

The Influence of Blending Learning on Undergraduates' Critical Thinking Disposition: A Quasi Experimental Study

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ABSTRACT

Objective: To explore the influence of blending learning on the critical thinking disposition among undergraduates. **Methods:** Two undergraduate classes majoring in Applied Psychology with similar level of critical thinking disposition were selected as the research subjects. Class A (106 students) was the experimental class, and class B (131 students) was the control class. During the research period of one semester (four months), the following measures were implemented for the two classes. The control class studied Developmental Psychology under the conventional teaching methods and procedures, while the experimental class studied Developmental Psychology according to the requirements and procedures of blending learning. The two classes were investigated with Critical Thinking Disposition Inventory-Chinese Version (CTDI-CV) at the beginning and end of the course. **Results:** At the beginning of the course, the total scores of CTDI-CV of the two classes were (217.33 ± 14.90) and (218.31 ± 16.29) , respectively, with no significant difference ($P > 0.05$). At the end of the course, the total scores of CTDI-CV of the experimental class and the control class were (237.84 ± 17.53) and (224.22 ± 17.52) , respectively, and the difference was statistically significant ($P < 0.001$). **Conclusion:** Blending learning may have a positive effect in improving the critical thinking disposition in undergraduates.

1. Introduction

Critical thinking is a way of thinking in a reasonable, reflective and open mind, which can help people express clearly and accurately, reason logically and efficiently, and cultivate the spirit of speculation^[1]. From the perspective of constituent factors, critical thinking includes the skills and abilities of critical thinking, as well as the disposition of critical thinking, that is, the intrinsic motivation,

willingness, emotion and attitude of using critical thinking. Thinking skills or abilities are explicit, while critical thinking disposition is implicit attitude and tendency, which is also the psychological basis of critical thinking. Critical thinking helps people think independently and logically in the information society, identify information, make decisions quickly and correctly, and then innovate and start businesses^[2-3]. Therefore, as an indispensable part of college students' core quality, the cultivation of

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college students' critical thinking has always been the focus of higher education in the world^[4-6]. However, in the traditional teaching mode, critical thinking has not been well developed and cultivated, resulting in the low critical thinking ability of college students, which affects their academic performance and work performance^[7-9].

Blending learning is to combine the advantages of traditional learning methods and digital learning. It not only plays the leading role of teachers in guiding, inspiring and monitoring the teaching process, but also fully reflects the initiative, enthusiasm and creativity of students as the main body of learning. With the development of educational informatization, blending learning has become the development trend of teaching methods^[10-12]. Previous studies have shown that blending learning can better improve college students' team cooperation ability, oral expression ability and autonomous learning ability, and improve teacher-student interaction, knowledge sharing and academic performance^[10-12]. However, there are few domestic researches on whether blending learning can improve college students' critical thinking.

Developmental Psychology is a professional required course for undergraduates majoring in Applied Psychology, which is theoretical and experimental. It requires students to have strong theoretical analysis ability and higher empirical research ability. In the past, we used the traditional teaching mode, and students reflected that it was somewhat difficult to understand. Last year, we carried out blending learning for some students and found that compared with the traditional teaching mode, blending learning can better promote the learning effect, especially the students' critical thinking disposition.

2. Subjects and Methods

2.1 Subjects and Grouping

Two undergraduate classes majoring in Applied Psychology were selected. There were 106 students in class A [42 males, 64 females; age: 21-23 years old, average age: (22 ± 0.6) years old]; 131 students in class B [53 males, 78 females; age: 21-23 years old, average age: (22 ± 0.7) years old]. There were no statistically significant differences in average age and sex ratio between the two classes (all $P > 0.05$). Class A was the experimental class and class B was the control class.

2.2 Methods

2.2.1 Learning Methods

During the research period of one semester (four months), the following measures were adopted for the two

classes.

(1) Class A

The blending learning mode was adopted. The process included three basic links: students' online autonomous learning, meeting interactive class led by the teachers, and students' autonomous consolidation and improvement after meeting classes. The specific measures were as following: taking students as the center, teachers regularly assigned learning tasks to students through the online learning platform, and students conducted video learning, data search, homework, test, discussion and real-time communication through the online learning platform. Through the online learning platform, QQ and other online real-time communication tools, teachers could understand students' learning status and existing problems at any time, and regularly interact with students through meeting classes. In the meeting classes, teachers talked about a very small number of core concepts and basic theories. On this basis, the teachers focused on guiding the students to share their self-study experience, raise questions, state their views, explain the plan, encourage students to criticize each other and argue collectively, and finally express their views. In this process, students often asked or were asked "what is the main point of view of this part of the content", "what evidence is there", "how the author uses this evidence to support his own point of view", "do you think the author's argument is sufficient, please tell me your reasons", "what other points can you find about the above topic", "what are the similarities and differences between these views", "which view do you agree with, what different views do you have, and what are your reasons". Therefore, around the theme of learning, students gave their hypothesis, analysis, evaluation, inference, explanation, discussion, debate, etc. After full exploration and exchange, we could enhance students' professional knowledge, improve their critical thinking ability. After the completion of unit knowledge learning or meeting interactive learning, students could continuously consolidate and improve the learning effect through weekly test, chapter test, midterm and final examination, etc.

(2) Class B

The traditional teaching methods and procedures were adopted.

2.2.2 Evaluation Method

At the beginning and the end of the course, the two classes were investigated with Critical Thinking Disposition Inventory-Chinese version (CTDI-CV).

2.2.3 Evaluation Tool

Critical Thinking Disposition Inventory- Chinese Version (CTDI-CV).

It is revised by Peng et al. [13] according to California Critical Thinking Dispositions Inventory (CCTDI). There are 70 questions, divided into seven subscales: “seeking truth”, “open thinking”, “analytical ability”, “systematization ability”, “self-confidence of critical thinking”, “thirst for knowledge” and “cognitive maturity”. The Likert 6-point scoring method is used to score from 1 to 6 points corresponding to “very disagree” to “very agree”. The higher the score, the stronger the tendency of the subscale (item). The total score was 70-420. The evaluation rules are as following: the total score is 350-420, which indicates that the subject’s critical thinking disposition is comprehensively strong; the total score is 280-349, which indicates that the subject’s critical thinking disposition is relatively strong; the total score is 210-279, which indicates that the subject’s critical thinking disposition is in the range of contradiction; the total score is 70-209, which indicates that the subject’s thinking disposition is seriously opposed to critical thinking. The scores of each subscale ranged from 10 to 60. The evaluation rules of each subscale are as following: the score is higher than 50, indicating that the disposition is very strong; the score is 40-49, indicating that the disposition is relatively strong; the score is 30-39, indicating that the disposition is in a state of contradiction; the score is 10-29, indicating that the disposition is contrary to the requirements of critical thinking. In this study, the *Cronbach* coefficient of the

total scale is 0.84, and the *Cronbach* α coefficient of each subscale is 0.68-0.77.

2.3 Data Processing

Spss20.0 software is used to analyze the valid data. The main statistical methods are independent sample *t* test, chi square test and so on.

3. Results

3.1 Comparison of Scores of CTDI-CV between Two Classes before and after Course

As showed in table 1, there was no significant difference in the total score of CTDI-CV or scores of each subscale between two classes before course (all $P > 0.05$). However, following the course, the total score, scores of seeking truth, open thinking, analytical ability, self-confidence of critical thinking, thirst for knowledge and cognitive maturity were significantly higher in the experimental class compared with the control class (all $P > 0.05$), while there was a marginal significant difference in systematization ability between two classes ($P = .054$).

3.2 Comparison of the Percentages of Each Fraction Segment in CTDI-CV Total Score between Two Classes

As showed in table 2 and table 3 that before the course, there was no significant difference between the two classes in the percentages of each fraction segment of CTDI-CV total score ($\chi^2 = 0.201, P = 0.905$). However, following the course, there were significant differences between the two classes in the percentages of each fraction

Table 1. Comparison of scores for CTDI-CV between experimental class and control class (x ± SD)

Subscale	before intervention		<i>t</i>	<i>P</i>	after intervention		<i>t</i>	<i>P</i>
	experimental class	Control class			experimental class	control class		
seeking truth	37.34±3.52	37.73±4.06	-.601	.549	41.88±3.89	38.50±4.47	4.766	<.001
open mind	39.10±4.24	38.82±4.10	.399	.691	41.78±4.57	40.00±4.71	2.269	.025
analytical ability	32.67±3.04	33.12±3.62	-.795	.428	35.42±3.85	34.00±3.86	2.181	.031
systematization ability	29.01 ±2.38	29.28±3.52	-.525	.600	30.67±3.09	29.51±3.88	1.946	.054
Self-confidence of critical thinking	26.34±2.12	26.80±1.84	-1.362	.175	27.72±2.84	26.85±2.02	2.101	.037
thirst for knowledge	24.70±2.54	24.53±2.37	.422	.674	26.97±3.08	24.95±2.56	4.256	<.001
cognitive maturity	28.15±4.37	28.03±4.52	.163	.871	33.40±4.77	30.41±4.92	3.666	<.001
CTDI-CV total score	217.33±14.90	218.31±16.29	-.372	.710	237.84±17.53	224.22±17.52	4.666	<.001

Table 2. Comparison of the percentages of each fraction segment of CTDI-CV total score of the two classes before the course

class	Comprehensively strong (%)	Relatively strong (%)	Range of contradiction (%)	Serious opposition (%)	χ^2	<i>P</i>
experimental class	0(0)	5(4.7)	66(62.3)	35(33.0)	.201	.905
control class	0(0)	8(6.0)	81(60.9)	44(33.1)		

Table 3. Comparison of the percentages of each fraction segment of CTDI-CV total score of the two classes following the course

class	Comprehensively strong (%)	Relatively strong (%)	Range of contradiction (%)	Serious opposition (%)	χ^2	<i>P</i>
experimental class	0(0)	18(17.0)	65(61.3)	23(21.7)	6.756	.034
control class	0(0)	9(6.9)	83(63.4)	39(29.8)		

segment of CTDI-CV total score ($\chi^2 = 6.756, P = 0.034$). The percentages of relatively strong was higher in the experimental class compared with the control class, and the percentage of serious opposition in the experimental class was lower than that of the control class.

4. Discussions

Before the course, the total score of CTDI-CV and the scores of each subscales of the two classes were in the contradictory range, nearly 2/3 of the students were in the contradictory range, and nearly 1/3 of the students were in the serious antagonistic state, which was consistent with the results of previous studies [7-9], suggesting that the level of critical thinking disposition was not high, which was common among college students.

After the one-semester teaching experiment, the total score, scores of 6 subscales of CTDI-CV and the percentage of those who were in relatively strong in the experimental class were significantly higher than those before the self-experiment, and also significantly higher than those of the control class in the same experimental stage, which was consistent with the results of previous studies [14-15]. It was suggested that the application of blending learning in the study of Developmental Psychology could improve the critical thinking disposition of college students.

After the one-semester teaching experiment, the CTDI-CV scores of the control class and the percentages of students who were relatively strong and who were in range of contradiction were also significantly higher than those before the teaching experiment. Apart from the interference factors such as the natural maturity of critical

thinking disposition and the practice effect of scale, it was suggested that the conventional teaching method might also improve the critical thinking disposition of college students to a certain extent, and it needed further study to explore the effectiveness and mechanism.

After the one-semester teaching experiment, the CTDI-CV scores of the experimental class and the percentage of the students with high CTDI-CV score increased significantly, but the CTDI-CV total score of the experimental class was still in the contradictory range, and the percentage of the students with high CTDI-CV total score was still not high, which was consistent with the results of the previous study [14-15], suggesting that the effect of one-semester blending learning on improving the students' critical thinking was limited. As an advanced form of human thinking, the development of critical thinking needs a good social atmosphere, abundant family living conditions, highly developed intelligence and perfect personality, systematic education, rich knowledge reserve and other factors [16-21]. One-semester blending learning can only make students initially master the skills of critical thinking and form the habit of using critical thinking. We also need to create a good social, family and school education atmosphere, and carry out long-term and systematic thinking training, so as to improve college students' critical thinking ability in essence.

The shortcomings of this study are as following: ① Using the comparison model of the two groups before and after the experiment, we can understand the immediate and short-term effect of the experimental measures, but can not understand the long-term effect of the experimental measures. In the future, we can use the follow-up

randomized controlled experiment model to improve this deficiency. ② The scores of CTDI-CV are used as the only indexes to evaluate the critical thinking disposition. If we can use a variety of evaluation methods, or add other quantitative evaluation indicators, such as the online and offline learning performance of research subjects, we can have a more comprehensive understanding of the role of experiment measures.

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