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Research on the effectiveness of flipped classroom model in enhancing critical thinking ability of non-English major students in higher education

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Abstract: *This study combined questionnaires, interviews, and classroom observations to empirically investigate the critical thinking dispositions of 87 non-English major students from the 2024 cohort at a university in Sichuan Province under the flipped classroom model. Utilizing the critical thinking ability test developed by Professor Mei-Chi Peng, I conducted on students' critical thinking ability using a scale, combined with relevant data obtained from specific interviews and teaching observations. Through analysis, it can be seen that the flipped classroom teaching model can promote students' personalized learning, enhance their ability to think and solve problems, and thus cultivate their critical thinking.*

Keywords: *higher education; Flipped classroom; Non-English major students; critical thinking*

1. Introduction

The Outline of the National Medium - and Long-Term Education Reform and Development Plan (2010-2020) emphasizes that "one of the goals of China's education reform and development is to cultivate students' innovative spirit of daring to explore and practical ability to solve problems." Therefore, the core and primary goal of China's higher education is to cultivate innovative college students with critical thinking ability. In English teaching, both internal input and external output processing are inseparable from thinking ability. University foreign language courses have the unique feature of cultivating students' thinking and flexibility. Through foreign language learning, not only are students learning a new language, but also learning a new way of thinking, which can promote the development of critical awareness, mastery of new perspectives for understanding the world, and construction of new expression systems. According to relevant literature research. In relevant literature research, it was found that in 1993, the United States Congress released the "2000 Goals: American Education Act", which clearly listed the educational goals of universities: to significantly increase the proportion of graduates with high critical thinking skills, effective communication skills, and problem-solving abilities. As a result, the cultivation of critical thinking has become an important teaching goal in American universities, and the learning and training of critical thinking have been integrated into subject curricula.

In China, in 1999, in the "Several Opinions on the Reform of Undergraduate Education in Foreign Language Majors", researchers emphasized the importance of cultivating the thinking and innovation abilities of English major students; However, the research by Wen Qiufang and Zhou Yan (2006) still indicates that "the critical thinking ability of foreign language majors is significantly lower than that of students from other majors when they graduate from university." Huang Yuanshen (2010) also explored the "critical thinking absence" phenomenon among English majors in 1998. Huang Yuanshen (2010) pointed out that scholars in the field of foreign language education in China have found that English learners in China have a "critical thinking absence," and the lack of critical thinking ability mainly refers to the lack of critical thinking skills.it has been found that due to the influence of traditional teaching concepts, Non-english in China have insufficient critical thinking ability and weak language application and innovation abilities. However, previous studies have mainly explored critical thinking skills, with less attention paid to critical thinking tendencies. A deeper understanding of students' thinking tendency characteristics is more helpful in exploring effective paths for cultivating students' critical thinking abilities. In the flipped classroom teaching model, learner centeredness is achieved by providing learners with diverse resources such as micro videos before class, enabling them to participate in activities with higher requirements and stronger thinking. Learners can set their own pace and freely choose when and where to study. They actively participate in knowledge construction and create more learning opportunities through in-depth exploration of the topic. Teachers observe students' learning progress and

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related issues at any time, provide immediate feedback based on different students' needs, and evaluate and assist learners' learning.

2. Explanation of related concepts

(1)Flipped Classroom

Flipped classroom refers to a teaching format where students preview materials before class and engage in interactive discussions during class. Before class, teachers provide learners with basic knowledge and concepts —such as textbooks, lecture notes, audio-visual materials, or self-recorded micro-videos—through the internet or learning platforms for self-study, allowing students to learn according to their own needs and repeat learning independently [1]. The time in class is used for learner-centered teaching, such as discussing learning tasks assigned by teachers, conducting thematic exploration activities, helping students understand, restructure, and transform knowledge through group cooperative learning and deep interaction with teachers, enabling students to acquire the content to be taught in the course more deeply and fully, and triggering high-level thinking such as application, analysis, and creation.

(2)Critical thinking

There is no consensus in the academic community on the definition of critical thinking. Currently, the most influential ones are Ennis and Ge according to Lazer's definition (Yuan Pinghua, 2010) .the former believes that "critical thinking is a rational thinking" that emphasizes individual self reflection and scientific judgment. The latter proposes that 'critical thinking is a synthesis of attitudes, knowledge, and skills', emphasizing that this thinking cannot be separated from' questioning 'and' effective reasoning ', and that reasoning abstract and general knowledge is a manifestation of this ability[2]. Based on the above points, this study believes that critical thinking focuses on the process of thinking how to think, questioning and analysis are essential prerequisites for thinking, and making scientific judgments about the subject is the result of thinking. It is a constructive and practical thinking, and a reasonable reflective thinking.

3. Research Design

(1)Research content

This article mainly explores the impact of flipped classroom teaching mode on enhancing the critical thinking ability of non-English major students. To achieve the purpose of this study, the following research questions are emphasized: to what extent does the flipped classroom teaching model enhance the critical thinking ability of non-English major students? Secondly, what are the attitudes of non-English major students towards the flipped classroom teaching model?

(2)Research Object and Method

This study selected 87 students from two classes of 2024 non-English majors at a university in Sichuan Province as research subjects. Before the experiment, both classes of students took the national college entrance examination English exam, with an average English score of 80 in each class. The experimental class has 43 students, including 30 boys and 13 girls; s; the control class, including 34 boys and 10 girls. The age, educational background, and other factors of students in the experimental and control classes are basically the same. The pre-test data of critical thinking of the first two classes (as shown in Table 1) and the scores of the national college entrance examination English test show that there is no significant difference in their critical thinking ability and English proficiency, so they can be regarded as homogeneous research subjects. However, as non-English majors, the overall English proficiency of the students in both classes is low, and the English learning environment and atmosphere are lacking. Additionally, due to the influence of traditional learning methods, the students in both classes lack initiative and confidence in English learning, and their language application abilities are not high.

In the quasi-experimental research stage, the experimental class adopts the flipped classroom teaching mode, utilizing the WeChat platform. Teachers released teaching micro courses and a small number of assessments prior to class to facilitate knowledge transfer. During class, targeted teaching methods are used to clarify and address the key and difficult points previously studied by students, thus promoting the internalization of knowledge. The control class adopts the traditional second language acquisition teaching mode with consistent teaching materials, instructors, teaching schedules, and assessment

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methods. After 16 weeks, SPSS16.0 was used to conduct independent sample t-test and paired sample t-test on the post-test results of both groups for statistical analysis. Additionally, qualitative analysis was conducted on the online communication texts and classroom observation records on the WeChat platform to complement the quantitative research. [3]. 87 valid survey questionnaires were distributed and collected, with a recovery rate of 100%.

(3)Research tools

Based on the theoretical foundation of critical thinking ability, the academic community has extensively researched how to measure critical thinking abilities. The California Critical Thinking Disposition Inventory (CCTDI), developed by Facione et al. (2000), is widely recognized internationally for its reliability and validity (Paul, 1983; cited in Luo Qingxu, 2002). To make this instrument applicable to Chinese students, Taiwanese scholars Peng Meici et al. (2004) adapted CCTDI into the "Critical Thinking Disposition Inventory Chinese Version" (CTDI-CV), tailoring it to local cultural contexts through multiple revisions and tests from a cultural equivalence perspective. The overall reliability coefficient of the CTDI-CV reached 0.90 (with the usual threshold being 0.70). In this experiment, the CTDI-CV scale was used to conduct both pre-tests and post-tests on students' critical thinking abilities. The CTDI-CV scale is used to assess students' critical thinking ability, with a total of 70 items, including 30 positive items and 40 negative items. The scale consists of seven characteristic subscales: seeking truth, analytical ability, systematic ability, confidence in critical thinking, and cognitive maturity.

(4)Teaching Practice

To implement flipped classroom teaching, it is possible to build a WeChat platform based on the course "Comprehensive English (1)." The platform's design is aligned with the professional knowledge and skills outlined in the "Comprehensive English (1)" syllabus. t provides timely and varied language teaching resources tailored to students' cognitive levels, and sets up scaffolded learning tasks to accommodate different English proficiency levels. Diversified formative assessment methods were also adopted to evaluate students' learning progress. The platform consists of seven course units, each divided into four sub chapters: pre class tasks, overall and detailed learning, consolidation tasks, and extended learning, gradually guiding students to engage in self-directed learning before and after class. In response to the teaching difficulties of each unit, the teacher designed and produced corresponding micro-lesson videos and supplementary materials, implementing a 14-week flipped classroom teaching practice based on micro lessons in the experimental class[4-5].

In the classroom, teachers spend a brief period clarifying the content that students have learned before class and focus on key and challenging concepts to test the effectiveness of students' pre-class learning, while promoting knowledge internalization and the application of English skills. After outlining the task, the teacher encourages group collaboration among students. Following this, through guided demonstration, teachers and students collaboratively summarize the main themes of the lesson. To further engage students, teachers employ both online and offline learning guidance and interaction, stimulating curiosity by creating conflict and questioning incentive strategies, and used pictures, words, and symbolic prizes to reward incentive strategies, improving students' learning success experience.

After class, students summarize the key points of the lesson and refine their English expression skills. They are encouraged to reflect on what they have learned in class and actively apply their critical thinking skills to solve problems and challenges encountered during the learning process. Throughout the flipped classroom experience, teachers employ student self-assessments, peer evaluations, and group feedback—to guide students in verifying their hypotheses and reasoning with sufficient evidence. This process also encourages them to critically assess both their own and their peers' views with an open mind, ultimately enhancing the objectivity of the evaluation process.

4. Experimental analysis

Table 1: Independent sample t-test for CT pre-test and post test in experimental and control groups

	Experimental Class			Control Class				
	N	Mean	Std.Deviation	N	Mean	Std.Deviation	T	Sig.(2-tailed)
Pre	44	181.60	15.06	44	174.60	10.58	.888	.424
Post	43	228.20	10.06	43	023.20	12.19	3.53	.008

This study used the Chinese version of the CCTDI-CV scale to conduct pre - and post- tests on critical thinking tendencies of students in both the experimental and control groups. SPSS was utilized to perform independent sample t-tests on the test results of both groups, and the corresponding data is presented in

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Table 1.

As shown in Table 1, the independent sample t-test of the pre-test for two classes revealed no significant difference in the pre-test scores of critical thinking tendency between the experimental group (181.60 ± 15.06) and the control group (174.60 ± 10.85), with (86)=888 and p>0.10, fulfilling the experimental conditions.. This lack of difference is expected, as the two groups were parallel classes that had not yet received any critical thinking training. However, the total score of critical thinking tendency for both classes of students was below 210, indicating a generally low or negative critical thinking ability. After the intervention, the post-test results demonstrated a significant improvement in the experimental group's critical thinking scores (228.20 ± 10.06) compared to the control group (203.20 ± 12.19), with t(86)=3.53, p<0.05. The independent sample t-test after two classes showed that there was a significant difference in critical thinking scores between the experimental group (228.20 ± 10.06) and the control group (203.20+12.19), with t (86)=3.53, p<0.05. The average score of critical thinking tendency of the experimental group students was>210, indicating a development from negative critical thinking ability to a moderate level, while the critical thinking ability of the control group students also increased, but still showed a negative trend. The following study examines the changes in critical thinking ability of students in two classes from seven dimensions, as shown in Table 2.

As shown by the paired sample t-test results in Table 2, the critical thinking ability of students in the experimental group increased from below 30 points to above 30 points across five dimensions. The only exceptions were the dimensions of open-mindedness and cognitive maturity, which showed moderate improvement in the post-test data. This suggests that the overall critical thinking ability of students in the experimental group developed from a negative to a moderate level. Notably, significant changes were observed in the dimensions of open-mindedness and self-confidence, while the other five dimensions showed more modest improvements. Among the seven dimensions, significant changes were noted in the open-mindedness and self-confidence categories, while the remaining five dimensions did not exhibit statistically significant shifts.

Table 2: Sample testing of CT pre-test and post test in experimental and control groups

Class		pre	post	t	p
finding the truth	1	24.00 ± 6.56	35.80 ± 3.11	-3.45	.025
	2	27.40 ± 4.15	30.20 ± 4.76	-2.25	.084
Analytical ability	1	20.20 ± 7.56	32.80 ± 2.17	-1.40	.265
	2	27.00 ± 6.40	28.80 ± 3.35	-7.89	.001
Systematic capability	1	23.80 ± 3.90	30.40 ± 4.98	-3.07	.046
	2	21.60 ± 5.22	29.20 ± 6.65	-1.33	.060
Self confidence ability	1	24.40 ± 5.13	32.00 ± 6.16	-2.85	.050
	2	23.80 ± 3.89	27.40 ± 5.22	-2.63	.033
cognitive sophistication	1	31.00 ± 5.57	39.20 ± 4.76	-2.33	.080
	2	29.20 ± 2.17	33.00 ± 2.16	-4.07	.052
CT	1	181.60 ± 15.61	225.00 ± 10.68	-5.067	.007
	2	176.50 ± 10.35	206.40 ± 12.14	-11.36	.000

According to Table 2 analysis, during the process of teaching non-English major students on WeChat platform, discussion records focused on course content, current events, trending topics, and daily learning activities, reflecting shifts in learners' emotions and attitudes. The course-related discussions and inquiries were primarily about difficulties and confusions that emerged during the comprehension of teaching videos and tasks, such as understanding the content of the micro teaching videos or translating certain sentence structures from the videos[6-12]. Speeches related to current events are mostly excerpted from original ecological articles by students or generated with the help of online dictionaries, with high vocabulary difficulty. Speeches related to daily activities are compared in sentence structures, vocabulary, and content, colloquial, rich, diverse, and moderately difficult. Learners have a high interest and enthusiasm for learning. This is partly attributed to the online learning environment supported by information technology creating a safer learning atmosphere, which is conducive to improving the comprehensive English skills of experimental class students. On the other hand, due to the age and era characteristics of vocational college students, post-00s college students prefer to use virtual platforms to convey information, express their personal voices and opinions.

In addition to conducting a questionnaire survey on non-English major students, this study also included interviews and in-class performance observations. During the interviews, most students expressed a preference for this new teaching model. Under this model, group cooperative learning

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encourages students to ask questions, analyze, and solve problems, which helps deepen their understanding of the course material. It also allows them to critically evaluate and debate others' viewpoints. They can reflect on their own learning, which is very helpful for cultivating their imagination and creativity[13-16]. Furthermore, classroom observations revealed that the experimental class had a more dynamic atmosphere, with students engaging in more meaningful exchanges and idea-sharing, which led to deeper and more thoughtful questions.

5. Conclusion

The "Critical Thinking Ability Measurement Scale" (CTDI-CV), adapted from the original CCTDI scale to suit the cultural and academic context of Chinese university students, has proven to be both scientific and practical, yielding positive results in the context of domestic higher education. However, the critical thinking abilities of non-English major students in China remain relatively underdeveloped. While emphasizing the training of students' application abilities, university education should also pay attention to the cultivation of critical thinking. Only with more targeted teaching tasks and a more reasonable curriculum system can students have more opportunities for critical thinking skills training, and maintain a sustained interest, sufficient curiosity, and strong spirit of exploration in language learning, thereby improving their overall thinking ability and cultivating and stimulating their internal motivation for foreign language learning.

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