improved after the intervention of three consecutive semesters. Information awareness and information capabilities are critical skill that guarantees the nurse to access and search medical information exactly. The National Informatics Agenda recommended developing students' information literacy in nursing curricula [14]. Because in the blended learning, the use of PBL and CBL which students are expected to feel and experience actual clinical scene, stimulates students' interest and curiosity, thus encouraging active explore and solving questions. Furthermore, blended learning is learner-centered, treating each student as a self-regulated learner. Self-regulated learning outside the classroom and problem-solving by using Internet resources to access rich information to solve problems actively before group discussion [15]. What' more, students need to judge, screen, process and absorb information. After three semesters of continuous intervention, students gradually become accustomed to collecting information actively and solving problems through group discussion rather than by relying on instructors.

With respect to the self-regulated learning ability, our results showed greater improvement in motivation of the BL group in comparison to the LBL group. Our finding was consistent with the study conducted by Yoo [16], which used CBL strategy in a health communication course. The results showed a higher degree of learning motivation than that in control group. Another study [17] conducted in China, provided a medical physiology course for a semester. It found that most students (75.73% and 58.25%) held the opinion that blended learning improved their self-study skills and self-organization ability. In our study, blended learning was applied in three courses in a row facilitated the continuous exposure of students to the innovative teaching strategy and consolidated this effect.

We also found more negative comments after the course group learning, such as the improvement of learning stress, economic stress and interpersonal stress. But we failed to observe significant differences between the two groups. This finding is similar to literature indicating that online learning students were sometimes more frustrated than traditional lecture students and it didn't appear only from the technology [5]. Instructors will need to keep this in mind when considering this type of education measures.

Among the limitations of our study, let us pay attention to the lack of subjective assessment indicators, such as satisfaction. Another limitation is the small sample of participants, we suggest that future research can increase the sample size to compare the differences between the blended learning group and traditional lecture group. Finally, the students were recruited from a single university, which might have limited the generalizability of our report.

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