Interdisciplinary Academic and Research Journal, 6 (6), November-December 2026
Old ISSN 2774-0374: New ISSN 2985-2749
Website: https://so03.tci-thaijo.org/index.php/IARJ/index
Article ID: e298234

Effect of Inquiry-Based Learning on Critical Thinking Ability in an Ancient Chinese Literature Course

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Received 09/02/2026 Revised 12/02/2026 Accepted 17/03/2026

Abstract

Background and Aims: Amid China's educational reforms, the traditional teaching of Ancient Chinese Literature often emphasizes memorization over critical thinking. Although Inquiry-Based Learning (IBL) has proven effective in STEM, its application in humanities disciplines—particularly within vocational colleges—remains underexplored. This study examined Inquiry-Based Learning's (IBL) effectiveness by: 1) comparing students' critical thinking pre- and post-intervention, 2) evaluating whether outcomes met a 70% mastery criterion, and 3) assessing student satisfaction with IBL. The course context (History of Chinese Ancient Literature) is explicitly foregrounded to provide immediate disciplinary grounding.

Methodology: This quasi-experimental study used a one-group pretest-posttest design. The participants were 50 second-year Chinese major students from Yunnan Economics Trade and Foreign Affairs College. The students' critical thinking ability was assessed before and after the intervention using a Critical Thinking Ability Assessment Form based on Facione's (2015) framework. Quantitative data were analyzed using the arithmetic mean, standard deviation, paired-sample t-test, one-sample t-test, and Cohen's d effect size.

Results: 1) Post-intervention critical thinking scores ($M = 70.08$, $SD = 4.53$) were significantly higher than pre-intervention scores ($M = 61.84$, $SD = 2.48$), $t(49) = 13.13$, $p < .001$, with a large effect size (Cohen's $d = 1.86$). 2) Posttest scores significantly exceeded the 70% criterion (67.2), $t(49) = 4.495$, $p < .001$. 3) Overall satisfaction was very high ($M = 4.56$, $SD = 0.13$). Among the six critical thinking dimensions, Inference and Self-Regulation showed the most substantial gains, while Interpretation exhibited the smallest improvement.

Conclusion: Inquiry-based learning effectively enhances critical thinking in vocational college students studying Ancient Chinese Literature, thereby filling a pedagogical gap in humanities education within the Chinese vocational context.

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Keywords: Inquiry-Based Learning (IBL); Critical Thinking Ability; Student Satisfaction; Ancient Chinese Literature; Vocational Education

Introduction

Since critical thinking supports students' abilities for analysis, evaluation, and problem-solving, it continues to be a primary goal of higher education (Facione, 2015). Critical thinking is very important for Chinese language majors in academic writing, literary interpretation, and textual criticism. However, rote memorization and the dissemination of preexisting knowledge have often been the focus of traditional pedagogical approaches in courses like History of Chinese Ancient Literature. These methods could impede autonomous research and limit chances for more in-depth analytical involvement (Wang & Quan, 2021). These drawbacks highlight the need for innovative teaching strategies that systematically develop higher-order thinking abilities.

IBL, or inquiry-based learning, presents a viable substitute. IBL, a constructivist-theorized student-centered instructional style, encourages knowledge building via cooperative problem-solving, reflective discussion, and active inquiry (Hmelo-Silver et al., 2007). IBL strongly coincides with the developmental goals of critical thinking by reorienting the educational focus from passive receipt to active intellectual engagement. Despite strong evidence of IBL's efficacy in STEM fields, little is known about its implementation and quantifiable effects in the humanities, especially in Chinese vocational higher education (Pedaste et al., 2015).

By claiming that Ancient Chinese Literature is particularly well-suited to inquiry-based learning, this study aims to close this gap. Classical Chinese literature poses intrinsic interpretive obstacles, such as issues of textual authenticity, authorial intention, and historical contextualization, in contrast to STEM fields, which generally use hypothesis testing to explore universal laws. Instead of being solved formulaically, these problems require cultural sensitivity, the appraisal of many types of evidence, and hermeneutic reasoning. Therefore, without rigorous theoretical adaptation, results from STEM-based IBL contexts cannot be directly applied to humanities subjects.

Additionally, there are unique educational conflicts faced by students in vocational colleges. National curriculum standards require them to engage with classical literary traditions, even though their training frequently stresses practical competencies. By converting abstract cultural knowledge into chances for active analysis, interpretation, and the development of transferable critical skills, inquiry-based learning may offer a useful link between these goals.

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Objectives

1. To examine the effect of the inquiry-based learning method on students' critical thinking ability by comparing pretest and posttest scores.

2. To determine whether students'critical thinking ability after the intervention meets or exceeds the 70% criterion, and to discuss the pedagogical rationale for adopting this threshold in the context of continuous critical thinking development.

3. To investigate students' satisfaction with the inquiry-based learning method and explore its relationship with learning outcomes.

Literature Review

The literature review in this study is related to inquiry-based learning methods and students' critical thinking in the course of Chinese ancient literary history, second-year Chinese majors at Yunnan Economics Trade and Foreign Affairs College. This chapter covers the following topics:

1. The Course of Chinese Ancient Literary History: Structure and Challenges

As a core Chinese university course, the History of Ancient Chinese Literature teaches literary development from Pre-Qin to Ming-Qing. While traditional lecture-focused delivery may cause issues, the subject's rich content—debates, diverse texts, deep culture—is ideal for inquiry-based learning. Its inherent problems, like interpreting characters or poetic evolution, offer authentic questions for student investigation.

2. Theoretical Foundations of Inquiry-Based Learning

In this study, the inquiry-based learning method was synthesized based on reviewing Pedaste's (2015), Hmelo-Silver's (2019), and Scanlon's (2018) frameworks for inquiry phases.

According to the above three scholars, the inquiry-based learning teaching steps are:

Step 1: Problem Introduction and Inquiry

Step 2: Problem Analysis and Hypothesis

Step 3: Inquiry Implementation and Data

Step 4: Data Analysis and Conclusion

Step 5: Result Communication and Reflective Evaluation

However, constructivist theory—while widely endorsed—faces inherent tensions when applied to highly structured classical texts. Unlike open scientific investigations, ancient literary works are fixed; students cannot "discover" new texts but must learn to construct nuanced interpretations within historical constraints. This study acknowledges that IBL in this context does not mean unfettered discovery but guided, evidence-based hermeneutic inquiry. Recent scholarship (Li & Chen, 2022; Zhang, 2024) has begun to address these tensions, emphasizing the need to adapt IBL phases to the interpretive nature of the humanities.

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3. Critical Thinking Ability: Definition, Components, and Measurement

In this study, the theoretical framework of critical thinking was synthesized based on reviewing Paul & Elder's (2019) developmental stages, Hitchcock's (2018) core requirements, and Dewey's (1910) reflective sequence.

According to the above three scholars, the researchers made the following comprehensive analysis of the Students' Critical Thinking teaching components:

Component 1: Interpretation – Understanding and Clarifying Literary Meaning

Component 2: Analysis – Deconstructing Argumentative & Narrative Structures

Component 3: Evaluation – Assessing Credibility and Critical Reception

Component4: Inference – Drawing Well-Supported Historical-Literary Conclusions

Component 5: Explanation – Articulating and Justifying Literary Arguments

Component 6: Self-Regulation – Monitoring and Improving Literary-Thinking Processes

To explicitly connect these components to the specific nuances of Ancient Chinese Literature, this study operationalized each component through discipline-grounded tasks. For example, Inference required students to deduce authorial stance from fragmented historical records; Self-Regulation was assessed through reflective journals on how they revised interpretations after peer feedback. Such operationalization ensures that the measurement of critical thinking is not generic but authentically embedded in literary inquiry.

4. Student Satisfaction in Educational Contexts

Student satisfaction, a key indicator of educational quality, reflects perceptions of relevance, challenge, support, and fairness. In IBL, it is measured by evaluating task authenticity, teacher facilitation, collaborative value, and the fairness of process-product assessments. This study further investigates whether high satisfaction scores might be influenced by the novelty of the IBL approach, an issue addressed in the Discussion section.

5. Cultural and Institutional Context of IBL in Chinese Vocational Education

Implementing IBL in Chinese vocational colleges entails confronting deeply rooted cultural norms. The traditional “teacher-as-authority” paradigm and students’ prior conditioning to passive learning may create resistance or anxiety (Zhao, 2021). This study explicitly considers these potential barriers and integrates scaffolding strategies (e.g., gradual release of responsibility, explicit modeling of inquiry talk) to mitigate them. Moreover, unlike research-intensive universities, vocational institutes prioritize employability; therefore, the IBL design connected literary analysis to career-relevant skills such as evidence evaluation and clear communication.

6. Synthesis and Research Gap

Comprehensive analysis of the above studies reveals several important trends: 1) diversification and localization of measurement tools; 2) refined research on teaching methods;

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3) in-depth cross-cultural research; 4) application of neuroscience methods; 5) attention to individual differences. Despite these advances, no empirical study to date has systematically tested IBL's effect on critical thinking in a vocational college Ancient Chinese Literature course using validated, discipline-specific assessments. This study fills that gap while also addressing the limitations of prior work by reporting effect sizes and acknowledging design constraints transparently.

Conceptual Framework

Based on the literature review, the independent variable in this study is the use of an inquiry-based teaching method, which is grounded in John Dewey's pragmatic educational philosophy and Piaget's constructivist learning theory (Hmelo-Silver et al., 2007). The dependent variables are students' Critical Thinking Ability and Students' Satisfaction.

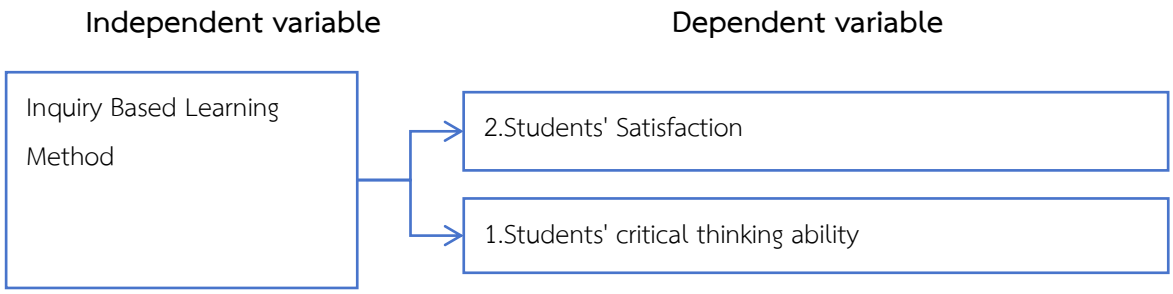


Figure 1 Conceptual Framework

Figure 1 presents a refined conceptual framework showing the hypothesized directional relationships. Each IBL phase (Orientation, Conceptualization, Investigation, Conclusion, Discussion) is mapped onto the critical thinking components it primarily activates. For instance, the Investigation phase is expected to have a strong direct effect on Analysis and Inference, while the Discussion phase is linked to Explanation and Self-Regulation. This framework moves beyond a simple variable list and provides a testable model for future research.

Methodology

1. Population and Sampling

The target population was all 150 second-year students majoring in Chinese Language and Literature at Yunnan Economics Trade and Foreign Affairs College. Using cluster random sampling, one natural class of 50 students was selected as the experimental sample. The use of a single

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intact class, while logistically necessary, limits generalizability; this is explicitly acknowledged as a limitation in the Discussion.

2. Experimental design

This study used a one-group pretest-posttest design, as shown in the figure below.

O_1	X	O_2

O_1 was a measurement of the students' critical thinking ability before an experiment.

X was an inquiry-based learning method.

O_2 was a measurement of the students' critical thinking ability and students' Satisfaction after an experiment.

A significant limitation of this design is the absence of a control group, which threatens internal validity due to potential maturation, history, and testing effects. A true experimental design was not feasible because the college could not ethically withhold an innovative method from one class while providing it to another, nor could they artificially split intact cohorts. To partially mitigate this, we triangulated quantitative gains with qualitative feedback from students and compared growth patterns with historical cohorts' performance on similar assessments; these comparisons suggest the observed gains are unlikely to be solely due to maturation.

3. Research Instruments and Development

Three rigorously validated instruments were used in this study.

3.1 IBL Lesson Plans: Six detailed lesson plans, structured around the five-step IBL model, were developed for core topics in ancient literary history. These plans underwent expert validation by a panel of three specialists: one professor of Chinese classical literature, one educational psychologist with expertise in inquiry learning, and one senior vocational college instructor with 15 years' experience. All held doctoral degrees and had published in their respective fields. Expert feedback (e.g., refining inquiry questions to better match students' prior knowledge) was incorporated into the final versions.

3.2 Critical Thinking Ability Assessment Form: This core instrument, based on Facione's (1990) six-component framework, used a 4-point scale (1 = Beginning to 4 = Excellent), yielding a total possible score of 96. The instrument demonstrated good content validity (IOC values ranged from 0.67 to 1.00) and acceptable inter-rater reliability (ICC = 0.884). While the 4-point

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scale may reduce sensitivity to small improvements, it was retained to align with the college's standard grading categories; future studies are encouraged to use 5- or 6-point rubrics.

3.3 Student Satisfaction Questionnaire: This 12-item, 5-point Likert scale questionnaire covered four dimensions: Content, Process, Instructor Support, and Assessment & Outcomes. It demonstrated strong content validity (IOC = 1.00) and exceptional internal consistency (Cronbach's α = 0.962).

4. Data Collection

4.1 The sample was pretested using a designed instrument to measure students'critical thinking ability.

4.2 The sample was taught using an Inquiry-Based Learning approach. The intervention was integrated into the existing 18-week semester, replacing six traditional lecture sessions while preserving total credit hours. Each IBL cycle spanned three weeks, allowing sufficient time for deep inquiry.

4.3 After completing the instruction, the subjects took a post-test using the same instrument used in the pretest.

4.4 The sample was administered a student satisfaction questionnaire.

5. Data Analysis

In this study, data were analyzed using the statistical program according to the research objectives:

5.1 Determine the effect of IBL on critical thinking by comparing pretest and posttest scores using a paired-sample t-test and calculating Cohen's d effect size.

5.2 Compare students' posttest critical thinking scores with the 70% criterion using a one-sample t-test.

5.3 Assess students' satisfaction using the arithmetic mean and standard deviation, and explore the correlation between satisfaction scores and posttest critical thinking performance.

Results

1. Effect of IBL on Critical Thinking Ability

Table 1 Comparison of Critical Thinking Ability Before and After IBL (N = 50)

Group	n	Full score	Pretest scores		Posttest scores		Mean gain	t	p	Cohen's d
			M	S.D	M	S.D				
Experimental group	50	96	61.84	2.48	70.08	4.53	8.24	13.13*	<.001	1.86

*p < .05

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As shown in Table 1, the mean critical thinking score increased from 61.84 (SD = 2.48) to 70.08 (SD = 4.53), a statistically significant gain (t(49) = 13.13, p < .001). The effect size (Cohen's d = 1.86) is very large according to Cohen's (1988) benchmarks, indicating that the intervention had substantial practical significance. Among the six critical thinking dimensions, the greatest improvements were observed in Inference (pretest M = 9.86, posttest M = 12.40; gain = 2.54) and Self-Regulation (pretest M = 8.94, posttest M = 11.38; gain = 2.44). The smallest gain was in Interpretation (pretest M = 11.20, posttest M = 12.04; gain = 0.84), suggesting that clarifying literal meaning may require more sustained practice.

2. Comparison with the 70% Criterion

Table 2 One-Sample t-Test Comparing Posttest Mean with 70% Criterion (70% = 67.2)

Group	Full score	Criteria score	n	M	S.D.	t	p
Experimental group	96	70% (67.20)	50	70.08	4.53	4.495*	<.001

*p < .05

The posttest mean (70.08) significantly exceeded the 70% criterion score (67.20), t(49) = 4.495, p < .001. This indicates that the whole class, on average, achieved the mastery benchmark. Nevertheless, critical thinking is a continuous competency; the 70% threshold is a pragmatic institutional target and should not be interpreted as an endpoint for development.

3. Student Satisfaction and Its Relationship with Outcomes

Table 3 Student Satisfaction Levels with IBL Intervention (N = 50)

No.		Item	Mean(M)	S.D	Level of appropriateness
Part 1: Teaching Content	1	The six chapter topics (realism in the Book of Songs, romantic spirit of Li Sao, Tao Yuanming's pastoral aesthetics, Li Bai vs. Du Fu, Su Shi's ci innovation, narrative art of Dream of the Red Chamber) are highly relevant	4.64	0.48	Very high level

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No.		Item	Mean(M)	S.D	Level of appropriateness
		to my learning needs.			
	2	Inquiry questions (e.g., “Why is the Book of Songs called a video-camera of Zhou society?”) successfully aroused my interest in ancient literature.	4.48	0.5	high level
	3	The supplied texts, commentaries, and extended materials are sufficient for me to complete inquiry tasks such as the “Historical Fact vs. Poetic Text” table.	4.44	0.5	high level
Part 2: Teaching Process	4	The group-work cycle (brainstorm ⟶ hypothesis ⟶ evidence ⟶ conclusion) allows me to experience authentic academic inquiry.	4.48	0.5	high level
	5	Tools like Padlet, Question Wall, and traffic-light cards create an open and interactive atmosphere.	4.64	0.48	Very high level
	6	Multiple presentation formats (3-min group report, elevator pitch, TED-style talk) improve my academic speaking and critical-thinking skills.	4.56	0.5	Very high level
Part 3: Instructor Support	7	The instructor’s micro-lectures provide timely background knowledge that helps me clarify key concepts.	4.44	0.5	high level
	8	During group inquiry, the	4.52	0.5	Very high level

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No.		Item	Mean(M)	S.D	Level of appropriateness
		instructor gives concrete and useful feedback on evidence and logic.			
	9	After-class online Q&A (via Xuexitong/QQ group) responds quickly and solves my reading or assignment problems.	4.44	0.5	high level
	10	The KSA three-domain assessment (Knowledge quiz 30 % + Skill rubric 40 % + Attitude peer rating 30 %) is reasonable and reflects my real effort.	4.48	0.5	high level
Part 4: Assessment & Outcomes	11	Assessment criteria (e.g., “comparison table ≥3 textual evidences”, “speech logic 0-4 rubric”) are transparent and guide my improvement.	4.64	0.48	Very high level
	12	After the course, my abilities in close reading, historical contextualisation, and critical thinking have clearly improved.	4.44	0.5	high level
		Overall Total	**4.56**	**0.495**	**Very high level**

Overall satisfaction was very high (M = 4.56, SD = 0.495). Despite these uniformly positive ratings, two methodological cautions should be noted. First, the exceptionally high scores may partly reflect a social desirability bias or the Hawthorne effect—students responding favorably because they received a novel instructional approach. Second, a Pearson correlation between overall satisfaction and posttest critical thinking scores revealed a weak, non-significant relationship (r = 0.18, p = 0.21), indicating that the “happiest” students were not necessarily the

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most improved. This suggests that satisfaction and learning gains are distinct constructs and should be reported separately.

Discussion

The findings confirm all research hypotheses. The significant, large-effect-size gain in critical thinking (d = 1.86) aligns with meta-analytic evidence on IBL's effectiveness (Arifin et al., 2025), but extends it to a humanities discipline and a vocational education context. The structured IBL cycle systematically engaged students in the cognitive processes underlying critical thinking, particularly Inference and Self-Regulation—skills central to interpreting ancient texts with limited historical evidence.

Nevertheless, a more critical interpretation is warranted. Some students struggled with the transition from passive to active learning, particularly during the initial IBL cycles. Classroom observations and informal debriefings revealed that approximately 20% of students initially expressed anxiety about "not being told the right answer" and uncertainty about how to form hypotheses regarding historical texts. This resistance gradually diminished as scaffolding was intensified and peer models were shared. This finding underscores that IBL in traditional humanities courses requires not only instructional design but also affective support and gradual enculturation into inquiry norms.

Applying IBL to Ancient Chinese Literature presents unique challenges not encountered in STEM contexts. Forming testable hypotheses about, for example, the authenticity of a Tang dynasty poem fragment is constrained by the paucity of contemporary records. Students had to learn to work with probabilistic evidence and tolerate ambiguity—a cognitive demand that differs from the controlled experiments typical of science IBL. The moderate gain in the Interpretation component likely reflects this inherent difficulty. Future implementations should allocate more time to modeling how literary historians frame questions from fragmentary evidence.

Comparing these results with broader international studies in humanities IBL (e.g., Carver, 2020; Murphy, 2023) reveals consistent patterns: IBL enhances higher-order thinking across disciplines, yet effect sizes vary with the "structuredness" of the knowledge domain. This study contributes a benchmark effect size for classical literature, facilitating future cross-domain meta-analyses.

The very high satisfaction ratings, while encouraging, should be interpreted cautiously. As noted, the absence of a strong correlation between satisfaction and performance gains suggests that students' positive affective responses may be partially driven by the novelty of the approach rather than solely by deep learning. This does not diminish the value of IBL, but it

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calls for longitudinal research to determine whether satisfaction remains high once the method becomes routine.

Recommendations

1. For Educators:

Instead of merely "integrating IBL," begin with low-stakes, short inquiry cycles (e.g., one-session document analysis) to accustom students to ambiguity before moving to multi-week investigations.

Explicitly teach inquiry heuristics for literary evidence: how to cross-reference commentaries, how to weigh conflicting scholarly opinions, and how to formulate defensible claims when evidence is incomplete.

Manage increased instructor workload by developing reusable inquiry modules and training peer tutors to provide real-time feedback during group work.

2. For Curriculum Designers:

Provide institutional support for hybrid models that balance IBL with the demands of high-stakes traditional exams. For instance, design assessments that combine IBL-generated artifacts (e.g., research posters) with conventional multiple-choice questions that sample factual knowledge, thereby aligning with both innovative pedagogy and accountability requirements.

Establish faculty learning communities to share IBL lesson plans, video-recorded model lessons, and validated rubrics. Such professional development resources are essential for sustainable, college-wide adoption.

3. For Future Research:

Conduct longitudinal studies with follow-up assessments at six months and one year to determine whether critical thinking gains are retained or whether they represent a temporary response to a novel teaching style.

Incorporate qualitative components (semi-structured interviews, think-aloud protocols) to capture the "why" behind quantitative shifts—for example, how students conceptualize inquiry, what kinds of evidence they trust, and how they negotiate interpretive disagreements within groups.

Replicate this study with a comparison group design in contexts where ethical and administrative constraints allow, and expand to other humanities disciplines (e.g., modern Chinese literature, world history) to test the generalizability of findings.

Initiate comparative studies between vocational and academic tracks to examine whether IBL effects differ across student populations with distinct career orientations and prior academic experiences.

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4. For Institutional Policy:

Develop a phased roadmap for scaling IBL beyond individual classrooms. This could begin with voluntary "IBL fellows," then expand to departmental pilot programs, and eventually revise program-level learning outcomes to explicitly include inquiry competencies. Such systemic change requires alignment of curriculum, assessment, and faculty evaluation criteria.

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Citation:
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