

Developing a Chinese Language Course Integrating Deep Learning Theory and OBE: Promote Critical Thinking Skill for Undergraduate Students in Guangzhou, China

Na Li¹ & Jiraporn Chano¹

¹Maharakham University, Thailand

Correspondence: Na Li, Maharakham University, Thailand. E-mail: lin@nfu.edu.cn

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Abstract

This study aims to develop and evaluate a Chinese language course designed to enhance college students' critical thinking skills through the integration of deep learning theory and Outcome-Based Education (OBE). The research specifically addresses two questions: (1) What are the characteristics of a Chinese language course that integrates Deep Learning Theory and OBE? (2) What are the effects of this course on promoting critical thinking skills among undergraduate students?

The study employs a quasi-experimental design, involving 120 undergraduate students divided into a control group and a test group from Nan fang College, Guangzhou, China. The control group received conventional teaching methods, while the test group participated in the newly developed course. Data were collected through pre-tests and post-tests using California critical thinking skills test (Chinese version), as well as semi-structured interviews.

Results indicate a significant improvement in the critical thinking skills of students in the test group compared to the control group. The test group showed higher mean scores and lower standard deviations in post-test results, demonstrating the effectiveness of the course in enhancing critical thinking abilities. Qualitative data from interviews supported these findings, highlighting increased student engagement and deeper understanding of course materials. The findings suggest that this integrated approach can be effectively implemented in other educational contexts to achieve similar outcomes.

Keywords: deep learning theory, outcome-based education, critical thinking skill, Chinese language course, flipped classroom

1. Introduction

In an era of rapid globalization and the increasing complexity of information landscapes, the need for critical thinking skills in higher education has never been more pressing. These skills are essential for analyzing, evaluating, and synthesizing information, which are crucial for academic success and effective citizenship in a globalized world (Facione, 2011; UNESCO, 2015). In China, the push for critical thinking is driven by educational reforms aimed at fostering innovation and creativity. However, traditional teaching methods, characterized by rote memorization and exam-oriented learning, have been criticized for their inadequacy in developing these essential skills (Zhang & Watkins, 2011).

To address these challenges, educators and policymakers are advocating for the adoption of innovative teaching approaches that go beyond surface-level learning. A student-centered teaching model, emphasizing collaborative learning, independent learning, project-based learning, and peer assessment, has been shown to significantly enhance student engagement and deeper understanding of course material. These strategies align with active learning principles, fostering critical thinking and problem-solving skills (Prince, 2004; Hmelo-Silver, Duncan, & Chinn, 2007).

These approaches emphasize meaningful learning experiences that encourage students to connect new knowledge with existing cognitive frameworks, thereby fostering a deeper and more enduring understanding of the material (Hattie & Donoghue, 2016; Biggs & Tang, 2011).

This study aims to develop and evaluate a Chinese language course that integrates deep learning theory with

Outcome-Based Education (OBE) through the implementation of a flipped classroom model. By implementing this integrated approach, the study seeks to provide empirical evidence on its effectiveness in enhancing critical thinking skills and offer insights for broader application in educational contexts.

2. Literature Review

2.1 Critical Thinking Skills

The concept of Critical Thinking can be traced back to the philosopher Socratic questioning, while Critical Thinking skills were defined and classified in detail by Peter Facione in his report "Critical Thinking: What It Is and Why It Matters" (1990). He classified Critical Thinking skills into a series of specific abilities, including interpretation, analysis, reasoning, evaluation, explanation, and self-regulation. These skills form the core of Critical Thinking, which aims to help individuals deal with complex problems and situations through a systematic approach (Facione, 2011). Ennis emphasized that Critical Thinking is a fundamental goal of contemporary education and asserted that Critical Thinking is essential to prepare students to deal with complex real-world problems (Ennis, 2018).

2.2 Deep Learning Theory

Marton and Säljö (1976) proposed the deep learning theory to distinguish between surface learning and deep learning. Surface learning involves superficial exposure to materials, while deep learning requires a thorough understanding and the ability to apply knowledge in different contexts. Hattie and Donoghue (2016) further elaborated on the principles of deep learning, emphasizing the importance of intrinsic motivation, active participation, and the ability to connect new information to prior knowledge.

Recent advances in educational technology have also influenced the application of deep learning in education, discussing how digital platforms can promote student engagement through interactive content and collaborative tools, thereby promoting a deeper learning experience (Kember, 2020).

Deep learning entered the Chinese education field in 2005 (Zhou, 2017). Li and He (2005) first proposed the concept, describing it as the critical learning of new ideas and knowledge based on the learner's cognitive ability and prior knowledge. Over the years, there has been a focus on deep learning and teaching, emphasizing the consistency between teaching and learning (Guo, 2015). Combining learners' deep learning with teachers' deep learning is a major trend.

Deep learning is understood as understanding-based learning, emphasizing the application of students' critical thinking. Learners critically engage with new ideas and facts, integrate them into their cognitive structure, and activate prior knowledge. They connect old and new knowledge and transfer what they have learned to new real-life situations to make decisions and solve problems (Li, 2020).

Anderson and Krathwohl explored how deep learning strategies can be effectively integrated into course design to improve students' critical thinking skills (Anderson & Krathwohl, 2019).

2.3 Outcome-based Education (OBE)

Outcome-based education (OBE) is an educational theory that focuses on the outcomes of the learning process rather than the process itself (Spady, 1994). It aims to ensure that all students achieve a predetermined set of competencies. OBE has been shown to be effective in a variety of educational settings because it provides clear goals and aligns teaching methods and assessments with these goals (Harden, Crosby, & Davis, 1999). Institutions should invest in professional development (PD) programs based on strong educational frameworks such as OBE, and educational policies should support the implementation of OBE in professional training to improve the overall quality of education. Integrating the OBE framework into the PD program for professional teachers can increase trainees' learning motivation and satisfaction (Wang, 2024). Recent research has further expanded the applicability of OBE in the digital age, highlighting the importance of aligning learning outcomes with the needs of the 21st century workforce (Harden et al., 2021).

2.4 Flipped Classroom Model

The flipped classroom model is a teaching strategy that flips the traditional learning environment by delivering content outside of class and using class time for interactive activities (Bishop & Verleger, 2013). This approach has gained popularity in recent years for its potential to improve student engagement and learning outcomes (Chen, Wang, Kinshuk, & Chen, 2014). The flipped classroom model significantly improves learning outcomes by promoting active learning and student participation (Jensen, Kummer, & Godoy, 2015). It allows for more personalized instruction and creates opportunities for collaborative learning and problem solving (Lo & Hew, 2017).

2.4.1 Research on Flipped Classrooms in Language Education

In language education, the model promotes more interactive and communicative activities, which can significantly improve English learners' engagement and language skills. This is essential for developing critical thinking skills (Hung, 2015). Compared with traditional methods, flipped classroom methods in language courses can improve student satisfaction and better learning outcomes (Chen, Wang, Kinshuk, & Chen, 2014). Lee and Martin (2022) explored how to integrate advanced technologies into flipped classrooms to further improve student engagement and learning outcomes in language education. The China Panorama course combines flipped classroom technology, motivational communication, and task-based teaching models. The course also explores the impact of factors such as age, gender, nationality, and length of stay in China on students' psychological and learning adaptability (Fan, 2024).

2.4.2 Integrating Deep Learning and Outcome-based Education in Flipped Classrooms

Deep learning principles can guide the design of pre-class activities to ensure that students meaningfully engage with the learning materials (Hattie & Donoghue, 2016), while outcome-based education provides a clear structure for the course, guiding classroom activities and assessments to meet specific learning outcomes (Spady, 1994). Kim et al. (2020) showed that flipped classrooms combined with collaborative learning strategies can improve student performance and satisfaction. The model emphasizes the role of digital tools in enhancing student interactions and learning outcomes, especially when these tools are effectively combined (Jensen et al., 2019).

In summary, this study will integrate deep learning theory with outcome-based education (OBE), which can create a more engaging and efficient learning environment in the flipped classroom and promote critical thinking.

3. Method

This study aims to develop and evaluate a Chinese language course for undergraduate students that integrates deep learning theory and outcome.

3.1 Research Questions

This study aims to develop a Chinese language course for undergraduate Chinese students that integrates deep learning theory and outcome-based education (OBE) to promote critical thinking skills. The research addresses the following questions:

- 1) What are the characteristics of Chinese Language Course Integrating Deep Learning Theory and OBE?
- 2) What are the effects of a Chinese language course that integrates Deep Learning Theory and OBE on promoting critical thinking skills for undergraduate Chinese students?

3.2 Research Design

This study is divided into two phases:

Phase1 Developing course. Phase2 Evaluate course includes three stages: critical thinking skills pre-test, implementation course, and post-test.

Employs a mixed-methods research design, combining quantitative and qualitative approaches to provide a comprehensive evaluation of the instructional intervention. The quantitative component involves a quasi-experimental design with pre-test and post-test measures, while the qualitative component includes semi-structured interviews with students and teachers.

3.3 Participants

The participants of this study are 120 undergraduate freshmen enrolled in non-Chinese Language and Literature majors at Nan fang College, Guangzhou, China. The participants are divided into two groups: an experimental group (n=60) and a control group (n=60). The experimental group participates in the Chinese language course designed with deep learning, OBE, and flipped classroom principles, while the control group receives traditional lecture-based instruction. Additionally, three experienced Chinese language course teachers from Nan fang College participate in the study.

3.4 Research Instruments

3.4.1 Questionnaire

This study decided to use the "California Critical Thinking Skills Test (Chinese Version)" to assess the critical thinking skills of non-Chinese major students at Guangzhou Nan fang College.

California Critical Thinking Skills Test (Chinese Version) assessed the reliability of the scale through the following methods:

Internal Consistency Reliability: By calculating the consistency coefficients (such as Cronbach's α) between the items in the scale. The study results showed that the Cronbach's α coefficient of the scale was above 0.80, indicating that the scale has high internal consistency.

3.4.2 Interview

Semi-structured interviews are conducted with three Chinese language course teachers to gain insights into their perceptions of the students' critical thinking skills and the effectiveness of the instructional approach. The interview outline includes open-ended questions focused on the six dimensions of critical thinking skills and the teachers' observations and experiences with the course implementation.

3.5 Data Collection Procedures

3.5.1 Quantitative Data Collection

Pre-test: California Critical Thinking Skills Test (Chinese Version) is administered to both the experimental and control groups at the beginning of the semester to establish baseline critical thinking skill levels.

Implementing course: The experimental group participates in the Chinese language course designed with deep learning, OBE, and flipped classroom principles. The course includes pre-class self-study, in-class collaborative learning, discussions, and post-class peer evaluations using new media platforms. The control group receives traditional lecture-based instruction.

Post-test: At the end of the semester, California Critical Thinking Skills Test (Chinese Version) is administered again to both groups to measure changes in critical thinking skills.

3.5.2 Qualitative Data Collection

Semi-structured interviews with the three Chinese language course teachers are conducted at the end of the semester. The interviews are recorded and transcribed for analysis. The teachers are asked to reflect on the students' engagement, the effectiveness of the instructional strategies, and any observed improvements in critical thinking skills.

3.6 Data Analysis

3.6.1 Quantitative Data Analysis

Quantitative data from the pre-test and post-test questionnaires are analyzed using descriptive statistics to summarize the mean scores and standard deviations. A paired sample t-test is conducted to compare the pre-test and post-test scores within each group, and an independent sample t-test is used to compare the post-test scores between the experimental and control groups. The level of significance is set at $p < 0.05$.

3.6.2 Qualitative Data Analysis

The qualitative data from the semi-structured interviews are analyzed using thematic analysis. The transcriptions are coded to identify emerging themes related to the six dimensions of critical thinking skills, the effectiveness of the instructional approach, and the teachers' observations. The themes are then triangulated with the quantitative findings to provide a comprehensive understanding of the impact of the instructional intervention.

3.7 Summary of the Research Design

The integration of deep learning theory and OBE within a flipped classroom framework is evaluated through a comprehensive mixed-methods approach. The study design ensures that both quantitative and qualitative data are collected and analyzed to understand the effectiveness of implementation course in enhancing students' critical thinking skills.

4. Results

The primary objective of this study was to develop a course based on deep learning theory and outcome-based education (OBE) to enhance critical thinking skills among Chinese college students. The study successfully demonstrated the effectiveness of this integrated approach in fostering critical thinking abilities across six dimensions: interpretation, analysis, inference, evaluation, explanation, and self-regulation.

Phase 1: Developing course

The Taba Model (Hilda Taba, 1962) is an inductive approach to curriculum development that emphasizes gradually building a curriculum based on the actual experiences of teachers and students. In developing a

Chinese Language Course based on deep learning theory and Outcome-Based Education (OBE), the course outline is formulated with key elements including principles, objectives, content, Learning Management, and Assessment.

The course integrates deep learning theory with OBE, adopts a flipped classroom model, combines pre-class independent learning, classroom inquiry-based learning, and collaborative learning, and uses new media platforms for peer evaluation and feedback in after-class activities.

Table 1. Course topic to promote college students' critical thinking skill

Unit	Topic	Duration
1	Introduction: "Humanities" in Life	2 hours
2	Traditional Chinese Philosophy	2 hours
3	Traditional Chinese food, clothing, housing and transportation	2 hours
4	Chinese traditional etiquette system	2 hours
5	Traditional Chinese Art	2 hours
6	New Singing of Ancient Poetry	2 hours
7	Special Topic on Chinese Culture	2 hours
8	Chinese Witchcraft Culture and Ancient Mythology	2 hours
9	The Biography of Xiang Yu and the Tragedy of China and the West	2 hours
10	Shan Hai Jing and Ancient Chinese Novels	2 hours
11	Special Topic on Comparative Studies of Chinese and Western Culture	2 hours
12	Chinese Culture Group Show	2 hours

The course consisted of 12 topics, with 2 hours of instruction per week, totaling 24 hours, to pilot the course and analyze the results.

The researchers analyzed the relationship between the study units in the draft course on promoting critical thinking skill six dimension, as shown in Table2.

Table 2. The draft Chinese language course based on deep learning theory and OBE

Learning units /content/learning standards	Objective	Techniques and methods for organizing learning
Introduction: "Humanities" in Life	Developing critical thinking skill Dimension - Interpretation - explain -Evaluation	-OBE -Guided Learning (Describe the learning outcomes) -Mini-task -case analysis -Inquiry-based learning
Traditional Chinese Philosophy	Developing critical thinking skill Dimension - Interpretation - Analysis -Explanation	-Multimedia Resources -Online Platforms Inquiry -Self-Directed Learning -Problem-Based Learning -Case analysis -Debate activities
Special Topic on Chinese Culture	Developing critical thinking skill Dimension -Inference -Analysis -Explanation	-OBE -Multimedia Resources -Online Platforms -Self-Directed Learning -Case analysis -Classroom Discussion -Teacher Assessment -Post-Class Reflection
New Singing of Ancient Poetry	Developing critical thinking skill Dimension -Analysis -Evaluation -Explanation -Self-Regulation	-Project-Based Learning -Role-Playing -Collaborative Learning -Case analysis -Peer Assessment -Teacher Assessment
Shan Hai Jing and Ancient Chinese Novels	Developing critical thinking skill Dimension - Interpretation -Evaluation -Explanation	-OBE -Online platform - Cooperative learning --Post-Class Reflection
Chinese Culture Group Show	Developing critical thinking skill Dimension - Interpretation -Analysis -Inference -Evaluation -Explanation -Self-Regulation	-OBE -Project-Based Learning -Role-Playing -deep learning -Collaborative Learning -Case analysis -Peer Assessment -Teacher Assessment -Post-Class Reflection

Table 3. Results of Course Suitability Evaluation by Experts

Indicator	M	S.D.	Appropriate level
1. Principles	4.6	0.74	High Applicability Level
2. Objectives	4.8	0.91	High Applicability Level
3. Structure Content	4.5	0.74	High Applicability Level
4. Learning Management	4.7	0.60	High Applicability Level
5. Assessment	4.4	0.86	Moderate to High Applicability Level
Total average	4.60	0.77	High Applicability Level

The evaluation results indicate a high level of applicability and suitability of the course design across all indicators. Experts rated the principles, objectives, structure, and learning management of the course highly,

suggesting that the course is well-aligned with educational standards and effectively designed to meet learning outcomes. The slightly lower score in the assessment category points to the need for ongoing refinement in evaluation methods to ensure they comprehensively measure student learning and critical thinking development.

Phase 2 Implementing course

The results of using this course to promote college students' critical thinking skill are as follows.

California Critical Thinking Skills Test (Chinese Version) was administered to both the test and control groups before and after the intervention. The pre-test and post-test scores were analyzed to measure the impact of the implementation course on students' critical thinking skills.

4.1 Quantitative Analysis

Table 4. Pre-test: Comparison of Critical Thinking Skills (Control Group vs. Test Group)

Test	N	M	S.D.	t-value	p
Test group	60	22.40	13.928	.524	.603
Control group	60	20.40	13.064		

Note. **p<.05.

The pre-test results indicated that both groups had similar levels of critical thinking skills before the intervention. The mean score for the experimental group was 16.46 (SD =2.25), and the mean score for the control group was 23.8(SD = 2.56). A t-test confirmed that there was no significant difference between the groups at the pre-test stage (t = 11.96, p > 0.05).

Table 5. Post-test: Comparison of Critical Thinking Skills (Control Group vs. Test Group)

Test	N	M	S.D.	t-value	p
Test group	60	70.80	19.928	2.956	.005
Control group	60	52.40	23.854		

Note. **p<.05.

According to the results of Table 5, The mean score of the test group (M = 70.80) is higher than that of the control group (M = 52.40), indicating that the course is effective in improving critical thinking skills.

The t value is 2.956, and the corresponding p value is .005 (<.05), indicating that the difference is statistically significant.

The results show that there is a significant difference in the critical thinking skills test results between the test group and the control group, and the Chinese language course based on deep learning theory and OBE is effective in improving students' critical thinking skills.

4.2 Qualitative Analysis

Semi-structured interviews with the three Chinese language course teachers provided additional insights into the effectiveness of the instructional approach. The teachers observed significant improvements in students' engagement, critical thinking, and overall academic performance. The thematic analysis of the interviews revealed the following key themes:

Enhanced student engagement, teachers reported that the use of flipped Regarding classroom activities and collaborative learning strategies increased student participation and motivation. Students were more actively involved in discussions and more willing to express their viewpoints.

"The students were more engaged and participated actively in discussions. They seemed more motivated to learn and were more confident in expressing their ideas."

(Lecturer 1, March 5, 2024: interview)

Regarding critical thinking skills, all three teachers noted substantial improvements in the students' ability to analyze, evaluate, and synthesize information. The integration of deep learning and OBE principles fostered a deeper understanding of the course material.

"I observed a significant improvement in the students' critical thinking skills. They were better at analyzing and evaluating information, and their ability to synthesize ideas improved markedly."

(Lecturer 2 March 16, 2024: interview)

Regarding positive perceptions of the instructional approach, the teachers had positive perceptions of the integrated instructional approach, noting its effectiveness in promoting critical thinking and fostering a supportive learning environment.

"The instructional approach was highly effective. It created a supportive learning environment and helped students develop essential critical thinking skills."

(Lecturer 3, March 3, 2024: interview)

4.3 Quantitative and Qualitative Integration

The integration of quantitative and qualitative findings provides a comprehensive understanding of the impact of the instructional intervention. The significant improvement in the post-test scores of the experimental group, coupled with the positive feedback from teachers, highlights the effectiveness of integrating deep learning theory and OBE within a flipped classroom framework to enhance critical thinking skills.

The study's results underscore the importance of adopting innovative instructional strategies to promote critical thinking in higher education. The findings suggest that such approaches can lead to significant improvements in students' analytical, evaluative, and self-regulatory skills, thereby preparing them for the complex demands of the modern academic and professional landscapes.

The results of this study demonstrate that the integration of deep learning theory and OBE within a flipped classroom framework significantly enhances students' critical thinking skills. Both quantitative and qualitative data support the effectiveness of this instructional approach, highlighting its potential for broader application in higher education settings.

5. Discussion

This study confirms the efficacy of integrating deep learning theory with OBE in a flipped classroom model to enhance critical thinking skills in higher education.

The post-test results demonstrated a substantial increase in the mean scores for the experimental group, while the control group, which received traditional instruction, showed only a slight improvement. This indicates the effectiveness of the integrated instructional approach in fostering critical thinking skills.

5.1 Enhancement of Critical Thinking Skills

The improvement in critical thinking skills among students in the experimental group reflects the effectiveness of active learning strategies, particularly within the flipped classroom model (Kim et al., 2020). This model, emphasizing pre-class preparation and interactive in-class activities, fosters a deeper understanding and practical application of knowledge (Jensen et al., 2019). The integration of deep learning theory further enhances this process by encouraging students to connect new information with existing knowledge, leading to more profound learning outcomes (Anderson & Krathwohl, 2019).

5.2 Outcome-Based Education (OBE) and Learning Outcomes

The application of OBE principles in course design ensures that instructional activities and assessments are aligned with clearly defined learning outcomes, enhancing student motivation and engagement (Harden et al., 2021). This alignment is crucial for fostering critical thinking skills, as it provides students with a clear understanding of their learning objectives.

5.3 Flipped Classroom Model and Student Engagement

The flipped classroom model's impact on student engagement was evident, with the experimental group showing greater improvement in critical thinking skills than the control group. The use of new media platforms for peer evaluations and discussions further supported this engagement, providing continuous learning and interaction opportunities (Lee & Martin, 2022).

5.4 Comparison with Traditional Teaching Methods

The traditional lecture-based instruction did not result in a significant improvement in critical thinking skills, consistent with criticisms that such methods focus on rote memorization rather than developing higher-order thinking skills (Biggs & Watkins, 2001). The challenges associated with implementing the flipped classroom model include preparation time, increased workload, and the need for access to technology (Jensen et al., 2019).

This study has several limitations that should be addressed in future research. The sample size was relatively small, and the study was conducted in a single institution, which may limit the generalizability of the findings. Future research should include larger and more diverse samples to validate the results. Additionally, longitudinal

studies are needed to examine the long-term impact of the instructional intervention on students' critical thinking skills.

6. Conclusion

This study demonstrates that integrating deep learning theory and OBE within a flipped classroom model significantly enhances critical thinking skills among undergraduate students. The findings support the adoption of innovative instructional strategies in higher education to foster critical thinking.

While the integrated instructional approach has demonstrated effectiveness, its implementation poses several challenges. Future research should include larger and more diverse samples to validate the findings and examine the long-term impact of the instructional approach. Longitudinal studies could provide insights into how the integration of deep learning theory and OBE within a flipped classroom framework influences students' critical thinking skills over time.

Expanding the Scope: Future studies should explore the application of the integrated instructional approach in different educational contexts and disciplines to assess its generalizability and effectiveness.

Longitudinal Studies: Conducting longitudinal studies to examine the long-term impact of the instructional intervention on students' critical thinking skills and academic performance.

Exploring Technological Enhancements: Investigating the use of advanced technologies, such as adaptive learning systems and artificial intelligence, to support and enhance the flipped classroom model.

The integration of deep learning theory and OBE within a flipped classroom provides a robust approach to enhance critical thinking skills in higher education. This study's findings highlight the effectiveness of this instructional approach in promoting higher-order thinking skills and engaging students in meaningful learning activities. By adopting innovative instructional strategies and leveraging technology, educators can create a supportive learning environment that fosters critical thinking and prepares students for the complex demands of the modern academic and professional landscapes.

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Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Obtained.

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Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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