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An Empirical Study on the Influence of PBL Teaching Model on College Students' Critical Thinking Ability

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Abstract

The critical thinking ability is an indispensable ability of contemporary college students, and the PBL teaching model abandons the shortcomings of traditional teaching methods, which is more suitable for the development trend of university curriculum teaching reform in China. In order to understand the influence of PBL teaching mode on college students' critical thinking ability, the research is carried out into English critical thinking dispositions and skills of the second grade English education majors in Jiangxi Province, via questionnaires, interview, English tests and the PBL teaching experiment. And the results indicate that the PBL teaching model can improve such three English critical thinking temperament level as analysis, openness and fair, and it can significantly improve the two English critical thinking skills of analysis and interpretation, but do not improve the English scores of the students significantly. The purpose of this study is to enrich the research into the influence of PBL teaching model on English critical thinking ability, and so as to provide some reference for improving the quality of English teaching in colleges and universities.

Keywords: English major, critical thinking, PBL teaching model, critical thinking temperament, critical thinking skills

1. Introduction

Critical thinking refers to the comprehensive analysis of information, the high level of cognitive ability, and the accuracy, authority or value of various statements and suggestions, so as to make scientific and accurate reasoning and judgment (Liu, 2012). In the mass data era of information explosion, the cultivation of students' creative thinking ability has become an important task in our education. And the core of creative thinking is critical thinking, so the cultivation of critical thinking is of great importance. In recent years, critical thinking has been a hot issue in the education research at home and abroad, and the development of students' critical thinking ability has attracted extensive attention of many experts and scholars, a majority of which focus on the current situation of critical thinking ability of college students, scale development, training methods, difference between arts and science majors, and academic achievement, and the relationship between critical thinking ability and reading and writing, the influence of effectiveness of language teaching mode on critical thinking ability, and achieved certain results (Facione, 1990; Paul, 1998, 2003; Vaughn, 2005; Wen, 2010; Li, 2011; Sun, 2015; Wang, 2017).

The PBL teaching model (Problem-Based Learning), which is problem-based learning, is an important mode of teaching organization. Barrows first put forward PBL teaching model in 1969, and it has been widely used in teaching. The theoretical basis of PBL teaching model is constructivist teaching theory. This model takes the students as the center, provides students with the real problem situation, asks students to actively participate in the analysis of the problem, identify the relevant facts, and construct new knowledge, solve problems in small teams, so as to improve their ability of critical thinking, which is also known as the best container of thinking (Nelson, 2008; Zhi, 2009; Chen, 2013). The PBL teaching model can be divided into five major steps: question-analysis-problem solving-results reporting-reflection and evaluation (Song, 2015). The PBL teaching mode emphasizes students' autonomous construction of knowledge, putting forward hypotheses and finding solutions, which is a way of learning that is conducive to students' autonomous learning and initiative development, and at the same time, it helps to cultivate students' spirit of cooperation and innovation (Ren, 2011). The PBL model advocates that students study, discussion and cooperate to solve problems through

self-study, to cultivate students' autonomous learning ability, develop students' critical thinking ability, which bears the feature of autonomy, openness and cooperation with the model (Lei, 2011).

However, these studies mainly focused on the research of training mode of non English majors' critical thinking ability, and took English major students as the research object, combining the research of PBL teaching mode and students' critical thinking together choosing English majors as subjects is particularly scarce, so it should become the focus and direction of English teaching reform of the university in the future.

2. Research Method

2.1 Subjects of Study

The subjects are English major sophomores from two classes, 35 students in the experimental class, 39 students in the control class, who are randomly selected from a second level university in Jiangxi province.

2.2 Research Tools

The data are collected through questionnaire survey, test paper, experiment and interview. The questionnaires include the critical thinking temperament questionnaire and the critical thinking skill questionnaire. The critical thinking temperament questionnaire adopts Wen and others' adapted questionnaires, including 8 dimensions, namely, analysis, truth-seeking, curiosity, self-confidence, tenacity, openness, maturity and justice, which contains 54 questions. The reliability of the questionnaire was 0.810. The critical thinking skill questionnaire is based on the questionnaire of Chen's, which consists of 28 questions, 6 dimensions, and a scale of 0.913. In the critical thinking questionnaire survey, the scores of each dimension are between 10-60 points, 40 points or more means positive, and 30 points or less means negative. The questionnaire employs the form of Likert's five level scale. The test paper includes two CET4 test papers in December 2015 and June 2016.

The interview subjects are 10 students, 5 out of each class, who are randomly selected from each class. Each student's interview time is 5 minutes. The main purpose is to explain the questionnaire reply.

2.3 Data Collection and Processing

The experiment includes the pre-test, experiment and post-test. 1) Pre-test: The language test, questionnaire survey and interview are conducted on the subjects; 2) Experiment: One class was chosen as the experimental group, and the other one as the control group. And the experimental group adopted the PBL teaching mode, in which the experiment lasted for 12 weeks, while the control group took the traditional teaching mode; 3) Post-test: The language test, questionnaire survey and interview are conducted on the subjects. The questionnaires and test papers were released in the second week and sixteenth weeks in the autumn of 2016, and the actual effective questionnaires were 74, including 67 girls and 4 boys. The language test data and the result data of the questionnaire were entered into SPSS 22 for descriptive statistical analysis, paired sample T test analysis and independent sample T test analysis.

3. Research Results and Analysis

3.1 Comparison Between the Experimental Group and the Control Group in the Pre-test

The independent samples T test is carried out on the control group and the experimental group as to the critical thinking temperament, critical thinking skills and CET4 score (Table 1), and the statistical results shows that in each dimension of critical thinking temperament and critical thinking skills and CET4 achievement, the significance value was greater than .05, that means there is no significant difference between the two groups in the aspects of critical thinking temperament, critical thinking skills and CET4 score. Thus, the level of two classes is rather similar as to that critical thinking temperament, critical thinking skills, CET4 score, which means the two classes are suitable to carry out the PBL teaching mode in the subsequent experiment.

Table 1. Statistical table of pre-test independent sample T test of two groups

		Mean (CG)	Mean (EG)	t	p
Critical thinking	Analysis	37.56	38.19	.532	.861
temperament	Curiosity	46.32	45.67	.798	.213
	Tenacity	33.59	34.12	.759	.352
	Confidence	38.78	38.96	.907	.709
	Truth-seeking	35.69	35.32	.732	.603

	Maturity	37.61	38.19	.891	.818
	Openness	38.67	37.53	.953	.296
	Justice	39.02	38.67	1.012	.301
Critical thinking skills	Interpretation	37.89	38.28	.679	.461
English score	Analysis	38.57	38.79	-.047	.879
	Evaluation	35.67	35.83	.083	.843
	Reasoning	33.86	34.59	-1.237	.142
	Interpretation	39.19	39.73	.331	.429
	Self-regulation	37.56	37.49	-.179	.553
	CET4 score	456	452	1.532	.459

CG= *the Control Group;* EG= *the Experimental Group.*

3.2 Comparison of the Pre-test and Post-test of the Control Group

By conducting the paired samples T test of the control group before and after the experiment, the statistical results (Table 2) demonstrated that the significant values of the control group in all dimensions of critical thinking temperament and critical thinking skills and CET4 scores are all larger than .05, which means that there is no significant difference. The control group does not participate in the PBL teaching mode experiment, but only accepts the conventional classroom teaching mode. It is obvious that the traditional classroom teaching model can not effectively improve students' critical thinking ability.

Table 2. Statistical table of paired sample t test of control group

		Mean (Pre-test)	Mean (Post-test)	t	p
Critical thinking	Analysis	37.56	38.59	.079	.961
temperament	Curiosity	46.32	46.56	.036	.547
	Tenacity	33.59	33.89	.967	.209
	Confidence	38.78	38.56	.856	.312
	Truth-seeking	35.69	36.12	.373	.135
	Maturity	37.61	37.57	.678	.096
	Openness	38.67	38.53	.095	.063
	Justice	39.02	39.78	1.171	.057
Critical thinking skills	Interpretation	37.89	38.96	.481	.579
	Analysis	38.57	39.03	.529	.583
	Evaluation	35.67	35.99	.647	.476
	Reasoning	33.86	33.78	.779	.321
	Interpretation	39.19	39.86	.753	.428
	Self-regulation	37.56	37.79	.684	.067
English score	CET4 score	456	461	1.126	.251

3.3 Comparison of the Pre-test and Post-test of the Experimental Group

Through the paired T test for the experimental group, the statistical results (Table 3) showed that: in the eight dimensions of critical thinking temperament of the experimental group, the significant value of curiosity, tenacity, self-confidence, truth-seeking and maturity is greater than .05, and there is no significant difference between the two groups. In the analysis, the values of openness and justice are less than .05, which means that there are significant differences. The experimental group was taught by the PBL teaching model, and the three critical thinking temperaments are significantly promoted. In the experimental group, the significant values of the

interpretation, evaluation, reasoning and self-regulation of critical thinking skills are all greater than .05, and there is no significant difference between the two groups. The significant values of the analysis and interpretation are less than .05, and there are significant differences in the two groups. It can be seen that the level of two critical thinking skills of the experimental group has improved after the PBL teaching model experiment. However, there is no significant difference between pre-test and post-test of the experimental group in CET4 score, which shows that the experiment has not improved the English performance.

Table 3. Statistical table of paired sample t test of the experimental group

		Mean (Pre-test)	Mean (Post-test)	t	p
Critical thinking	Analysis	38.19	40.29	.721	.013
temperament	Curiosity	45.67	45.71	.803	.591
	Tenacity	34.12	35.62	.762	.057
	Confidence	38.96	41.27	.813	.066
	Truth-seeking	35.32	38.69	.765	.079
	Maturity	38.19	40.35	.957	.068
	Openness	37.53	40.06	.969	.013
	Justice	38.67	43.67	1.023	.025
Critical thinking	Interpretation	38.28	40.96	-.8.132	.053
skills	Analysis	38.79	42.67	-8.576	.003
	Evaluation	35.83	38.67	-5.643	.075
	Reasoning	34.59	35.03	-4.796	.391
	Interpretation	39.73	42.56	-5.852	.034
	Self-regulation	37.49	40.67	-3.679	.067
English score	CET4 score	452	470	1.023	.347

3.4 Posttest Comparison Between the Experimental Group and the Control Group

Independent samples T test was performed on the post test data of the control group and the experimental group, the statistical results (Table 4) reveals that among the eight dimensions of the temperament of critical thinking, significant value of curiosity, tenacity, confidence, truth-seeking, and mature are higher than .05, which means that the two groups have no significant difference. And the significant values of analysis, openness and justice are less than .05, and there are significant differences. In the experimental group, the significance of interpretation, evaluation, reasoning and self-regulation of critical thinking skills are more than .05, and there is no significant difference between the two groups. The significant values of the analysis and interpretation are less than .05, and there are significant differences. After the PBL teaching model experiment, as for the experimental group, the level of three critical thinking temperament of analyzing, openness and justice, and two critical thinking skills of analysis and explanation have been significantly improved. The significant value of CET4 scores in the experimental group and the control group are greater than .05, which shows that there is no significant difference in the two groups.

Table 4. Statistical table of post-test independent sample t test of two groups

		Mean (CG)	Mean (EG)	t	p
Critical thinking	Analysis	38.59	40.29	2.163	.012
temperament	Curiosity	46.56	45.71	1.569	.059
Critical thinking	Tenacity	33.89	35.62	1.678	.061
skills	Confidence	38.56	41.27	2.032	.055
	Truth-seeking	36.12	38.69	2.169	.073

	Maturity	37.57	40.35	2.013	.056
	Openness	38.53	40.06	2.165	.008
	Justice	39.78	43.67	3.561	.041
	Interpretation	38.96	40.96	2.231	.081
	Analysis	39.03	42.67	2.159	.042
	Evaluation	35.99	38.67	2.013	.065
	Reasoning	33.78	35.03	.415	.683
	Interpretation	39.86	42.56	2.561	.041
	Self-regulation	37.79	40.67	.579	.057
English score	CET4 score	461	470	1.029	.092

4. Discussion

4.1 The PBL Teaching Model Improves the Students' Critical Thinking Ability to a Certain Extent

The traditional English teaching attaches much attention to the rote of knowledge and ignores the cultivation of students' critical thinking ability. However, the PBL teaching model considers students as the center, provides a relaxing platform for the cultivation of students' critical thinking ability, by defining the problem, analyzing materials, demonstrating programs, presenting results, self-assessment, peer assessment, in which students use the critical thinking skills of interpretation, analysis, explanation and evaluation (Chen, 2013). In this study students have made significant progress in the critical thinking temperament of analyzing, openness, justice and in the critical thinking skills of analyzing and explaining, but other aspects of the critical thinking temperament and skills have not been significantly enhanced. Thus it can be concluded that the PBL teaching model can improve students' critical thinking ability to a certain extent, and not comprehensively. The reason may be that the teaching experiment time is short, and critical thinking ability is a subjective factor, so it is difficult to improve it completely in a short time.

4.2 PBL Teaching Model Can Not Effectively Improve Students' English Performance

There is no significant difference in English scores between the experimental group and the control group before and after the experiment, and there is no significant difference between the experimental group before and after the experiment. This study fails to prove that the PBL teaching mode can effectively improve students' English achievement. But the result of Chen's (2013) found that there are differences, and compared with the traditional teaching, the PBL teaching model can cultivate students' autonomous learning ability, and has a significant effect on improving second language acquisition ability, so that students achieve the ability development in the construction of new knowledge. The reasons for different results exist in many aspects, for example, the test cycle is short, the experimental objects are different, and experimental operation and experimental variables control are difficult. Furthermore, English achievement is very complicated, affected by many factors, so it is difficult to simply capture the situation of two variables through the short-term experiments to achieve the improvement of English achievement.

5. Conclusion

In the present mass data era, it is easy for college students to become slaves of information. What's worse, the college English education often ignores the cultivation of students' critical thinking. The college English education should cultivate college students to be good critical thinkers. This study aims to explore the critical thinking ability of college students through English PBL teaching model and the experimental results show that compared with traditional teaching, PBL teaching model is problem centered, pays attention to team learning, sets ability as the goal, and promotes students' critical thinking and can contribute to ability development and the cultivation of students' autonomous learning ability, analyzing ability, the ability to solve problems, but it has no significant effect on improving the English achievement. It may be difficult to control the experimental variables because of the short period of the experiment. Therefore, follow-up research should lengthen the training time of PBL teaching model, control experimental variables, explore a more reasonable PBL English teaching model, and further study the relationship between PBL teaching model and college students' critical thinking ability.

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