

Teaching Methods and Learning Environments as Catalysts for Critical Thinking: A Social Cognitive Approach in Japanese Junior High Schools

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Abstract

This study analyzed the factors impacting critical thinking among junior high school students contributing to pedagogical practice. Based on social cognitive theory (SCT), the theoretical framework focused on the interplay of environmental and personal factors. The quantitative action research design surveyed junior high school students (n = 55), and a descriptive analysis approach was applied. The data showed that teaching methods, teaching aids, and assessment methods significantly impacted the students' critical thinking. However, peer interaction, self-efficacy, classroom management, and course content moderately influenced critical thinking. The study recommended that the school enhance educators' pedagogical skills, expand learning aids, and refine assessment methods to better align with essential aspects of thinking by conducting frequent educational seminars, workshops, and action research.

Keywords: Collaborative Learning, Critical Thinking, Junior High School, Pedagogical Practice, Quality Education

Introduction

Over the past decade, cultivating critical thinking in junior high students has become a priority worldwide, yet few studies have examined how complex factors interact in bilingual, international-education settings. Practicing a critical-thinking

approach in a junior education context can empower younger students' cognitive and performance abilities, moving beyond rote memorization (Bloom, 1956; Ennis, 1985; Paul, 2006). While many conventional pedagogical approaches still rely on memorization, a more revolutionary emphasis on critical thinking and creativity can significantly advance a nation's educational progress.

Notably, this study context includes diverse learners, such as Japanese returnees, newcomers, and long-term international residents—each bringing varied educational backgrounds. Although critical-thinking pedagogy was introduced recently, it requires continuous refinement of strategies. By examining students' authentic experiences, this study aims to contribute to advancing critical-thinking practices. However, implementing new programs to foster critical thinking presents particular difficulties (Anderson & Krathwohl, 2001). Therefore, exploring these challenges comprehensively is essential to achieve educational goals and fulfill institutional missions.

Exploring individual factors, such as teaching methods, curriculum content, and technology integration (Abrami et al., 2015; Bezanilla et al., 2019; Cargas et al., 2017; Li, 2024; Ranbir, 2024; Valencia & Shodiq, 2024), can partially support and hinder excellent critical thinking practice. Moreover, studies that focus solely on educators' perspectives (Heijltjes et al., 2014; Supansa et al., 2024) leave out students' voices crucial for effective practice and achievement. Social Cognitive Theory (Bandura, 1986) advocates a comprehensive approach that emphasizes the interplay between environmental and personal factors. In this light, this study explores how contextual (teaching and assessment) and personal (self-efficacy) factors impact students' critical-thinking development. Based on this framework, the following specific research questions are designed:

1. How do environmental factors influence junior high school students' critical thinking development?
2. Which of these factors exerts the strongest impact?

Literature Review

Concept of Critical Thinking

Critical thinking in education is increasingly recognized as a significant aspect to enhance students' creative and rational abilities. Critical thinking in education is the systematic act of thinking and applying knowledge in new ways to foster innovative knowledge and professional skill development for both students and educators. In other words, critical thinking refers to the cognitive process of raising a question about existing knowledge to avoid confusion and encourage creativity. However, critical thinking moves beyond simply asking questions, as many questions are straightforward requests for information (McPeck, 2016). The terms 'good thinking' and 'effective thinking' are often intertwined with the concept of

‘critical thinking’ as described in academic literature. Several scholars in the field of education have defined critical thinking in different ways, contributing to pedagogical practices at varying levels of education, from elementary to higher education contexts. Higher-order thinking skills include processes for analysis, evaluation, creation, and self-regulation to solve problems (Bloom, 1956; Paul, 2006).

Analysis is a core higher-order cognitive skill in Bloom et al.’s (1956) original taxonomy, enabling students to deconstruct information and identify patterns, themes, and cause-and-effect relationships (Facione, 1990). Anderson and Krathwohl (2001) further highlight analysis as crucial to critical thinking by facilitating deeper understanding and effective problem-solving. In tandem, evaluation helps learners assess the credibility and value of evidence or knowledge statements, examining both the positive and negative aspects to guide subsequent actions (Paul & Elder, 2006; Bloom et al., 1956). Anderson and Krathwohl’s (2001) revised taxonomy positions evaluation just below creation, illustrating how thoughtful assessment of issues informs students’ ability to innovate and propose meaningful solutions.

Creation stands at the climax of Bloom’s revised taxonomy (Anderson & Krathwohl, 2001). It includes formulating new ideas or approaches through systematic analysis and evaluation, allowing students to synthesize knowledge into workable strategies (Paul & Elder, 2006; Bailin, 2002). Scholars acknowledge that creativity and critical thinking are interdependent: without creativity, critical thought risks becoming overly skeptical, while creativity devoid of critique yields superficial originality (Bonk & Smith, 1998; Paul & Elder, 2006). Finally, self-regulation, although not explicitly mentioned in Bloom’s original taxonomy, is emphasized by Krathwohl (2002), Facione (1990), and Kuhn (1999) as a metacognitive cornerstone of critical thinking. It involves students actively monitoring and reflecting on their cognitive processes, enabling them to refine judgments and sustain high-level reasoning. Collectively, the four components, such as analysis, evaluation, creation, and self-regulation, capture the essence of critical thinking development in education.

Empirical Studies

Studies explored the interrelationship of various factors that shape students’ critical thinking. Several studies have linked discussion-based and seminar-style teaching to gains in critical thinking (Abrami et al., 2015; Supansa et al., 2024). The methods, such as inquiry-based learning, problem-based learning, and Socratic questioning, enable learners to challenge real-world problems, collaborate effectively, and evaluate knowledge from multiple viewpoints (Heijltjes et al., 2014). Soublis et al. (2025) suggested showing the importance of poetry analysis as a pedagogical approach that can enhance disciplinary literacy and critical

thinking skills, creativity, and deeper comprehension using the interpretation of complex texts.

In addition, a curriculum that promotes these methods significantly influences students' metacognitive processes and can either facilitate or hinder the development of critical thinking (Pulungan et al., 2024). Research suggests that inquiry-driven curricula promote deeper evaluative skills compared to memorization-focused instruction (Bezanilla et al., 2019; Hoirina et al., 2024). Notably, well-designed textbooks aligned with Bloom's taxonomy have been shown to encourage higher-order thinking and self-efficacy among students in secondary-level education (Neziri, 2019; Pinner et al., 2022). Xie et al. (2025) further suggested the connection between the critical thinking components of the national education policies and the curriculum documents.

Moreover, assessment methods are another significant factor that can shape students' critical thinking growth, as poorly aligned evaluation systems can negate the positive effects of interactive pedagogy (Liu & Stapleton, 2018; Henry, 2020). A modern, multi-part framework breaks down skills like analysis, evaluation, creation, and inference, with regular assessments helping students engage more deeply with the material. Strategies such as peer assessment facilitate group feedback and collaborative problem-solving, deepening understanding through reciprocal perspectives (Jiang, Zhang, & Yin, 2022). Differentiated assessments based on Bloom's taxonomy help students progress through different levels of thinking, while real-world tasks show how knowledge can be applied outside the classroom. Classroom environment also contributes significantly; reflective thinking, self-monitoring, and a blend of learner-centered and teacher-centered strategies are found to reinforce higher-order thinking (Ghanizadeh, 2017; Rompelman & Broek, 2012). Peer interaction, specifically through group work and collaborative projects, drives mutual reasoning yet requires strong class management and teacher scaffolding to mitigate off-task behavior and maintain effective engagement (Li & Guo, 2015; Kong, 2014). Suprijiono et al. (2025) suggested that peer interaction through cooperative learning and deliberative democracy can develop learners' thinking skills, moderated by the learning style of different students.

In addition to pedagogical and organizational factors, self-efficacy and motivation are pivotal for critical thinking development (Carol, 2000). Students who perceive themselves as capable tend to persist through challenging tasks, regulate their efforts effectively, and prove stronger higher-order thinking (Asadullah et al., 2019; Komarraju & Nadler, 2013). Moreover, emerging technologies like virtual and augmented reality can enhance critical thinking and test performance (Abdelrahim, 2023; Li, 2024). Studies in diverse settings, including boarding schools, indicate that technology-based tools significantly boost students' problem-solving skills (Valencia & Shodiq, 2024). A recent study also showed the importance of the use of tablet technologies to enhance critical

thinking and communication skills in students with intellectual disabilities, not only in other students (Al-Naim, 2025). When we use technology, AI has become an integral part of recent days, so Ward et al. (2025) suggested that AI integration through the transmissional, transactional, and transformative (TTT) framework enhances critical thinking. Consequently, effective teacher training in the thoughtful use of these digital resources remains crucial, ensuring that educators are equipped to guide learners in meeting 21st-century challenges and cultivating the critical thinking capacities essential for academic and professional success.

In conclusion, several studies have significantly contributed to the practice of critical thinking by exploring various factors, mainly from the educators' perspectives. However, effective implementation and achievement of critical thinking in junior high school students may depend on more complex and interconnected factors, including students' viewpoints, which can enable its practical application.

Theoretical Lens

Social Cognitive Theory (SCT) is an essential framework for analyzing how multiple factors influence students' critical thinking skills (Bandura, 1986). The theory highlights personal, environmental, and behavioral facets, which can affect student learning and critical thinking skills at any educational level. This study explored the notable constructs because they align with regular pedagogical practices in classroom activities. For instance, personal factors are crucial for understanding how students' self-efficacy and motivation shape higher-order thinking and classroom engagement (Hapsari, 2016).

Environmental factors refer to contextual aspects that directly or indirectly influence students' learning, including teaching methods, teaching aids, curriculum content, and assessment practices (Bandura, 1986). The educational context is complex, requiring consideration of multiple factors to improve critical thinking. Focusing narrowly on pedagogy may overlook alignment between instructional methods and assessment systems. A holistic view, integrating both direct and indirect impacts, can support understanding how the elements collectively affect students' critical thinking process and skill (Demir, 2022). For instance, assessments that require higher-order thinking can enhance motivation and inform deeper learner engagement, ultimately improving critical analysis capabilities (Mallisa, 2019). In addition, behavioral factors indicate the active roles of both students and teachers, including student participation in discussions, interest in presentations, and completion of assignments. Additionally, teachers' academic and personal behaviors can foster learning engagement and critical thinking by modeling creativity and equitable facilitation (Bandura, 1986; Martaida et al., 2017). The concept of reciprocal determinism, central to SCT, emphasizes that changes in one domain can influence and be influenced by others (Bandura, 1986). For instance, practical teaching strategies (environmental) can

enhance students' motivation (personal), leading to active learning (behavioral). This interconnectedness makes SCT particularly suited for exploring the multifaceted factors shaping junior high school students' critical thinking.

However, this research primarily focuses on environmental and personal factors to allow deeper analysis and ensure practical applicability. Although behavioral and reciprocal determinism factors remain valuable for understanding the overall dynamics of critical thinking development, they lie beyond this study's scope.

Research Method

This study was conducted as action research at a junior and senior high school in Japan that adopts a novel ideology of integrating critical thinking into its curriculum, targeting both junior and senior high school students. This approach represents a revolutionary step in the Japanese educational context, shifting high school education from traditional learning models to a global, competency-based framework. The goal is to prepare students for the challenges of an increasingly competitive and complex postmodern world. Although the school employs a comprehensive framework that integrates both Japanese and international curricula, it places substantial emphasis on critical thinking, with more than half of its curriculum dedicated to this skill.

The incorporation of critical thinking at the junior high school level is ideologically significant for enhancing students' learning quality. However, multiple challenges may arise in practice, particularly when balancing traditional educational practices with innovative methods that prioritize critical thinking. As educators implement this approach, various factors have emerged that influence the development of students' critical thinking processes, making it difficult to identify which factors are most impactful. Therefore, this study aimed to explore the significant factors affecting students' critical thinking from their own perspectives by employing a quantitative action research design, thereby informing more effective pedagogical approaches in the future. Action research has been recognized as an effective method for examining classroom practices and determining factors that influence student learning (Ferrance, 2000). The use of quantitative data enables an objective analysis of students' perceptions and experiences, offering valuable insights into the practical implications of a curriculum centered on critical thinking (Creswell & Creswell, 2018).

Participants

This study involved junior high school students enrolled in an English-medium program, focusing on first- and second-year students (grades seven and eight). A purposive sampling approach was used to include all students exposed to the newly developed curriculum, assuming they would be well-prepared to complete the survey. Among several sections in these grades, only advanced-level students were

selected, given their higher confidence and proficiency in English, which were essential for accurately understanding and responding to the survey. Additionally, as part of this action case study, I also taught these students directly, giving me the context and rapport needed to interpret their responses more fully.

Purposive sampling is widely used in educational research when the study design calls for participants with specific characteristics, such as language ability or exposure to curricula (Palinkas et al., 2015). Moreover, selecting advanced-level students ensures that participants possess the requisite skills to provide meaningful responses, contributing to reliable and valid data collection in educational surveys (Creswell & Creswell, 2018). By targeting advanced English language learners, this study sought to produce a more accurate assessment of the new curriculum's impact on students' learning experiences and outcomes.

Research Tool

The study employed a survey approach developed through an extensive literature review and aligned with the research's theoretical framework. The survey protocol was meticulously designed to capture seven potential factors influencing students' critical thinking processes and skills, as identified in the theoretical foundation. Clear and consistent items were then created to measure each factor comprehensively. These items included various response options, most notably a five-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." The choice of this scale was guided by the Japanese educational context, which merges Japanese and international curricula with a pronounced focus on cultivating critical thinking. Moreover, few studies have thoroughly measured factors affecting critical thinking by applying the Social Cognitive Theory (SCT) framework to junior high school students in Japan. Although this survey instrument holds promise for making significant contributions, it may also present limitations that can be addressed in future refinements for enhanced applicability.

Analysis Approach

A descriptive analysis approach was used to organize the data systematically. The online responses, stored in Excel, were imported into SPSS for further analysis. The results were presented in tables and supplemented by figures to address the research questions effectively. The descriptive analysis began by assessing the reliability of the survey scale using Cronbach's alpha (Bandalos & Finney, 2018) to ensure internal consistency. Additionally, measures of central tendency (mean, median) and variability (standard deviation) were calculated to provide a comprehensive understanding of the data distribution (Kline, 2016). Furthermore, a regression analysis was performed to determine which factors significantly influenced students' critical thinking, clarifying whether each factor exerted positive or negative effects and highlighting its relative importance. The use of regression aligns with established educational research practices to isolate

predictive relationships and deepen understanding of how specific elements affect students' learning outcomes (Tabachnick & Fidell, 2019).

Reliability

Regarding reliability, the study's survey scale showed a Cronbach's Alpha of 0.898 across 26 items, indicating excellent internal consistency. This value surpasses the widely accepted threshold of 0.7 for high reliability (Bandalos & Finney, 2018; Nunnally & Bernstein, 1994). A Cronbach's Alpha value approaching 0.9 suggests that the survey items demonstrate strong consistency and accurately measure the same underlying construct, thereby establishing the scale as highly reliable for its intended purpose. Accordingly, the newly developed survey scales for assessing factors that influence critical thinking in a college-level context appear to be well designed and yield consistent responses an essential feature for ensuring validity in educational research (Tavakol & Dennick, 2011).

Results

The study examined the environmental and personal factors influencing junior high school students' critical thinking, analyzed them using a descriptive approach, and revealed the responses from 55 students to the following sections.

Impact of Environmental and Personal Factors

Teaching Methods

The research participants generally reported a positive experience with the current teaching methods in the school. For instance, as mentioned in Table 1, among the items, "My teachers often encourage engaging in group discussions that improved my critical thinking" had the highest mean score ($M = 4.00$, $SD = 0.839$), showing agreement. However, "During class work, some questions confuse me to write logically" received a lower mean score ($M = 3.20$, $SD = 1.026$), reflecting a problem in logical thinking during class activities.

Table 1

Students' Perceptions of Teaching Methods Supporting Critical Thinking

Items	<i>M</i>	<i>SD</i>
My teachers encourage me to ask questions to explore different ideas	3.80	0.683
My teachers often encourage me to engage in group discussions that improve my thinking.	4.00	0.839
My teachers give specific critical thinking questions.	3.82	0.945
During class work, some questions confuse me to write logically.	3.20	1.026
My teachers prepare us with practice essays before PBL tests.	3.45	0.899

Note: M = Mean score, SD = Std. Deviation

Curriculum Content

The analysis of the curriculum content demonstrates a generally positive experience among junior high school students. The item “Our subjects (all subjects) relate to real-life situations, helping me think about how to solve problems” indicated moderate agreement ($M = 3.62$, $SD = 0.805$). Similarly, the other item, “Exercises in most subjects include critical thinking-type questions that help me explore ideas in depth,” scored a slightly higher mean value than the previous item ($M = 3.87$, $SD = 0.848$). These findings suggest that while students perceive their curriculum as supportive of real-life application and critical thinking, there is still room for further improvement in enhancing these aspects.

Assessment Method

The study showed mixed experiences regarding the assessment method applied in the school, with some areas reflecting challenges in understanding and logical organization during term-end tests. In contrast, others emphasized the positive impact of feedback on improving critical thinking skills. For instance, as seen in Table 2, the item “Feedback helped me improve my PBL thinking and writing skills” received the highest mean score ($M = 3.82$, $SD = 0.863$). Similarly, another item, “Most teachers give clear feedback after PBL tests,” had a moderately high mean score ($M = 3.53$, $SD = 0.979$). However, items such as “Most subjects’ PBL questions confuse me during tests to organize writing logically” ($M = 3.35$, $SD = 0.966$) indicate moderate agreement, reflecting difficulties in test design and logical thinking. Additionally, “Out-of-scope PBL questions make it hard for me to think logically” scored the lowest ($M = 3.24$, $SD = 0.999$), highlighting the need to align test questions with expected learning outcomes better. While feedback is positively received, challenges remain in assessment design and tests.

Table 2

Students’ Perceptions of Assessment Methods Supporting Critical Thinking

Items	<i>M</i>	<i>SD</i>
Most subjects’ term-tests focus more on memorizing than understanding and creation.	3.31	0.979
Most subjects’ PBL questions confuse me during tests to organize writing logically.	3.35	0.966
Out-of-scope PBL questions make it hard for me to think logically.	3.24	0.999
Most teachers give clear feedback after the PBL test.	3.53	0.979
Feedback helped me improve my PBL thinking and writing skills.	3.82	0.863

Learning Environment

Regarding the classroom’s learning environment, the participants perceived a generally positive influence on their discussion, idea exploration, and the availability of resources. For instance, the item “My classroom environment focuses on discussion and idea exploration” received the highest mean ($M = 3.65$, $SD = 0.844$). Similarly, “I have sufficient learning resources in the school that support my writing in a logical way” scored moderate agreement ($M = 3.60$, $SD = 0.735$). However, “I feel encouraged to share my ideas in class” received a slightly lower agreement ($M = 3.49$, $SD = 0.940$).

Peer Interaction

The study participants reported a positive influence of peer discussion on their critical thinking process and writing. For instance, group discussion received the highest mean score ($M = 4.09$, $SD = 0.845$). In addition, working with classmates demonstrated that most participants agreed on this item ($M = 4.05$, $SD = 0.951$), and group projects like poster creation supported their critical thinking and writing skills, showing most participants agreement ($M = 3.95$, $SD = 0.870$), highlighting the benefit of collaborative activities. However, classroom management, including seating and grouping, scored a slightly lower mean value ($M = 3.69$, $SD = 0.879$).

Table 3

Students’ Perceptions of Technology Use Supporting Critical Thinking

Items	<i>M</i>	<i>SD</i>
Technology used by teachers in my classroom helps me organize ideas in writing.	4.04	0.838
Clear PowerPoint explanations help me understand topics better.	4.16	0.811
Clear questions (analysis, evaluation and creativity) and instructions on the PowerPoint helps me to think and write logically.	3.98	0.871
When teachers use attractive PowerPoints, I better understand and actively engage in the classroom.	4.15	0.848

Technology Integration

While analyzing the influence of technology use on the critical thinking of students, research participants reported a highly positive experience. The item “Clear PowerPoint explanations help me understand topics better” received the highest mean value ($M = 4.16$, $SD = 0.811$). In addition, the item “When teachers use attractive PowerPoints, I better understand and actively engage in the classroom” is near strong agreement ($M = 4.15$, $SD = 0.848$). Moreover, most participants agreed with the item, “Technology used by teachers in my classroom helps me organize ideas in writing” ($M = 4.04$, $SD = 0.838$). However, with high

variation, most participants moderately agreed with the item, “Clear questions (analysis, evaluation, and creative) and instructions on the PowerPoint help me to think and write logically” ($M = 3.98$, $SD = 0.871$), indicating that a clear instructional design aids in logical thinking.

Self-efficacy and Motivation

Examining the personal factors, such as self-efficacy and motivation, revealed that most participants had mixed experiences with higher positive perceptions. The item “I believe that developing logical thinking and writing skills will help me in my future career” has the highest agreement ($M = 4.05$, $SD = 0.848$). However, “enjoyment of tackling problems requiring deep thinking” scored moderately high agreement ($M = 3.56$, $SD = 0.938$). Moreover, “confidence in creative and logical thinking abilities” was scored slightly lower in agreement by the participants ($M = 3.47$, $SD = 0.979$). In summary, the results demonstrated the beneficial impact of self-efficacy and motivation on their critical thinking skills, underscoring their need to enhance their confidence in their abilities.

Most Effective Factors

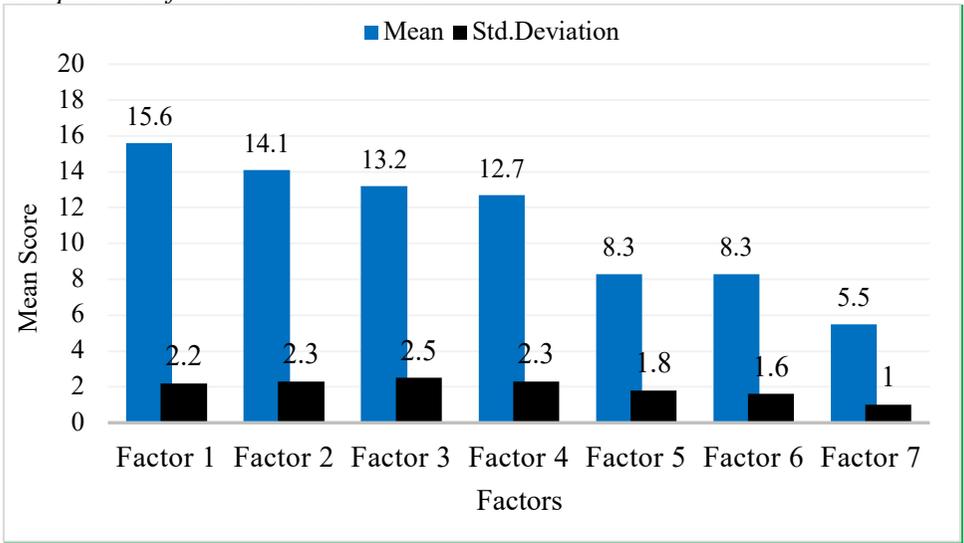
This section presents descriptive statistics on factors impacting the development of critical thinking skills among junior high school students. According to the theoretical framework, personal factors such as self-efficacy and motivation, along with environmental factors including teaching methods, assessment methods, technology use, peer interaction, the classroom learning environment, and course content, are analyzed above. This section summarizes the most effective factors influencing critical thinking.

According to the data mentioned in Figure 1 below, teaching methods were found to be effectively impacting the junior high school student’s critical thinking process and skill ($M = 15.64$, $SD = 2.26$), indicating that teaching methods such as discussion approaches may have a stronger role in critical thinking development compared to other factors. The factor is followed by the assessment method ($M = 14.18$, $SD = 2.32$) and technology use in the classroom ($M = 13.22$, $SD = 2.51$), indicating that the most important thing is enhancing the students’ critical thinking abilities if the approaches are well and skillfully applied. Peer interaction, on the other hand, had a slightly lower mean value ($M = 12.71$, $SD = 2.34$), while self-efficacy and motivation ($M = 8.39$, $SD = 1.84$) and the classroom environment ($M = 8.35$, $SD = 1.67$) had similar mean scores, indicating that they had a moderate effect. The practiced course content recorded the lowest mean score ($M = 5.56$, $SD = 1.01$), indicating a relatively smaller role in fostering critical thinking development. On the other hand, the standard deviation indicates that Technology Use ($SD = 2.51$) had the highest variability in responses, whereas Course Content ($SD = 1.01$) showed the least variability. The variations highlight differing

perceptions among students regarding how these factors supported their critical thinking development.

In sum, teaching methods, assessment methods, and technology blending appear to be the most impactful factors that play a significant role in developing critical thinking skills, as evidenced by the higher mean value. Conversely, factors such as course content seem to have less impact. These findings suggest the need for educational strategies focusing on innovative teaching and assessment practices as well as the integration of advanced technology to enhance critical thinking skills. Furthermore, enhancing other factors is necessary, given the significant disparity in the participants' perceptions.

Figure 1
Comparison of Factor Mean Values



Discussion

The study examined how personal and institutional environmental factors impacted junior high school students' critical thinking development after applying new teaching approaches in the school. The data demonstrated that the teaching methods had the highest mean score of all seven factors ($M = 15.64$, $SD = 2.26$), followed by assessment methods ($M = 14.18$, $SD = 2.32$) and technology integration ($M = 13.22$, $SD = 2.51$). This ranking underscores the central role of interactive, discussion-based strategies in fostering critical thinking skills. For instance, the group discussion item alone had the highest mean value ($M = 4.00$, $SD = 0.84$).

Previous studies indicated that active learning, collaborative discussion, inquiry-based learning, problem-based learning, and Socratic questioning are all important for developing analytical and evaluative skills (Abrami et al., 2015; Ranbir, 2024; Supansa et al., 2024). The current study data aligns with the previous research, suggesting that it's time to equip educators across disciplines (social science, mathematics, and natural science educators) with the resources to effectively practice innovative teaching approaches, Socratic Questioning (SQ), Question Formulation Technique (QFT), Problem-Based Learning (PBL), and the Concrete-Pictorial-Abstract (CPA) Approach to enhance students' critical thinking.

Technology utilization in the classroom was an influential factor ($M = 13.22$, $SD = 2.51$), highlighting its perceived effectiveness among students. The findings indicate that most students responded positively to technological tools such as PowerPoint slides, videos, and photos, which they felt enhanced their understanding of critical thinking concepts and writing skills. The findings align with previous studies, highlighting the positive role of technological tools in developing students' learning engagement, critical thinking, and achievement (Li, 2024; Valencia & Shodiq, 2024). It means the equitable utilization of the technology is meaningful for diverse backgrounds based on students' learning abilities. However, the relatively high standard deviation ($SD = 2.51$) for technology use indicates that students use it and find it helpful differently. The variation in perceptions suggests that teachers need training to strengthen their skills and adopt best practices in using technology. Presenting without engaging content, even with tools like PowerPoint, is unlikely to help educators achieve their teaching objectives. Therefore, educators should integrate diverse technological tools such as computers, tablets, and software with an artistic approach to foster conceptual clarity and critical thinking skills among students.

Assessment methods ranked second among the seven factors ($M = 14.18$, $SD = 2.32$), indicating students view them as a key support for critical thinking. Within this category, feedback items scored the highest mean value ($M = 3.82$, $SD = 0.86$), while “confused problem-based questions” received $M = 3.35$ and $SD = 0.97$, indicating the need for clearly aligned questions with Bloom's Taxonomy. The relatively large SDs (0.86–1.00) indicate various experiences; some students benefit from clear, actionable feedback, whereas others struggle with poorly aligned questions designed in the formative and summative tests. These results underscore that systematic and multidimensional assessment aligns pedagogical goals, which can guide students' reflection and skill development (Lisdawati & Umam, 2022), while inconsistent or unclear evaluation tools hinder both learner progress and teacher decision-making (Brookhart, 2017; Liu & Stapleton, 2018). Going forward, assessment items must map directly to Bloom's revised taxonomy—application, analysis, evaluation, and creation—and include frequent formative tests to ensure alignment with the school's critical thinking philosophy.

Peer interaction ranked as another influential factor among all others ($M = 12.71$, $SD = 2.34$), indicating a moderate but consistent role in supporting junior high school students' critical thinking skills. Within this facet, peer group discussion received the highest endorsement ($M = 4.09$, $SD = 0.85$), followed by working with classmates ($M = 4.05$, $SD = 0.95$) and group projects such as poster creation ($M = 3.95$, $SD = 0.87$). Classroom management scored lowest ($M = 3.69$, $SD = 0.88$), suggesting some variability in how seating and grouping are organized. The relatively narrow SDs for discussion items show broad agreement on their value, whereas the larger spread for management points to consistent implementation. The findings align with the previous studies that explored how well-structured collaborative activities enhance reasoning and problem-solving (Kong, 2014; Li & Guo, 2015), but the current data add that the quality of group facilitation rather than mere frequency shapes critical thinking. Since frequent, active, and quality interaction is important, every subject educator should create a respectful and productive classroom climate by implementing structured collaborative group discussion, debate, and peer teaching models.

The role of self-efficacy and motivation in students' critical thinking development was impactful ($M = 8.39$, $SD = 1.84$). Previous studies have demonstrated a strong relationship between students' self-activeness and the development of critical thinking (Asadullah et al., 2019; Komarraju & Nadler, 2013). This study revealed a slight difference, suggesting that self-efficacy plays a less significant role than other factors. The finding implies that the factors could have a more significant impact despite potential differences in the participants' learning abilities and grade levels from previous studies. The first- and second-year students who demonstrated self-activeness and motivation significantly improved their writing and oral presentation skills, achieving higher final-term scores than anticipated. Additionally, most students strongly believed in their ability to solve problems and the value of critical thinking for their careers, indicating the need for teachers to engage them and present learning content that fosters critical thinking skills rather than mere memorization. Henceforth, the educators should empower the students' interest by explicitly conveying the importance of critical thinking. For instance, a worksheet should include structured critical thinking questions related to daily life activities, allowing them to illustrate or visualize causes, effects, and solutions to real-world problems. In addition, educators should provide 'clear and prompt' constructive feedback on each type of question or problem so that they can differentiate it and connect it to their complex writing.

The classroom environment was also perceived as a significant factor ($M = 8.35$, $SD = 1.67$) in developing junior high students' critical thinking, although its mean score was lower than that of other factors. However, the findings can be significant in changing and moderating the critical thinking process in the classroom, although classroom management may not directly impact their writing

skills. This finding partially aligns with previous studies that suggest the learning environment is important for fostering critical thinking (Ghanizadeh, 2017; Rompelman & Broek, 2012). The conclusion implies that the study's findings also point to a deficiency in discussion-based learning, which provides students with ample opportunities to express their opinions freely. Therefore, educators should allocate 70% of classroom time to interactive discussions and question-based activities to enhance critical thinking and 30% to lecture-based teaching for conceptual understanding.

The analysis proved that curriculum or course content positively impacts the development of critical thinking in junior high school students ($M = 5.5648$, $SD = 1.01427$), although its mean value was relatively lower compared to other factors. Previous research also highlights the significant role of curriculum in fostering higher-order thinking; however, these studies often lack details on the magnitude of its effect (Bezanilla et al., 2019; Hoirina et al., 2024). Despite its relatively lower mean score, well-structured course content, when aligned with the highest levels of critical thinking, has the potential to moderate students' cognitive processes and enhance their writing skills. For instance, studies have shown that interactive and inquiry-based approaches in natural science subjects inspire independent thinking and problem-solving (Jamil et al., 2024). Similarly, integrating innovative tools such as Web 2.0 technologies can strengthen students' critical thinking dispositions (Korukluoğlu, P., Çeliköz, M., & Gürol, M., 2022; Pinar et al., 2022).

In addition, the result indicates gaps or unclear curriculum content and presentation within the classroom environment. For example, conflating questioning practices without categorizing them according to learning objectives or taxonomy can hinder students' logical reasoning. According to Social Cognitive Theory, environmental factors like teaching aids and curriculum alignment with assessments play a crucial role in motivating students toward critical thinking development (Bandura, 1986). Therefore, educators should prioritize creating dynamic and flexible content that can promote analytical thinking and creativity while minimizing reliance on rote memorization. Therefore, educators should align clear content and questions with taxonomy, which includes analysis, evaluation, and creation. For instance, educators should plan their presentation and practice of content by clearly separating critical thinking elements, such as focusing on analysis and progressing toward creation.

Ultimately, the study suggests the school invest in professional development programs for teachers, advanced technological tools, and creative teaching materials to create an engaging learning environment for both teachers and students. Professional development by "Foster a Culture of Inquiry by Inter- and Intra-School Workshop": Regarding inter-school workshops, organize annual and biannual workshops and research presentations, connecting with other member schools' faculty members to develop critical thinking pedagogy for faculty. In this type of workshop, each department's faculty members should be encouraged to

present their creative ideas and experience by doing structured research studies or experiments in the classroom that better engage students and develop critical thinking.

Conclusion

The study utilized Social Cognitive Theory (SCT) to analyze the factors impacting the critical thinking ability of junior high school students (Bandura, 1986). The descriptive analysis indicated the critical role of environmental factors, such as teaching methods, learning materials (technological aids), and assessment methods. Personal factors and other environmental aspects, including peer interactions, students' self-efficacy and motivation, course content, and classroom environment, also contribute meaningfully. The findings of this study align closely with the theoretical framework, which emphasizes the significant influence of personal and environmental factors on students' cognitive thinking and learning behaviors. The findings are not only valuable for school educators but also for university education levels that can adopt innovative teaching strategies, leverage diverse technological tools, and design structured assessment methods to foster students' analytical, evaluative, and creative thinking. Additionally, the college should consider broader changes in professional development programs and learning aids and foster a culture of critical thinking throughout the school. By addressing these factors, schools offering general, critical thinking, and STEM-based curricula in Japan and globally can equip students with the critical thinking skills needed for success in higher education and the global workforce in the 21st century. Moreover, collective efforts by schools and educators are critical to optimizing teaching practices and supporting every student to realize their potential as critical thinkers.

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