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Enhancing Analytical and Critical Thinking Skills through Reflective and Collaborative Learning: A Quasi-Experimental Study

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Abstract

One of the main goals of academic institutions is to develop students' analytical and critical thinking abilities; however, traditional teaching modes do not provide the desired result. A study carried out recently suggested that integrating reflective and collaborative activities not only increases, but also activates these abilities. Such research, focusing on joint applications of these two methods, is still in its infancy. This research tries to fill this gap by exploring the effect of a blended instructional approach on the learning of medical students in Yunnan Medical Health College. For over 20 class sessions, the experimental group consisted of students working together on project for which they later had to reflect, while those in the control group were taught using traditional methods. Control and experimental groups showed remarkable growth in analytical and critical thinking skills, with the pre- and post-test data statistically significant. These findings prove that reflective and cooperative teaching methods offer consistent quality improvement tools; these findings have important implications for the improvement of undergraduate courses in higher education. The research presents supporting information based on which using better teaching methods which aim at the enhancement of cognitive skills should be implemented.

Keywords: analytical thinking, collaborative learning, critical thinking, quasi-experimental study, reflective learning

Introduction

As a university in this world of rapid transformation and complexity, we are facing the strong demand of developing students' thinking functions, especially analytical and critical thinking faculties (Yaacob et al., 2020). Such capabilities are very crucial for students in learning how to approach multifaceted problems, make prudent decisions, and engage in their professions and community. Integration of all small pieces of complex information into one well-explained statement is what we usually call analytical thinking. Inquiry, though, emphasized on appraising the existing information, questioning the underlying assumption, and bringing in different perspectives (Şener & Mede, 2023; Warsah et al., 2021). It should be noted that classic teaching methods, like the matter of passive learning, rote memorization, and lectures which is the main A-class media, are losing their power to form these higher-order cognitive skills.

Indeed, modern pedagogies prioritize learning strategies that highlight an active, student-centered space for learning, in which learning becomes an interactive and deeper cognitive process (Dada, 2023). The methods of reflective and collaborative learning are now, more than ever in the present focus, especially for improving these skills. Reflection encourages students to look back and rethink their own experiences, which is a good way of gaining deeper insights, questioning preconceptions, and integrating the new knowledge into previous knowledge systems (Tan, 2021). This process boosts self-awareness, encourages respect for diverse viewpoints, and cultivates continuous self-advancement—these, I would argue, are the most important outcomes of critical thinking cultivation (Nobutoshi, 2023). Conversely, collaborative learning uses social interaction and team spirit. It is possible that working towards shared interests, solving tough problems as a team, and developing the comprehension of the subject are the benefits. The effects of talking about concepts and events and sharing knowledge have been proven to lead to higher retention rates and improvement of critical thinking skills (Lee & Yang, 2023).

Though reflective and collaborative learning strategies provide distinct advantages, the space of research on how these two methods are combined to improve analytical and critical thinking skills of students is still empty. Though a number of the existing studies focus on them individually, researchers have so far made a few attempts at discussing the merits of their integration into one single

teaching approach (Akpur, 2020; Yaacob et al., 2020). Additionally, the vast bulk of studies so far has dwelled on the Western educational contexts or certain fields of education, which makes it difficult to implement the research findings more broadly. Consequently, addressing the question of using reflective and collaborative learning methods as complimentary alternatives will provide a greater cognitive gain across diverse forms of educational environments and particular student groups. To address these gaps, this study sets out to explore the impact of an integrated instructional approach one that combines reflective and collaborative learning on developing analytical and critical thinking skills among university students.

Research Questions

This research aims to answer the following questions:

1. How significantly does integrating reflective and collaborative learning improve students' analytical thinking skills?
2. In what ways does this combined approach enhance students' critical thinking skills?
3. What are students' perceptions of the effectiveness of this integrated instructional approach in fostering their cognitive abilities?

Consequently, the current research intends to fill this gap in the academic literature by providing empirical evidence regarding reliability of combining reflective with collaborative learning approach. These conclusions will present valuable evidence to educators and curriculum makers who intend to adopt such evidence-based teaching methods to improve higher-order thinking. Since the importance of critical and analytical thought is growing in academic and working environments, successful instructional methods must be implemented for the students who take them. Also, one of the major contributions of this study is to deepen the understanding of cultural impacts on educational methods through examining non-Western contexts.

Literature Review

Research Background

In university education in particular, in disciplines such as medical imaging which heavily require intricate thinking and reasoning, analytical and critical

thinking capacities are imperative. Analytical thinking relates to separating complex pieces of information and identifying successive correlations to draw conclusions (Hidayat et al., 2024). Critical thinking, on the other hand, consists of methodical analysis of information, studies of implicit beliefs and consideration of different points of view (Facione, 2015; Liyanage et al., 2024).

Classical instruction approaches tend to apply rote learning techniques, which alone are insufficient to achieve the higher-level thinking pace. To fill this void, applying reflective learning has been cited as an effective alternative. This approach uses the students' own experiences to invoke critical thinking and therefore, their deeper insights and understanding (Veine et al., 2020). As well as, learning through collaboration, that is characterized by social interaction and cooperative activities, has been verified as a highly effective means of enhancing, if not developing, understanding and retention of knowledge (Qureshi et al., 2023)

Relying on these ideas, reflective and collaborative instructional styles demonstrate themselves as promising alternatives in the attempt to narrow the distance in the formation of higher-order thinking skills. The next part will look at these practices in education and how they could be implemented in order to cope with the issues we are dealing with.

The Latest Research Progress

In recent studies, researchers explored the impact of reflective and cooperative learning in different educational settings. Another example is Elmoazen et al. (2024) who place a strong emphasis on reflective and collaborative techniques in their Community of Inquiry framework, as they are fundamental to the breakdown of the barriers to meaningful learning processes. This framework captures the interrelatedness of cognitive, social, and teaching presence to inspire students to exhibit higher-order thinking skills.

Maybe, reflective learning encourages students to evaluate their experiences critically on purpose to have a deeper understanding and improve in the future (Thorpe, 2004). The works by Yaacob et al. (2020) and Cheng et al. (2020) substantiate that reflective practices speed up the process of developing critical thinking skills. At the same time, Howell (2021) and Lin et al. (2022) conclude that such approaches promote memory retention and use. These outcomes, however,

still call for research on the joint effect of reflective learning and collaborative strategies.

Collaborative learning encourages students to work in pairs or groups to achieve particular goals/projects and to engage themselves in problem-solving, which in turn results in better study outcomes, personal development, and increased engagement in the process of learning (Hmelo-Silver & Chinn, 2013). Besides, Slavin (2015) and Uz-Bilgin & Gul (2020) state that it also creates positive attitudes towards learning and helps to succeed in the academic environment. In particular, Warsah et al. (2021) stress that collaborative learning can improve critical thinking, which helps both emotional and mental development, particularly in an Islamic educational context..

Integrating reflective and collaborative learning has been proposed as a way to provide the maximum possible benefits of both approaches. Tobin et al. (2024) and Meijer et al. (2020) express this perspective in that combination of those techniques strengthens attention and achievement. On the one hand, reflective learning is essentially an introspective engagement, but on the other hand, collaborative learning implicates an external, interactive frame. Additionally, these two approaches are interrelated in their application to cognitive skill development, but there has not been enough research studying this potential synergy between these methods.

Existing Problems and Future Research Directions

Research literature now encompasses a wide range of studies highlighting the advantages of reflective and collaborative learning in academia. However, a few pressing questions still remain. An important consequence of this is the absence of longitudinal studies which equals a lack of assessment of the permanent effects of using these two instructional approaches. On this front, there is a multitude of studies that stress on the immediate benefits of gainful learning: Analytical and critical thinking skills of the students are greatly enhanced. These studies, however, in hindsight, provide little evidence for sustainable impact (Supena et al., 2021; Warsah et al., 2021). With such long-term data missing, it restricts our appreciation of the cognitive skills beyond the classroom and into the real world experience of students, which stemmed from reflective and collaborative learning.

Moreover, a challenge is presented by the fact that the concept of reflective and collaborative learning is defined and regulated by different means and methods in various studies. Generally, educational researchers come up with different frameworks and definitions of instruction, which lead to unmatched results and make cross-study comparison difficult (O'Donnell, 2008). For instance, some studies focus on reflective learning as an individual self-assessment process, while others emphasize its role in group discussions and peer feedback (Ratminingsih et al., 2017). Conversely, collaborative learning is usually summarized narrowly by just team works, while some researchers include elements like peer tutors and joint problem solving (Kaendler et al., 2015). As a result, there was no consensus on the methods they apply and their latent possibilities for improving analytical and critical thinking.

Thus, future studies should examine the longitudinal research aimed at understanding the long-term effects of reflective and collaborative learning on the cognitive and intellectual development. Consequently, the descriptions of those studies would be more comprehensive and cover not only the short-term outcomes but also the medium- and long-term effects. Further, setting common standards on these methods may also enhance comparability of the outcomes across various jurisdictions and strengthen how they contribute to the new learning procedure. This would then help the educators to pull together effective and evidence-based approaches.

Aside from the reflection and collaboration characteristics, most of the earlier research investigates these issues separately, trying to determine their roles within different learning environments (Akpur, 2020; Yaacob et al., 2020). However, the literature on this subject is limited, specifically with the combined usage of above strategies and their whole impact on cognitive and critical thinking.

Methodology

Research Design

The researchers employed an equivalent control group design with a significance level (α)set at 0.05. After the first instructional management plan, pre-tests were conducted for the experimental and control groups separately to assess their basic analytical thinking skills and critical thinking skills for subsequent

comparative analysis. The study lasted for 20 instructional management plans, and after the 20th instructional management plan, we conducted a post-test to evaluate the therapeutic effect of the instructional approach.

Research Variables

Research variables are composed of two variables: Independent variable is instructional approach that categorized in two conditions, the first learning based on collaborative learning and reflective learning and the second context was assigned with learning through the traditional approach. Dependent variables are analytical thinking and critical thinking skills of students.

Research Sample and Population

The research population consists of 120 higher education students at Yunnan Medical Health College during the 2023 academic year. The sample includes 62 students, divided into an experimental group (30) and a control group (32), selected via cluster random sampling. This sample size is appropriate for a quasi-experimental study, reflecting typical class sizes at the college. As per the power analysis, the required number can be calculated to be 62 students, where significant effects are detected at the alpha level of 0.05 and effect size of 0.8 with 80% power (Cohen, 1988). The sample size thus guarantees that 20 instructional sessions will be performed. This will allow for collecting detailed data, which guarantees the internal validity and statistical integrity of the research.

Definition of Concept

In this research, some important concepts are defined in order to avoid vagueness, and to have consistency and coherency all the way through the study. Specific concepts are (i) analytical reasoning, (ii) critical thinking, (iii) reflective learning, (iv) collaborative learning, and (v) standard teacher–student modalities.

i. Analytical Thinking

In analytical thinking, we are looking into the detailed format of difficult information. In this type of thinking, we tend to think of a hypothesis, supporting idea, and confutation. In the current research, we have attained analytical thinking measurement by using the Analytical Thinking Assessment Scale (60%) and the Paper Test (40%).

ii. Critical Thinking

Critical thinking is the act of processing, analyzing, synthesizing, and evaluating data gleaned from different media sources (Yusuf et al., 2024). Among the factors that constitute it is questioning the assumptions, which give it different perspectives of the issue.

iii. Reflective Learning

Reflective learning encourages students to think critically about their own experiences, which leads to deeper understanding and personal growth (Woldt & Nenad, 2021). This approach helps students challenge their assumptions and integrate new insights with their existing knowledge, ultimately enhancing their critical thinking abilities.

iv. Collaborative Learning

Collaborative learning benefits from collaboration and the association of ideas to achieve shared objectives, tackle problems, and acquire a deeper comprehension of a subject (Gillies, 2019). In this study, we implemented instructional strategizing while observing the diverse strengths of team members during group activities.

v. Traditional Teaching Methods

Traditional teaching techniques put the teacher at the center too much, placing the primary focus on lectures while the students do predominantly passive learning, rote memorization, and working on singular tasks, which is not to be done with others in real-time (Javed, 2023). The control group in this study was also subjected to the same classical teacher-centered strategies that are common in conventional teacher-centered classrooms.

Research Treatment

To assure the reliability of this research, a random selection of 62 out of 120 students from college was utilized, and thus, representativeness was guaranteed. Teachers were trained uniformly, so all of them used the same system to assess students. Further, before the study, uniform training was provided to tutors with similar qualifications to eliminate possible variations due to individual teaching styles.

Research Hypothesis

The two research questions investigated in this study are:

1. Participants of a combined instructional strategy that includes collaborative and reflective learning will statistically have their analytical and critical thinking skills improve significantly post-intervention, by standardized assessments, in comparison to their pre-intervention levels.
2. Students having been taught through the integrated collaborative and reflective learning method will show notable improbabilities in post-intervention analysis and critical thinking skills in comparison to the control group (G). Overall, this will be determined through comparative analysis using standardized assessment tools.

Research Instrument

Analytical Thinking Assessment Scale

The Analytical Thinking Assessment Scale used in this research focuses on biochemistry and clinical case studies, in accordance with Boud et al. (2013) reflective learning design, in evaluating students' analytical thinking skills. It encompasses dimensions like knowledge comprehension, problem analysis, logical reasoning, and the application of biochemical technology knowledge. It employs five scales of performance, 'from Excellent to Unqualified', indicating the relevant factors linking to the capacity of analytical skills evaluation:

1. Knowledge Comprehension: On the mastered biochemical subject matter and being able to deal problems efficiently.
2. Problem Analysis: Analyzing the reason behind the biochemical issues.
3. Logical Reasoning: Applying logical reasoning in drawing conclusions of the scientific approach.
4. Application of Technology: Having operational knowledge of various types of biochemical techniques.

It mirrors the study's specific aim of improvement of analytical ability through reflective and collaborative learning, which questions the students in both theoretical knowledge and practical application to the core. It is a system that allows

an inclusive evaluation of thinking abilities that are indispensable for the medical practice and biochemistry.

Critical Thinking Assessment Scale

This study, inheriting Facione's (2011) framework of critical thinking assessment in a medical imaging environment, applies the Critical Thinking Assessment Scale of reasoning, problem-solving, and decision-making in medical imaging students. The scale subdivides achievement into five rankings of proficiency: "Excellent," "Good," "Moderate," "Qualified," and "Unqualified," each of them giving critical thinking requirements. An "excellent" rating means outstanding judgment and the capability to make independent decisions in complex situations, whereas the lower ratings show the greater need for counseling. The criteria of the scale coincide with the study's aim of enhancing and paraphrasing critical thinking through reflective and collaborative learning, elaborating a reliable factor of those cognitive qualities, which can be used to target the students' abilities.

Analytical Thinking Test-Paper

The analytical knowledge test paper Grades A students' skills in various biochemistry topics. There are eight questions in this segment, covering three aspects: knowledge understanding, problem analysis, logical reasoning, and application of biochemical technology used in lab studies. Every test question must contain the corresponding answer reflecting the essence of the posed question. Besides, educators will be able to monitor the students' understanding of biochemical basics, analysis of problems, reasoning logically, and applying biochemical techniques effectively.

Critical Thinking Test-Paper

This test aims to evaluate students' critical thinking skills across various aspects of biochemistry. It consists of ten questions categorized into determining the problem, analyzing information, making inferences and judgments, assumptions and verification, and critical understanding. Each question requires a complete and accurate response, reflecting students' proficiency in problem determination, information analysis, logical inference, assumption verification, and critical comprehension.

Instructional Model

The instructional model blends collaborative and reflective learning, organizing students into diverse teams to leverage their strengths for deep topic exploration and problem-solving (see Figure 1). After each collaborative task, students reflect on their contributions and refine their strategies. Through integration and presentations, they showcase their collective understanding, fostering collaboration while enhancing individual analytical and critical thinking skills. The following is a brief overview of this instructional model. For a detailed explanation, please refer to my previous research (Guo et al., 2024).

Step 1: Establish Goals and Themes

The teacher outlines clear learning objectives and course themes aligned with desired outcomes, introducing these to students who discuss their initial understanding and expectations.

Step 2: Team Formation

Students form diverse teams (3-5 members) based on their backgrounds and interests, participating in team-building exercises to foster a positive dynamic.

Step 3: Exploration Phase

Teams research assigned themes using various sources, sharing findings in structured discussions. The teacher guides research methods and source evaluation.

Step 4: Collaborative Practice

Teams work on problem-solving tasks with defined roles to ensure active participation. The teacher monitors progress, providing feedback and using digital tools to enhance collaboration.

Step 5: Reflection and Discussion

Teams take time to reflect on how they have roughed it during the whole process, which entails communicating the highs and the lows as they did. Even after they've shared their stories, educators engage the whole classroom in discussions. Thus, the students learn from one another's experiences. They also record these reflections in their journals or logs, as it allows them to capture their learning path.

Step 6: Integration and Presentation

Students will include their findings into the presentation or project, and they will be responsible for showing what they have learned. Classes are conducted with constructive criticism of their peers' analysts and their problems, which in turn aids them in refinement of their analysis and solutions.

Step 7: Summary and Evaluation

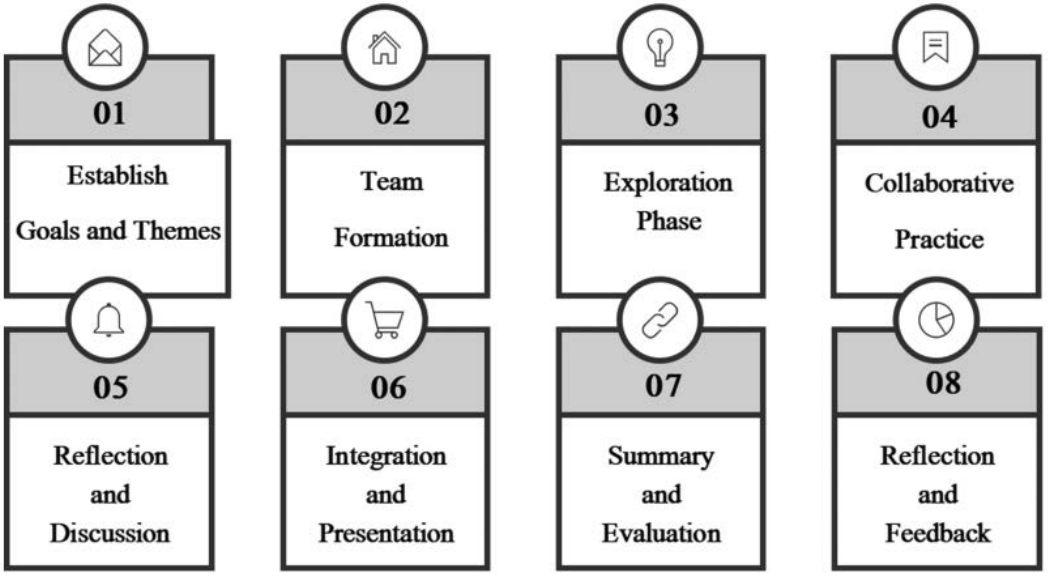
According to learnings outcomes, the teacher and the students critically review. Besides, students are also engaged in self-assessing and classroom discussions intended to encourage feedback gathering as well as deepening the search for areas of improvement.

Step 8: Reflection and Feedback

Students consider their whole lesson as well as the feedback of the teacher on their written work. This once again helps them to understand that it is possible to do great things and therefore think of all the ways we can implement what we learn next time.

Figure 1

Instructional Model Based on Collaborative Learning and Reflective Learning



Instrument Reliability

Analytical Thinking Assessment Scale

To ensure the reliability and validity of the Analytical Thinking Assessment Scale in this study, we relied on the Cronbach's α and KMO tests. The outcome revealed a Cronbach's α of 0.85 and a KMO of 0.86, which are appropriate for measuring analytical thinking skills in our investigation, so the scale is very reliable for the purposes of the research.

Critical Thinking Assessment Scale

Similarly, the reliability and consistency of the Critical Thinking Assessment Scale were checked using Cronbach's α and KMO tests respectively. The 0.82 Cronbach's α value could be interpreted as indicating high reliability of the scale. The KMO value of 0.78 in the same context means that the tested scale is valid for this study.

Analytical Thinking Skills Test-Paper

The Analytical Thinking Skills Test-Paper demonstrated an excellent internal consistency of analytical thinking abilities test reliability. Items 2 to 8 having consistent correlation (0.100) imply a high level of intelligibility with the aims of the test. The items (1 and 6) that were revealed to have a consistency ratio of 0.80 also happened to be relevant. The test was of moderate difficulty, with the difficulty index ranging from 0.36 to 0.49, and the theorem had excellent discriminatory power values, ranging from 0.42 to 0.67, which indicated that it was effective at distinguishing between the participants' skills.

Critical Thinking Skills Test-Paper

The Critical Thinking Skills Test-Paper was also seen to have a good content validity, as a part of the process of examining specialists' skills to think critically. The consistency rates for the tests were 0.80-1.00, and they were considered to have a high level of alignment with the test's objectives. The questions covered a moderate to a bit challenging level of difficulties (P.I = 0.32 to 0.54) together with good discrimination power (0.36 to 0.71), which were enough for students' proficiency differentiation.

Research Data Collection

Data Collection Time

To organize students' analytic and critical thinking skills, the assessment scales and test papers were used at the beginning and at the end of the instructional plans. This provided the feedback we needed to know whether these skills improved in students as a result of the interventions.

Collection of Data for Analytical Thinking Skill

Students' fleeting thinking capabilities were measured through both a test questionnaire and an assessment tool after the initial and last educational stages. The total assessment score had been 100 points, 40 points weighted for the test paper, and 60 points weighted for the assessment scale.

Collection of Data for Critical Thinking Skill

To assess students' critical thinking skills, a test paper and an assessment scale were used both after the first and the final instructional sessions. The total score was also 100 points, with 25 points coming from the test paper (25%) and 75 points from the assessment scale.

Research Data Analysis

Homogeneity Testing

In this study, independent samples t-test was utilized to find out any changes in the pre-test of analytical and critical thinking skills between the two groups studied, namely, the experimental and the control groups. The aim of this comparison was to confirm that the two groups were comparable, and such a consideration is significant for a subsequent reliable stage of comparison. It is primary to emphasize the group equivalence proper before group division for further homogeneity testing, as it helps to eliminate and minimize experimentation bias and controls the reliability of the findings during the intervention assessment.

Comparative Analysis

To determine the significance of the mixed type of learning modality on college intelligence and thinking, both independent t-tests and paired samples t-tests were utilized in this study to assess pre- and post-test data from both

experimental and control groups. Paired samples t-tests were deployed to evaluate the significance of improvement among those students after they were provided with the intervention. The study included the independent samples t-test results, with the experimental group having an integrated learning approach and the control group having traditional classroom teaching.

Ethical Consent

Before commencing this study, we obtained consent from Yunnan Medical Health College in China and Nakhon Phanom University in Thailand. Subsequently, we provided detailed research information to school administrators and teachers participating in the intervention study, and obtained their consent.

Results

Participants

The study sample consisted of college students from Yunnan Medical and Health College in China. Participants in both the experimental and control groups had an average age of approximately 19.5 years, with ages ranging from 19 to 20 years. The gender distribution of participants was as follows:

Table 1

Participants Information

Items	Number	Number (Male)	Number (Female)
Sample size	62	33	29
Experimental group	30	18	12
Control group	32	15	17

Analysis of Homogeneity

Initially, an independent samples t-test was performed on the pre-test scores of both treatment groups. The average scores on the pre-test among students in the experimental group were found to be similar to those of the control group and displayed no significant disparity. As illustrated in Table 2, the t-test outcomes ($t=-0.74$, $t=-1.04$, $p>0.05$) did not attain statistical significance, suggesting that the variations in the pre-test scores between the treatment groups were minimal.

Table 2

Comparison of Pre-test

Item Classification	Group	M	SD	t	df	p
Analytical thinking skills	Experimental Group	75.83	7.70	-0.74	61	0.47
	Control Group	77.28	7.80			
Critical thinking skills	Experimental Group	75.38	7.44	-1.04	61	0.31
	Control Group	77.31	7.24			

*P<0.05

Hypothesis Testing

Hypothesis testing I: Students who participated in the instructional approach integrating collaborative and reflective learning will demonstrate statistically significant improvements in their post-intervention analytical and critical thinking skills.

Table 3

Comparison of Pre-test and Post-test in the Experiment Group

Students' Scores in Different Tests	M	SD	t	df	P
			-22.66	29	0.000*
Pre-test of analytical thinking skill	75.83	7.70			
Post-test of analytical thinking skill	87.37	6.11			
			-22.73	29	0.000*
Pre-test of critical thinking skills	75.38	7.44			
Post-test of critical thinking skills	87.53	6.42			

*P<0.05

A Paired Sample T-Test was conducted to evaluate differences in test scores between two assessments in the same student cohort. Results in Table 3 show significant improvements in the second assessment: $t(29) = -22.66$ and $t(29) = -22.73$, $p < 0.05$. Mean differences were 11.54 and 12.15, with pooled standard deviations of 6.91 and 6.93, yielding large effect sizes ($d = 4.14$ and $d = 4.15$) per Cohen (1988). These findings indicate that students in the collaborative and reflective instructional approach improved significantly in both analytical and critical thinking skills after the intervention.

Hypothesis testing II: Students exposed to the integrated collaborative and reflective learning approach will show statistically significant differences in post-intervention analytical and critical thinking skills when compared to students in the control group.

Table 4

Comparison of Post-test Scores between Experimental and Control Groups

Item Classification	Group	M	SD	t	df	P
Analytical thinking skills	Experimental Group	87.37	6.11	3.47	61	0.000*
	Control Group	81.25	7.62			
Critical thinking skills	Experimental Group	87.53	6.42	3.77	61	0.000*
	Control Group	81.48	6.23			

*P<0.05

An Independent Sample T-Test assessed differences between instructional approaches (collaborative learning and reflective practices vs. traditional teaching) on college students' analytical and critical thinking skills. Table 4 shows significant disparities, with t (61) = 3.47 and t (61) = 3.77 ($p < 0.05$). Students using the collaborative and reflective approach outperformed those in traditional methods, with mean differences of 6.12 and 6.05. Effect sizes ($d = 0.88$ and $d = 0.96$) indicate a large impact per Cohen's (1988) criteria, confirming that the integrated approach enhances analytical and critical thinking skills compared to traditional methods.

Discussion

Sharing of Results

This study evaluated the effectiveness of an instructional strategy integrating reflective and collaborative learning to enhance college students' analytical and critical thinking skills. Pre- and post-test results demonstrated significant improvements in the experimental group, with mean increases of 11.54 and 12.15 for analytical and critical thinking skills, respectively ($t = -22.66$, $t = -22.73$, $p < 0.05$), and large effect sizes ($d = 4.14$ and $d = 4.15$). Independent samples t-tests showed the experimental group outperformed the control group in post-test scores, with mean differences of 6.12 and 6.05 ($t = 3.47$, $t = 3.77$, $p < 0.05$) and large effect sizes ($d = 0.88$ and $d = 0.96$), confirming the strategy's efficacy over traditional methods.

Comparison with Existing Studies

This study provides some support to and expands upon findings underscoring the advantages of reflective and cooperative learning. Such reflective practice, which emphasizes student's awareness to analyze their personal history in relation to the gained information, proved to assist critical thinking (Lin et al., 2022; Veine et al., 2020). According to our study, we saw major growth in both critical and analytical thinking (Nobutoshi, 2023; Yaacob et al., 2020). Examining collaborative learning as well, which develops engagement and retention of knowledge through social interaction (Lee & Yang, 2023), was another important adjustment that was discovered in our investigation. Results indicated a significant increase in analytical skill, a higher activation of participation in the classroom, as well as the new kind of dialogue that is relevant for better information retention (Qureshi et al., 2023). These conclude in this work of contemporary literature, such as Slavin (2015) and Hmelo-Silver & Chinn (2015). Besides, the study reiterates the Community of Inquiry framework work by Garrison et al. (2000), being one of the three key factors, both cognitive, social, and teacher presence, according to Elmoazen et al. (2024) and Hidayat et al. (2024). Thus, developing reflective and collaborative approaches are effective in dealing with a gap already manifested in previous findings (Supena et al., 2021; Warsah et al., 2021), and therefore more critical and analytical thinking should be a challenge for the Yunnan province Medical Health college mainly because of its feature of being a non-traditional university.

Practical Implications for Educational Practice

The findings of this study offer valuable insights for enhancing students' analytical and critical thinking through reflective and collaborative learning. Practical applications include:

Curriculum Development

Establishing critical reflective and collaborative tasks as permanent syllabuses in medicine, engineering, and social sciences majors can cultivate cognitive excitement (Zarestky et al., 2022). Activities like maintaining a journal, self-evaluation, and working in groups, can help students take their learning matters in their own hands and extend beyond the classroom.

Instructional Strategies

Educators simply have to use their skills for organizing the group workings by following their individual reflections to expose students to deeper comprehension. Activities, such as peer evaluation or group talks, are likely to enrich students' learning especially when they are trying to improve their understanding or acquire some experience.

Professional Development for Educators

Implementation of these strategies successfully would require unique professional development, which is dedicated to the management of the classroom dynamics, provision of a meaningful feedback, and direct guiding in student self-feedback.

Technological Integration

Digital tools such as e-portfolios, shared workspaces, or online discussion forums can serve as on-digital tools, linking a learner's learning in the classroom and beyond, creating a team that is always persistent in reflection and collaboration (Herrera-Pavo, 2021).

Adaptation to Diverse Educational Settings

The positive result of lessons in a country other than the West shows that they can work anywhere in the world. Teachers can adjust the techniques—like group discussions or individual reflective activities—so that different cultures and institutional contexts can be respected.

Limitations of the Study and Future Research Directions

This research has no shortage of limitations. According to the fact that only 20 lessons were conducted, the evaluation to the long-term consequences is inapplicable. In studies where students are followed for a longer duration, the contribution of reflective and collaborative practices to cognitive and critical thinking skills is better understood over time. Also, I would argue that this research only involves Yunnan Medical Health College in China and, thus, the outcomes cannot be applied to other settings. This is to show that for these results to be more widely applicable, it is worth exploring these methods across a variety of

organization types, institutions and cultural settings. Actually, the heterogeneity of concordance in the review process, expands the boundaries among different research work (Topping, 2005). Specifically, the standardization especially of respective frameworks is needed, which would eventually lead to better replicability and comparability, along with research on the mechanism that holds critical thinking. Another area for research is to more comprehensively discern the impact of technology in the E-IMPRINT model, as studies (Hmelo-Silver et al., 2013; Scardamalia & Bereiter, 2014) had indicated its high effectiveness in producing collaborative work, although the role of this transformation for reflective learning has not been explored yet. However, the effect of the teacher's type of training on the way the concepts were implemented in the classroom also deserves more attention and focus.

Conclusion and Recommendations

The study confirms that the blend of implicatory training and collaborative learning is a powerful strategy for applied skills development. Over the period of 20 lessons, students taught using conventional methods dropped noticeably; on the other hand, those experimented with improved manners of teaching proved significant development. In this way, the addition contributes to the confirmed research with new insights which testify the joint action. This implied that by engaging the students in these methods, they are likely to experience excellent cognitive engagement levels and learn more to think beyond the level of thought processes needed in academics. Additionally, the given inquiry establishes the effectiveness of these models within the context of education beyond the Western paradigm. In the next stage of this research, the impact and the wider resources of these alternative models will receive further investigation to highlight the role of innovative methods for improving the complex cognitive structure of current learners.

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