Contents lists available at Science-Gate

International Journal of Advanced and Applied Sciences

Journal homepage: https://www.science-gate.com/IJAAS.html

Investigating critical thinking awareness, competencies, and attitudes in high school students and the implications for educational practices

Lien Thi Bich Nguyen [1], Thang Van Le [2,*], Cong Van Tran [1], Oanh Thi Mai Lu [1]

[1]*Faculty of Education Sciences, VNU University of Education, Vietnam National University, Hanoi, Vietnam*
[2]*Department of Psychology and Education, University of Education, Hue University, Hue, Vietnam*

ARTICLE INFO

Article history:
Received 22 August 2025
Received in revised form
28 March 2026
Accepted 22 April 2026

Keywords:
Critical thinking
Student competencies
Learning attitudes
Educational assessment
Secondary education

ABSTRACT

This study aimed to assess the levels of critical thinking awareness, competencies, and attitudes among high school students and to examine their implications for teaching and learning. A cross-sectional design was used, involving secondary school students from different regions. Data were collected using a 39-item questionnaire based on validated tools, including the Critical Thinking in Daily Life Questionnaire (CTDLQ). Descriptive statistics, including means and standard deviations, were analyzed using SPSS 25.0. The results showed that students moderately recognized the influence of their background on their ability to evaluate issues objectively (M = 3.43, SD = 0.53). In terms of competencies, students performed well in evaluating issues from multiple perspectives (M = 3.86, SD = 0.38), which was one of the highest-rated skills. Regarding attitudes, students also showed a high level of willingness to seek additional information when facing uncertainty (M = 3.86, SD = 0.38), indicating a proactive approach to problem-solving and decision-making. Overall, the findings highlight the importance of developing both awareness and skills to support well-rounded critical thinking. Educational practices should emphasize reflection, open-mindedness, and targeted skill development to address existing gaps and enhance students' critical thinking. These results contribute to a better understanding of critical thinking as a multidimensional concept and provide useful insights for curriculum design and teaching strategies.

1. Introduction

Critical thinking has consistently been recognized as a vital competency for achievement in school, professional endeavors, and everyday life. Critical thinking is defined as the capacity to examine, evaluate, and synthesize information for informed decision-making or problem-solving, involving various cognitive abilities and dispositions that enable individuals to manage complicated and uncertain circumstances (Facione, 2011). In a time marked by swift technological progress, information saturation, and widespread misinformation, critical thinking has become increasingly essential. Educational institutions, especially at the high and tertiary levels, are essential in fostering critical thinking abilities to equip students for these problems (Miri et al., 2007). Research on critical thinking has highlighted its multifaceted nature, encompassing both cognitive skills and emotional dispositions and attitudes. Critical thinking awareness is acknowledging the significance of reasoning and reflection in the assessment of ideas and the resolution of problems. Critical thinking talents encompass specific skills, including the analysis of arguments, the differentiation between pertinent and extraneous material, and the recognition of logical flaws (Halpern, 2013). Moreover, critical thinking dispositions, including open-mindedness, intellectual humility, and perseverance, are vital for cultivating a mentality that promotes good reasoning (Ennis, 2015).

Awareness of critical thinking is essential for cultivating the capacity to reason, assess, and make educated decisions. It pertains to an individual's awareness of the processes and biases that influence their cognition and the significance of reflective reasoning in evaluating concepts and arguments (Facione, 2011). This awareness is crucial for comprehending how beliefs, upbringing, and contextual factors might impact the objectivity and

* Corresponding Author.
Email Address: lvthang@hueuni.edu.vn (T. V. Le)
https://doi.org/10.21833/ijaas.2026.04.020
Corresponding author's ORCID profile:
https://orcid.org/0009-0000-6327-8315

impartiality of one's judgments. In a society where individuals encounter varied perspectives and complicated issues, understanding of critical thinking is essential for developing the skills and attitudes required for effective reasoning and problem-solving. Critical thinking awareness is crucial for cultivating intellectual humility and recognizing personal biases. Halpern (2013) assertted that persons cognizant of the elements affecting their reasoning are more inclined to challenge assumptions, pursue evidence, and contemplate other perspectives. This self-awareness allows individuals to assess information critically and evade prevalent cognitive pitfalls, such as confirmation bias or overgeneralization. Studies indicate that knowledge of critical thinking is significantly associated with enhanced decision-making and the capacity to manage confusing circumstances effectively (Abrami et al., 2015; Dwyer et al., 2014; Halpern and Dunn, 2021). Despite its importance, awareness of critical thinking is frequently undervalued in educational curricula, which typically prioritize specific talents above the foundational awareness that underpins those skills (Lai, 2011). In the absence of specific guidance on the processes and biases influencing thought, students may find it challenging to engage profoundly with intricate concepts or acknowledge the constraints of their reasoning. Fostering this awareness necessitates the establishment of chances for self-reflection, metacognition, and critical engagement with varied information sources.

Critical thinking competences denote the cognitive skills necessary for the successful analysis, evaluation, and synthesis of knowledge. These competences encompass abilities such as detecting arguments, differentiating between pertinent and extraneous information, assessing evidence, and recognizing logical fallacies. These talents, as fundamental elements of critical thinking, empower individuals to systematically tackle complex situations and make educated decisions. Critical thinking skills are essential in both academic and practical settings for tackling obstacles, resolving issues, and participating in constructive dialogue (Bar-Tal et al., 2021; Halpern, 2013; Shutaleva, 2023). Enhancing critical thinking competencies requires both the acquisition of specific skills and the practical use of those skills in many contexts. The capacity to dissect an argument's structure or assess the reliability of evidence necessitates both theoretical comprehension and practical experience (Iordanou and Rapanta, 2021). May et al. (2020) asserts that these talents are transportable and applicable across various fields and situations, hence rendering them exceptionally valuable in a connected and information-dense environment. Moreover, persons possessing robust critical thinking skills are more adept at identifying misinformation, countering cognitive biases, and analyzing topics from several viewpoints. Although the significance of critical thinking abilities is acknowledged, research indicates that numerous students receive inadequate instruction in these competencies (Abrami et al., 2015; Pithers and Soden, 2000). In educational systems that emphasize memorizing rather than analytical thinking, students may find it challenging to cultivate the skills necessary for critical evaluation of arguments or the construction of logical reasoning (Sarwari and Kakar, 2023). Direct education in critical thinking, along with chances for practice and feedback, is crucial for developing these skills. In the absence of intentional integration of critical thinking into the curriculum, students may graduate lacking the abilities required to effectively negotiate intricate professional and personal contexts. Extending discussions on high-school students' critical thinking and broader well-being, a study showed that adolescents' mental-health challenges are shaped by academic stress and peer pressure, and that their openness to seeking professional psychological help plays a key role in this relationship (Nguyen-Thi et al., 2024).

Critical thinking attitudes indicate the individual dispositions and mindsets that facilitate and augment the use of critical thinking skills. The attitudes encompass open-mindedness, intellectual curiosity, perseverance, intellectual humility, and a readiness to engage with other ideas (Schöpfer and Hernandez, 2026). Critical thinking competencies emphasize the "how" of reasoning, whereas critical thinking attitudes pertain to the "why," inspiring individuals to regularly and successfully utilize their talents. Research indicates that a robust foundation in critical thinking attitudes is vital for cultivating a culture of inquiry and lifelong learning, as these attitudes promote the acceptance of challenges, the questioning of assumptions, and the pursuit of evidence-based solutions. Open-mindedness, a fundamental critical thinking disposition, entails the willingness to evaluate diverse perspectives and assess information impartially. This attitude is crucial for surmounting biases and participating in productive discourse. Intellectual humility, defined as the acknowledgment of the boundaries of one's knowledge, promotes an openness to learning and the modification of beliefs based on new information (Leary et al., 2017). These attitudes strengthen individual reasoning and facilitate collaborative problem-solving and successful communication in group contexts. Critical thinking attitudes, despite their significance, are frequently neglected in conventional educational institutions, which tend to prioritize quantifiable competencies over affective dispositions (Almulla and Al-Rahmi, 2023). Studies indicate that cultivating these attitudes necessitates intentional instructional tactics, including encouraging self-reflection, developing a growth mindset, and offering opportunity for meaningful involvement with tough tasks (Chandra Handa, 2023). Educators who prioritize critical thinking dispositions in conjunction with skills might more effectively equip students to address intricate, ambiguous, and dynamic challenges in both academic and real-world settings. Building on work that an investigate high-school students' critical

thinking awareness and attitudes, this study highlights how Vietnamese students' academic obstacles are closely tied to their need for academic advising (Huynh and Tran-Chi, 2019).

Although the significance of critical thinking is recognized, numerous students still have difficulties proficiently utilizing these skills in both academic and practical situations. This disparity frequently arises from insufficient explicit instruction and evaluation of critical thinking within educational curricula, where conventional teaching methods emphasize rote learning and material memorization rather than analytical reasoning (Abrami et al., 2015; Lai, 2011). The cultivation of critical thinking abilities and attitudes significantly differs due to individual variances, cultural contexts, and instructional quality, underscoring the intricate interaction between personal and environmental influences. Cultural norms can either promote free inquiry or restrict it, influencing students' readiness to question assumptions or accept alternative viewpoints. Moreover, numerous educational systems inadequately incorporate critical thinking into subject-specific teaching, resulting in students lacking the opportunity to utilize these abilities in significant, discipline-related contexts. Comprehending these complex influences is crucial for developing tailored educational interventions that foster critical thinking skills and cultivate the necessary attitudes and awareness for their sustained implementation. Educators can effectively prepare children to handle the complexity of an interconnected and information-driven society only by addressing both the cognitive and emotive elements of critical thinking.

This study aims to investigate critical thinking awareness, competencies, and attitudes among high school students, emphasizing their self-reported knowledge, abilities, and dispositions. This research aims to analyze these characteristics to elucidate the present condition of critical thinking among students and pinpoint areas for enhancement. The results will augment the existing research on critical thinking and provide practical applications for educators aiming to improve critical thinking instruction in their classrooms. This study specifically expands upon recognized frameworks of critical thinking, while addressing deficiencies in the current research about the correlation between critical thinking attitudes and competencies.

2. Methods

2.1. Participants

The research had 1,346 participants, chosen from several regions of Vietnam. Geographically, participants were spread over three primary regions: 521 (38.7%) from the North area, 320 (23.8%) from the Central region, and 505 (37.5%) from the South region. Participants were sourced from six distinct provinces or cities: Ho Chi Minh (n = 447, 33.2%), Ben Tre (n = 60, 4.5%), Khanh Hoa (n = 122, 9.1%), Da Nang (n = 83, 6.2%), Ha Tinh (n = 116, 8.6%), Ha Noi (n = 460, 34.2%), and Hoa Binh (n = 58, 4.3%). This distribution illustrates a varied mix of urban and rural environments throughout Vietnam. The gender distribution was imbalanced, with a greater percentage of females (n = 867, 64.4%) than males (n = 479, 35.6%). Participants were distributed throughout three academic grades: grade 10 (n = 407, 30.2%), grade 11 (n = 463, 34.4%), and grade 12 (n = 476, 35.4%). Regarding academic performance, almost half of the participants (n = 670, 49.8%) were categorized as "Distinguished," signifying exceptional academic achievement. A significant segment was classified as "Good" (n = 524, 38.9%), while lesser portions were designated as "Average" (n = 140, 10.4%) and "Poor" (n = 12, 0.9%). These classifications underscore the diverse academic competencies of the sample, presenting a wide range of performance levels. This varied sample facilitates an extensive examination of determinants across regions, gender, grade level, and academic achievement, hence ensuring the generalizability of findings to the wider community of Vietnamese high school students (Table 1).

Table 1: Characteristics of participants

Characteristic	N	%
Regions		
North region	521	38.7
Central region	320	23.8
South region	505	37.5
Province/city		
Ho Chi Minh	447	33.2
Ben Tre	60	4.5
Khanh Hoa	122	9.1
Da Nang	83	6.2
Ha Tinh	116	8.6
Ha Noi	460	34.2
Hoa Binh	58	4.3
Gender		
Male	479	35.6
Female	867	64.4
Academic performance		
Poor	12	0.9
Average	140	10.4
Good	524	38.9
Distinguished	670	49.8

2.2. Measurements

The research included an extensive questionnaire to assess participants' awareness, competencies, and attitudes regarding critical thinking. This instrument was mostly derived from the Critical Thinking in Daily Life Questionnaire (CTDLQ), created by Mincemoyer et al. (2001), within the "Assessing Youth Life Skills" paradigm. The CTDLQ has 20 items intended to assess key elements of critical thinking, such as reasoning, questioning, analysis and information processing, adaptability, and evaluation. The items were administered using a 5-point Likert scale, with response options from "strongly disagree" (1) to "strongly agree" (5). To augment the instrument's scope and applicability, the study team integrated further items based on Cottrell (2014) framework, which underscores the interrelation of awareness, abilities, and attitudes in critical thinking.

The identified deficiencies in the current measures were rectified by including newly designed items, culminating in a final instrument of 39 items. The completed questionnaire was crafted to comprehensively evaluate critical thinking, encompassing participants' comprehension of critical thinking concepts (awareness), their capacity to employ critical reasoning and analytical abilities (competencies), and their willingness to participate in critical thinking practices (attitudes). Psychometric testing was performed to verify the reliability and validity of the questionnaire. The internal consistency study produced a Cronbach's alpha of 0.91, signifying exceptional reliability. The research team performed exploratory factor analysis (EFA) to validate the latent construct of critical thinking, confirming the instrument's factorial structure and its appropriateness for assessing the targeted domains. The scoring process entailed computing mean scores for each participant based on their replies to all 39 items. Elevated mean scores signified a more pronounced presence of critical thinking awareness, skills, and attitudes. The stringent adaptation procedure, exceptional reliability, and established framework confirm the suitability of this instrument for evaluating critical thinking in the intended demographic. More granular documentation may be elaborated in extended methodological work derived from this study.

2.3. Procedures

The research was executed in multiple phases to guarantee thorough data collection and analysis. The study team initially developed a questionnaire to evaluate critical thinking awareness, competences, and attitudes, utilizing established instruments such as the Critical Thinking in Daily Life Questionnaire (CTDLQ) by Mincemoyer et al. (2001) and Cottrell (2014) critical thinking framework. The completed questionnaire, comprising 39 items assessed on a 5-point Likert scale, was tested with a small sample to verify clarity, validity, and reliability. The overall reliability coefficient of the questionnaire was established. Participants were selected from a varied cohort of high school students from multiple regions. Consent was secured from school administrators, participants, and their guardians before data collection commenced. Participants were informed of the study's objective, guaranteed the anonymity of their responses, and taught how to complete the questionnaire. The questionnaire was conducted in classroom environments under the oversight of qualified researchers to guarantee consistency in data collection methods. The data collection occurred over a fortnight, during which students completed the questionnaire in roughly 30 minutes. Subsequently, the finalized questionnaires were examined for thoroughness and precision prior to their entry into a statistical software application for analysis.

Exploratory factor analysis was used to validate the questionnaire's structure, thereafter accompanied by descriptive and inferential statistical analyses for data interpretation. During the study, ethical principles were rigorously followed, encompassing voluntary participation, preservation of participant anonymity, and utilization of data solely for research reasons. The processes aimed to reduce any biases and guarantee the validity and reliability of the results.

2.4. Data analysis

The data gathered in this study were examined employing descriptive statistical approaches to elucidate students' awareness, competencies, and attitudes toward critical thinking. Initially, all replies were evaluated for completeness and accuracy, with incomplete or inconsistent data omitted from the analysis. Descriptive statistics, comprising means (M) and standard deviations (SD), were computed for each questionnaire item to evaluate the overall levels of critical thinking across the three domains. The study was designed to provide a descriptive overview of students' critical thinking awareness, competencies, and attitudes. Accordingly, the analysis focuses on descriptive statistics, which align with the study's exploratory purpose.

3. Results

3.1. Critical thinking awareness

The study evaluated participants' awareness of critical thinking through many aspects, including mean scores (M) and standard deviations (SD) for each item. The results reveal differing degrees of awareness, with certain elements demonstrating superior comprehension compared to others (Table 2).

Table 2: Mean and SD of critical thinking awareness

Items	M	SD
I know the different meanings of the word "argue" in critical thinking.	3.14	0.38
I am aware of how my current beliefs may bias my ability to consider issues fairly.	3.00	0.00
I understand how to construct an argument.	3.29	0.49
I am aware of how my upbringing or the way I was raised can create bias in considering issues fairly.	3.43	0.53
I understand why vague language is often used in research papers.	3.00	0.58
I realize that sometimes there is no right or wrong answer to a question.	3.71	0.49
It is important to me to have information to support my opinions.	3.29	0.49

Participants exhibited a moderate awareness of the various interpretations of the term "argue" in critical thinking (M = 3.14, SD = 0.38), indicating a fundamental comprehension of this concept. The mean score for awareness of how present beliefs may prejudice the capacity to evaluate issues impartially was M = 3.00, SD = 0.00, indicating

consistency in replies. The absence of variety suggests that participants may possess a common understanding of their biases or possibly a restricted contemplation on this matter. The comprehension of argument construction demonstrated a marginally elevated awareness, with a mean score of M = 3.29 and SD = 0.49, underscoring participants' proficiency in this aspect of critical thinking. Participants similarly recognized the impact of their upbringing on their capacity to objectively evaluate issues (M = 3.43, SD = 0.53), reflecting a heightened awareness of personal factors influencing their critical thinking. Participants exhibited a moderate awareness of the function of ambiguous language in research publications (M = 3.00, SD = 0.58). This indicates that although participants acknowledge its existence, there may be discrepancies in their comprehension of its purpose or effects. The greatest awareness was noted on the understanding that there is often no absolute right or incorrect answer to a question (M = 3.71, SD = 0.49), indicating participants' receptiveness to ambiguity and complexity in critical thinking contexts. Ultimately, participants recognized the significance of possessing evidence to substantiate their viewpoints (M = 3.29, SD = 0.49), indicating an appreciation for evidence-based thinking.

The results indicate that individuals possess a moderate awareness of critical thinking, demonstrating abilities in identifying ambiguity and comprehending personal biases. Nonetheless, certain domains, such as the identification of ambiguous language or the examination of biases in beliefs, may necessitate more refinement.

3.2. Critical thinking competencies

The critical thinking competencies of participants were assessed with 23 items designed to measure their capacity to analyze, understand, and evaluate many facets of information. The findings, illustrated in Table 3, indicate a predominantly moderate to high degree of critical thinking ability within the population, with certain abilities exhibiting greater proficiency than others.

Participants had a modest capacity to concentrate on the specific demands of a task (M = 3.14, SD = 0.38) and to evaluate the framework of an argument (M = 3.43, SD = 0.53). The ability to comprehend the significance of succinct words yielded a moderate mean score (M = 3.14, SD = 0.69), although the recognition of indicators denoting stages of an argument attained an equivalent score to that of evaluating argument structures (M = 3.43, SD = 0.53). The capacity to differentiate between primary and secondary concepts in both speech and writing (M = 3.29, SD = 0.76) and to meticulously examine data for precise comprehension (M = 3.29, SD = 0.76) received comparable evaluations, indicating uniformity in these competencies. Moderate competence was observed in recognizing inappropriate persuasive strategies (M = 3.14, SD = 0.38) and in interpreting the implications of words and paragraphs (M = 3.29, SD = 0.76).

Table 3: Mean and SD of critical thinking competencies

Items	M	SD
I can concentrate on the exact requirements of an activity.	3.14	0.38
I can analyze the structure of an argument.	3.43	0.53
I can understand the meaning of a sentence, even if it is quite brief.	3.14	0.69
I am good at recognizing the signals used to indicate the stages of an argument.	3.43	0.53
I find it easy to distinguish between main (important) and secondary (unimportant) ideas in speech and writing.	3.29	0.76
I am very patient in carefully reviewing the facts to get an accurate view.	3.29	0.76
I am good at identifying inappropriate techniques used to persuade readers.	3.14	0.38
I am good at reading the implications of sentences and paragraphs.	3.29	0.76
I find it easy to evaluate evidence to support a point of view.	2.71	0.49
I find it a breeze to consider different points of view objectively.	3.14	0.69
I can present my arguments clearly.	3.86	0.38
I can distinguish between descriptive and analytical text.	3.43	0.53
I can easily spot a contradiction in an argument.	3.57	0.53
I am good at identifying patterns in text.	3.00	0.58
I know how to evaluate original documents.	3.57	0.53
I can answer open-ended questions logically.	3.43	0.53
I can easily understand the main idea of an article.	3.57	0.53
I can appreciate what other people are arguing.	3.71	0.76
I can give simple examples to clarify what I am explaining.	3.57	0.53
I can judge a problem accurately.	3.57	0.53
I can understand the content of multiple-choice questions.	3.29	0.49
I understand the connection between the headline and the news content of a particular article.	3.57	0.53
When I encounter a problem, I can analyze it from many different perspectives.	3.86	0.38

Participants demonstrated a relatively diminished capacity to assess evidence corroborating a viewpoint (M = 2.71, SD = 0.49), highlighting a necessity for enhancement in critical assessment competencies. Participants demonstrated superior competencies in articulating arguments (M = 3.86, SD = 0.38), differentiating between descriptive and analytical texts (M = 3.43, SD = 0.53), and identifying contradictions in arguments (M = 3.57, SD = 0.53). Participants exhibited proficient abilities in assessing original papers (M = 3.57, SD = 0.53), responding to open-ended inquiries logically (M = 3.43, SD = 0.53), and discerning the principal concepts of articles (M = 3.57, SD = 0.53). Participants demonstrated elevated competence in comprehending others' arguments (M = 3.71, SD = 0.76), using straightforward examples to elucidate explanations (M = 3.57, SD = 0.53), and appropriately assessing difficulties (M = 3.57, SD = 0.53). Furthermore, they excelled in comprehending the relationship between headlines and news content (M = 3.57, SD = 0.53) and in evaluating issues from many viewpoints (M = 3.86, SD = 0.38), which was among the highest-rated competences. The findings indicate that participants have robust critical thinking skills, especially in articulating

arguments, identifying contradictions, and examining issues from multiple perspectives. The comparatively lower score for evidence evaluation (M = 2.71, SD = 0.49) underscores a domain requiring additional enhancement. This disparity between robust interpretative skills and deficient evaluative skills offers a nuanced comprehension of participants' critical thinking capabilities.

3.3. Critical thinking attitude

The study examined participants' attitudes towards critical thinking, emphasizing their openness, patience, and dedication to participate in critical evaluation and reasoning. Mean scores (M) and standard deviations (SD) for each item were evaluated, revealing an overall favorable disposition toward critical thinking, although certain areas exhibited greater consensus than others (Table 4).

Table 4: Mean and SD of critical thinking attitudes

Items	M	SD
I feel comfortable pointing out potential weaknesses or limitations in the work of professionals.	3.57	0.53
I can give criticism without feeling that it makes me a negative person.	3.29	0.49
I listen to other people's opinions even when I disagree with them.	3.43	0.53
I am open to different ideas when planning to make decisions.	3.86	0.38
I am willing to sacrifice a lot of time and energy to improve my reasoning.	3.71	0.49
It is well worth the time and energy to acquire and use critical thinking.	3.71	0.49
I am patient in identifying the lines of reasoning in an argument.	3.43	0.53
If I am unsure about something, I will research to find out more information.	3.86	0.38
I often pay attention to small details.	3.43	0.53

Participants indicated a comfort level in identifying potential shortcomings or limits in professional work, with a mean score of M = 3.57 and a standard deviation of SD = 0.53. This indicates a considerable degree of confidence in constructive criticism. Participants had moderate confidence in delivering criticism without seeing it negatively (M = 3.29, SD = 0.49), indicating potential for further enhancement in balancing assertiveness and diplomacy in critique. Participants demonstrated a good inclination towards considering others' thoughts, despite disagreements (M = 3.43, SD = 0.53), reflecting their openness to other perspectives. The greatest consensus was seen in their receptiveness to diverse views during decision-making (M = 3.86, SD = 0.38), underscoring their flexibility and inclusivity in the decision-making process. Participants showed a robust inclination to dedicate time and effort to enhance their reasoning (M = 3.71, SD = 0.49) and recognized the value of gaining and utilizing critical thinking skills (M = 3.71, SD = 0.49). These findings highlight their acknowledgment of the enduring significance and applicability of critical thinking skills in both personal and professional realms. The capacity to discern streams of reasoning within arguments was assessed as moderate (M = 3.43, SD = 0.53), indicating their persistence in comprehending intricate arguments. A comparably elevated score was observed in their preparedness to investigate and pursue supplementary information when faced with uncertainty (M = 3.86, SD = 0.38), demonstrating their proactive methodology in problem-solving and decision-making. Participants exhibited moderate attentiveness to minor details (M = 3.43, SD = 0.53), reflecting a cautious and meticulous approach to critical evaluation. This characteristic enhances their overall critical thinking disposition and aids in a holistic approach to reasoning and analysis. Participants demonstrated a favorable and involved disposition towards critical thinking. Elevated scores in openness to ideas, readiness to exert effort, and initiative in information acquisition indicate a robust basis for cultivating advanced critical thinking skills. Nevertheless, aspects such as confidence in providing critique and patience in evaluating arguments may require future improvement to optimize participants' critical thinking capabilities. The item-by-item presentation of results is intentionally detailed to ensure transparency across the three domains measured by the 39-item instrument. A more synthesized presentation may be developed in subsequent analytical publications building on this descriptive foundation.

4. Discussion

The findings of this research underscore the crucial influence of critical thinking knowledge, skills, and attitudes on participants' cognitive growth. The elevated levels of awareness and proficiency indicate that participants possess a robust comprehension of essential critical thinking principles and can effectively apply them across many situations, especially in formulating and articulating arguments. The favorable attitudes toward critical thinking reinforce the idea that participants appreciate and are inclined to engage in critical reasoning processes, including information evaluation, perspective consideration, and knowledge acquisition in the face of ambiguity. Nevertheless, the somewhat lower results in analyzing evidence and offering constructive criticism suggest that, although participants exhibit overall ability, certain elements of critical thinking may want additional focus.

The findings indicate that although individuals possess adequate critical thinking abilities, specific interventions or further training could enhance these capabilities, especially in domains necessitating more sophisticated analysis and reflection. The study emphasizes the necessity of cultivating critical thinking skills and dispositions in educational and professional environments to enhance decision-making and problem-solving capabilities.

Critical thinking awareness denotes an individual's comprehension of the cognitive mechanisms underlying reasoning, problem-solving, and decision-making. It includes the capacity to identify biases, assumptions, and diverse variables that may impact judgment and decision-making. In this study, participants exhibited moderate to high awareness of critical thinking ideas, which is essential for enhancing their general critical thinking abilities. An essential component of critical thinking awareness is the capacity to identify how personal convictions, upbringing, and environmental factors might influence reasoning. Participants in this study were acutely cognizant of how their existing beliefs could skew their capacity to evaluate issues objectively. This aligns with current studies highlighting the significance of acknowledging cognitive biases, facilitating a more objective and balanced approach (Ehrlinger et al., 2016; Montibeller and von Winterfeldt, 2015). By recognizing these biases, individuals can reduce their influence and address situations with greater objectivity, which is crucial for equitable assessment and decision-making. Recognizing that personal experiences or cultural backgrounds may shape one's perception of information helps foster reflective thinking, prompting individuals to critically examine their beliefs and explore alternate perspectives (Roiha and Sommier, 2021). Participants demonstrated an understanding of the frequent use of ambiguous language in research and the necessity to acknowledge the complexities or ambiguities in arguments. This awareness is essential for cultivating the capacity to critically assess arguments, as it enables individuals to discern flawed reasoning or ambiguous claims in the information they encounter (Facione, 2011; Halpern, 2013). Moreover, participants recognized that there are instances where definitive right or wrong answers do not exist, indicating an awareness of the intricacies of various topics and the constraints of binary reasoning. This knowledge is crucial for addressing complex issues since it prompts individuals to contemplate various views and investigate nuanced solutions instead of depending on simplified responses. Understanding critical thinking processes includes acknowledging the necessity of substantiating opinions with evidence (Teng and Yue, 2023). In this study, participants assigned a high value to the necessity of supporting material for their beliefs, demonstrating an awareness of the relevance of evidence-based thinking. This demonstrates an appreciation for the necessity of assessing sources, differentiating between credible and non-credible information, and formulating arguments based on facts rather than conjecture or personal convictions. This awareness is essential for critical thinking, enabling individuals to engage with information more reflectively and to make better-informed judgments (Dykhne et al., 2021). Although there is a robust basis in critical thinking awareness, several areas warrant further enhancement. Participants exhibited an understanding of bias and the necessity for supporting evidence; nevertheless, their awareness of identifying ambiguous or biased language in research and media was comparatively diminished. This indicates that although participants had a general comprehension of critical thinking principles, their capacity to implement this knowledge in specific settings may require additional development (Lai, 2011). By improving the capacity to critically assess language and evidence, individuals can conduct more nuanced evaluations of the information they receive. The awareness of critical thinking is an essential initial step in cultivating advanced critical thinking abilities. The study's findings underscore participants' robust comprehension of reasoning processes, bias identification, and the significance of evidence. Nonetheless, sustained emphasis on assisting individuals in applying this understanding to practical scenarios—such as discerning biases in language or acknowledging intricate, multi-faceted issues—will enhance their comprehensive critical thinking skills. By cultivating critical thinking awareness, educators can more effectively equip learners to interact with information in a thoughtful, objective, and reflective way, improving their decision-making and problem-solving abilities (Facione and Facione, 2013).

Critical thinking competencies denote the actual talents and abilities individuals employ in assessing, evaluating, and formulating arguments, making decisions, and resolving problems. These talents are crucial for interacting with intricate concepts and forming informed decisions in academic, professional, and daily contexts. This study revealed that participants exhibited diverse critical thinking skills, including the capacity to articulate and convey arguments coherently, recognize inconsistencies, and evaluate issues from many viewpoints. These qualities correspond with accepted definitions of critical thinking that highlight the capacity to evaluate evidence, recognize patterns, and assess the validity of arguments. A significant competency identified in the study was the participants' capacity to examine and dismantle arguments. They successfully identified the structure of an argument, differentiated between salient and trivial concepts, and assessed the evidence substantiating claims. This aligns with Facione and Facione (2013) characterization of critical thinking as the methodical assessment of arguments. The capacity to analyze the logical framework of arguments enables individuals to evaluate if conclusions derive from premises and if evidence is suitably employed to substantiate assertions. In academic and professional contexts, such analytical skills are essential for assessing research, policy proposals, and routine decisions that necessitate meticulous examination of conflicting viewpoints. Another significant quality exhibited by participants was their capacity to assess challenges from various viewpoints. The capacity to approach a problem from several perspectives is a defining characteristic

of critical thinking, allowing individuals to assess situations more thoroughly and contemplate a broader array of solutions. The capacity to consider other viewpoints aids persons in addressing intricate, complicated issues lacking clear resolutions. It promotes intellectual humility by recognizing that one's viewpoint is not the sole valid perspective, an essential quality for effective critical thinking (King and Kitchener, 2004).

Participants demonstrated robust skills in assessing the quality of evidence utilized to substantiate arguments. Their capacity to differentiate between descriptive and analytical texts, as well as to recognize patterns, demonstrated an awareness of how to evaluate information for relevance and dependability. This competency is intricately linked to information literacy abilities, which are vital for critical thinking in the contemporary information era (Moustaghfir and Brigui, 2024). The capacity to assess evidence proficiently enables individuals to make educated decisions and evade influence from incorrect or biased sources. Notwithstanding these characteristics, the study identified opportunities for improvement, especially in assessing evidence to substantiate arguments. The participants' diminished scores in this domain indicate that, although they can formulate and articulate arguments, they may require additional enhancement in critically assessing the credibility of their evidence and evaluating its quality.

This finding aligns with Ennis (2015) research, which indicated that critical thinking encompasses not just analytical and reasoning abilities but also the capacity to assess the trustworthiness and relevance of utilized information. Consequently, educational interventions aimed at strengthening participants' capacity to evaluate the credibility of sources and evidence would be advantageous for developing their general critical thinking skills. Furthermore, the ability to deliver constructive criticism was identified as a domain requiring further enhancement. While participants showed proficiency in articulating their views and assessing evidence, the ability to provide constructive criticism in a non-adversarial manner necessitates more development. Constructive criticism is a vital component of critical thinking, as it promotes collaborative problem-solving and the enhancement of ideas (Carlgren, 2013).

By integrating training on providing and receiving constructive feedback, instructors can assist participants in honing this skill and enhancing their critical thinking capabilities. Critical thinking competencies are essential for an individual's capacity to participate in rational and reflective thought. The study participants exhibited robust skills in argument formulation, problem assessment, and evidence appraisal, which are crucial for effective decision-making. Nonetheless, aspects like evidence assessment and the delivery of constructive criticism signify avenues for development. Enhancing these competences through specific treatments could improve participants' critical thinking skills, allowing them to address difficult topics more adeptly and make more informed decisions in academic and real-world scenarios.

Critical thinking attitudes define the inclinations or cognitive habits that affect a person's method of engaging in critical thought. These attitudes are crucial for cultivating an open-minded, introspective, and inquisitive disposition that facilitates successful problem-solving and decision-making. In this study, participants demonstrated many attitudes essential for cultivating robust critical thinking skills, such as receptiveness to differing perspectives, readiness to challenge assumptions, and determination to pursue information. These perspectives correspond with the wider definitions of critical thinking, highlighting the importance of both cognitive abilities and reflective dispositions essential for higher-order thinking (Lai, 2011).

Participants exhibited a remarkable willingness to entertain other ideas and perspectives, despite encountering dissent. This disposition is intimately connected to intellectual humility, an essential element of critical thinking that entails acknowledging the boundaries of one's knowledge and being receptive to learning from others. This study revealed that participants shown a readiness to consider differing ideas, even in the face of disagreement, which is a crucial advancement in fostering critical thinking. Embracing other ideas enables individuals to expand their comprehension and prevent entrenchment in limited viewpoints. This openness is crucial for cultivating a more sophisticated and educated viewpoint on intricate matters, as it promotes engagement with a variety of information sources and concepts. A notable attitude observed in the study was a dedication to enhancing one's thinking skills. Participants demonstrated a robust commitment to investing time and effort in the enhancement of their critical thinking abilities. This perspective embodies the concept of intellectual persistence, defined as the ability to endure complexity and challenges during critical thinking (Halpern, 2013; Lai, 2011).

Intellectual endurance is essential for addressing complex issues and making educated decisions. Participants exhibited a growth mindset by recognizing the necessity for ongoing enhancement in their reasoning, signifying the view that critical thinking skills can be cultivated via effort and practice. This mentality is essential for fostering enduring learning habits and the ability to adjust to new information or evolving situations. The participants conveyed a significant appreciation for critical thinking, asserting that they consider the investment of time and effort in acquiring and applying these abilities to be worthwhile. This perspective corresponds with the notion of intrinsic motivation, when individuals participate in activities not for external incentives but due to the inherent significance and value of the action itself. Individuals with good attitudes toward critical thinking are more inclined to actively pursue opportunities to

employ these abilities across diverse contexts, enhancing their cognitive and intellectual development. The study's findings indicate that participants acknowledge the significance of critical thinking and are driven to integrate it into their daily routines. Participants exhibited patience and persistence when grappling with intricate concepts and arguments. This disposition is crucial for critical thinking, as it prompts individuals to meticulously investigate and assess material prior to reaching conclusions. The capacity to have patience in discerning logical arguments and to meticulously evaluate evidence is essential for making sound decisions, particularly in contexts when information is unclear or insufficient. This disposition of meticulous, intentional contemplation is crucial for circumventing impulsive judgments or rash conclusions, frequently predicated on insufficient or skewed information. The study participants exhibited robust critical thinking attitudes; however, opportunities for enhancement were also recognized. Participants could improve their capacity to manage criticism and react to feedback in a positive manner. Critical thinking encompasses not only receptiveness to novel concepts but also the readiness to evaluate one's own reasoning and embrace feedback from others. Motivating participants to accept constructive comments as a growth opportunity may enhance their critical thinking dispositions. Attitudes toward critical thinking are essential for fostering the development and utilization of critical thinking skills. The study indicated that participants demonstrated several positive attitudes, such as receptiveness to differing perspectives, a desire to enhance reasoning skills, and an acknowledgment of the importance of critical thinking. These mindsets are essential for cultivating a contemplative and inquiring methodology in problem-solving and decision-making. Promoting a constructive attitude toward hearing criticism and revising one's thinking could further strengthen participants' critical thinking dispositions. By fostering these attitudes, educators can assist individuals in cultivating the requisite mentality for engaging in deliberate, introspective, and effective critical thinking.

This study's findings have significant implications for educational practice and future research in critical thinking. The findings indicate that cultivating critical thinking awareness, skills, and dispositions in students can markedly improve their capacity to analyze, assess, and formulate coherent arguments. Considering the favorable attitudes toward critical thinking, educators can leverage these tendencies to establish learning settings that foster greater involvement with intricate issues. By incorporating critical thinking across diverse disciplines and promoting active, reflective learning, educators may facilitate the development of essential abilities for student success in academic and real-world environments. The study emphasizes the significance of fostering a growth mindset and a dedication to lifelong learning, since participants exhibited a readiness to invest time and effort in enhancing their reasoning skills. Furthermore, the results emphasize the importance of instructing students in the critical evaluation of evidence quality and the identification of argument structures. These competencies are crucial for students to make educated judgments and manage the growing complexity of information in the contemporary digital era. Consequently, instructors ought to concentrate on cultivating students' abilities in source evaluation, bias recognition, and differentiation between substantiated and unsubstantiated assertions. Educators may mitigate the proliferation of misinformation and enhance decision-making abilities across multiple disciplines by instructing students on how to critically engage with information. The study indicates that interventions designed to improve critical thinking attitudes, such as fostering intellectual humility and patience in reasoning, may effectively promote students' cognitive development. Educating pupils to embrace varied viewpoints and constructive feedback is essential for fostering reflective and balanced cognition. These attitudes are crucial for academic achievement and are also vital in promoting collaborative, courteous discourse in professional and daily environments. Ultimately, the study's results have ramifications for the development of forthcoming educational programs and curriculum. Integrating critical thinking into educational frameworks at both primary and higher education levels equips students to address difficult topics, solve problems efficiently, and engage meaningfully in democratic societies. These initiatives can cultivate a cohort of learners who are more adept at traversing an increasingly interconnected and information-dense environment. These implications are intended to outline possible educational directions rather than prescribe causal recommendations.

This study offers significant insights into participants' critical thinking awareness, competences, and attitudes; however, numerous limitations warrant consideration. The sample was not randomized, and the individuals were predominantly sourced from a certain geographical area. This constrains the applicability of the findings to alternative populations or localities. Subsequent research could enhance its findings by incorporating a more diverse sample regarding geography, age, and socio-economic status to more effectively examine the impact of these variables on critical thinking development. A further disadvantage of the study is the dependence on self-report data, which may be influenced by social desirability bias or mistakes in participants' self-evaluation of their critical thinking abilities and attitudes. Participants may exaggerate their talents or offer replies they perceive as socially desirable, rather than genuinely representing their genuine attitudes or competences. To mitigate this constraint, subsequent research could integrate objective measures, such as performance-based assessments or evaluations by

instructors, to attain a more precise comprehension of participants' critical thinking capabilities. The research utilized a singular questionnaire to evaluate critical thinking awareness, abilities, and attitudes. Although this tool was created based on recognized frameworks and exhibited substantial reliability, it may not encompass the complete intricacy of critical thinking across various domains and circumstances. Future study may investigate the utilization of several assessment instruments to obtain a more holistic understanding of critical thinking abilities and dispositions.

Moreover, longitudinal studies could monitor alterations in critical thinking over time to see how these competences evolve due to certain educational programs or life situations. Ultimately, although the study examined critical thinking broadly, it did not investigate specific domains or disciplines where its application may differ. Critical thinking may vary across STEM fields, humanities, and social sciences, and future research might investigate how disciplinary distinctions influence the cultivation and utilization of critical thinking. Examining the use of critical thinking in certain professional or real-world contexts may yield significant insights into the transfer and utilization of these talents in practice. Further interpretive elaboration may be developed in subsequent studies that incorporate additional analytical techniques or qualitative insights.

5. Conclusion

This study underscores the essential necessity of cultivating awareness, skills, and dispositions in critical thinking to equip students for intricate difficulties in both academic and real-world environments. The results reveal that although students exhibit moderate critical thinking skills, there is a necessity for more focus on fostering reflective awareness and open-mindedness. Mitigating biases, fostering intellectual humility, and developing perseverance in reasoning are crucial for improving critical thinking dispositions. Educational systems must stress the integration of critical thinking into curricula, emphasizing both cognitive skills and affective elements to enable comprehensive development. These findings necessitate focused techniques that integrate direct education, practice opportunities, and self-reflection to enhance critical thinking skills. Ultimately, equipping kids with these abilities can facilitate their enduring success and meaningful participation in an increasingly intricate environment.

Acknowledgment

The authors gratefully acknowledge the financial support provided by the VNU University of Education, Vietnam National University, Hanoi, Vietnam under project code QS.20.04, approved on July 16, 2020.

Compliance with ethical standards

Ethical considerations

The study was conducted in accordance with ethical standards. All participants were informed about the research's objectives and provided their informed consent voluntarily. The data collected was kept confidential and used strictly for academic research purposes to ensure the privacy of all respondents.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

Abrami PC, Bernard RM, Borokhovski E, Waddington DI, Wade CA, and Persson T (2015). Strategies for teaching students to think critically: A meta-analysis. Review of Educational Research, 85(2): 275-314. https://doi.org/10.3102/0034654314551063

Almulla MA and Al-Rahmi WM (2023). Integrated social cognitive theory with learning input factors: The effects of problem-solving skills and critical thinking skills on learning performance sustainability. Sustainability, 15(5): 3978. https://doi.org/10.3390/su15053978

Bar-Tal D, Vered S, and Fuxman S (2021). Between open-minded critical thinking and closed-minded allegiance: Educational tensions in societies involved in intractable conflict. Political Psychology, 42(S1): 3-28. https://doi.org/10.1111/pops.12687

Carlgren T (2013). Communication, critical thinking, problem solving: A suggested course for all high school students in the 21st century. Interchange, 44: 63-81. https://doi.org/10.1007/s10780-013-9197-8

Chandra Handa M (2023). The leading wisdom development framework: An integrated roadmap for cultivating a sense of purpose and meaning. Journal of Advanced Academics, 34(1): 32-67. https://doi.org/10.1177/1932202X221124931

Cottrell TL (2014). An assessment of the effect of multimedia on critical thinking outcomes. PhD Dissertation, Northern Illinois University, DeKalb, USA.

Dwyer CP, Hogan MJ, and Stewart I (2014). An integrated critical thinking framework for the 21st century. Thinking Skills and Creativity, 12: 43-52. https://doi.org/10.1016/j.tsc.2013.12.004

Dykhne M, Hsu SY, McBane S, Rosenberg E, and Taheri R (2021). Differences in learning styles, critical thinking skills, and peer evaluations between students with and without leadership engagement. Currents in Pharmacy Teaching and Learning, 13(6): 659-664. https://doi.org/10.1016/j.cptl.2021.01.039 **PMid:33867061**

Ehrlinger J, Readinger WO, and Kim B (2016). Decision-making and cognitive biases. Encyclopedia of Mental Health, 12(3): 83-87. https://doi.org/10.1016/B978-0-12-397045-9.00206-8 **PMCid:PMC7032726**

Ennis RH (2015). Critical thinking: A streamlined conception. In: Davies M and Barnett R (Eds.), The Palgrave handbook of critical thinking in higher education: 31–47. Palgrave Macmillan, New York, USA. https://doi.org/10.1057/9781137378057_2

Facione PA (2011). Critical thinking: What it is and why it counts. Insight Assessment, Millbrae, USA.

Facione PA and Facione NC (2013). Critical thinking for life: Valuing, measuring, and training critical thinking in all its forms. Inquiry: Critical Thinking Across the Disciplines, 28(1): 5-25. https://doi.org/10.5840/inquiryct20132812

Halpern DF (2013). Thought and knowledge: An introduction to critical thinking. Fifth Edition, Psychology Press, New York, USA. https://doi.org/10.4324/9781315885278

Halpern DF and Dunn DS (2021). Critical thinking: A model of intelligence for solving real-world problems. Journal of Intelligence, 9(2): 22. https://doi.org/10.3390/jintelligence9020022 **PMid:33916939 PMCid:PMC8167750**

Huynh VS and Tran-Chi VL (2019). Vietnamese high school students' perceptions of academic advising. International Journal of Learning, Teaching and Educational Research, 18(8): 98-107. https://doi.org/10.26803/ijlter.18.8.6

Iordanou K and Rapanta C (2021). "Argue with me": A method for developing argument skills. Frontiers in Psychology, 12: 631203. https://doi.org/10.3389/fpsyg.2021.631203 **PMid:33746851 PMCid:PMC7969807**

King PM and Kitchener KS (2004). Reflective judgment: Theory and research on the development of epistemic assumptions through adulthood. Educational Psychologist, 39(1): 5-18. https://doi.org/10.1207/s15326985ep3901_2

Lai ER (2011). Critical thinking: A literature review. Pearson's Research Reports, 6: 40-41.

Leary MR, Diebels KJ, Davisson EK, Jongman-Sereno KP, Isherwood JC, Raimi KT, Deffler SA, and Hoyle RH (2017). Cognitive and interpersonal features of intellectual humility. Personality and Social Psychology Bulletin, 43(6): 793-813. https://doi.org/10.1177/0146167217697695 **PMid:28903672**

May KR, Tomlinson BJ, Ma X, Roberts P, and Walker BN (2020). Spotlights and soundscapes: On the design of mixed reality auditory environments for persons with visual impairment. ACM Transactions on Accessible Computing, 13(2): 1-47. https://doi.org/10.1145/3378576 **PMid:41636587**

Mincemoyer CC, Perkins DF, and Munyua C (2001). Youth life skills evaluation project: Critical thinking in everyday life. Pennsylvania State University, University Park, USA.

Miri B, David BC, and Uri Z (2007). Purposely teaching for the promotion of higher-order thinking skills: A case of critical thinking. Research in Science Education, 37: 353-369. https://doi.org/10.1007/s11165-006-9029-2

Montibeller G and von Winterfeldt D (2015). Cognitive and motivational biases in decision and risk analysis. Risk Analysis, 35(7): 1230-1251. https://doi.org/10.1111/risa.12360 **PMid:25873355**

Moustaghfir S and Brigui H (2024). Navigating critical thinking in the digital era: An informative exploration. International Journal of Linguistics, Literature and Translation, 7(1): 137-143. https://doi.org/10.32996/ijllt.2024.7.1.11x

Nguyen-Thi HP, Truong AN, Le VT, Nguyen XT, and Tran-Chi VL (2024). The relationship between academic performance, peer pressure, and educational stress as it relates to high school students' openness to seeking professional psychological help. Journal of Curriculum and Teaching, 13(1): 83-101. https://doi.org/10.5430/jct.v13n1p83

Pithers RT and Soden R (2000). Critical thinking in education: A review. Educational Research, 42(3): 237-249. https://doi.org/10.1080/001318800440579

Roiha A and Sommier M (2021). Exploring teachers' perceptions and practices of intercultural education in an international school. Intercultural Education, 32(4): 446-463. https://doi.org/10.1080/14675986.2021.1893986

Sarwari K and Kakar AF (2023). Developing students' critical thinking skills through contextual teaching and learning. Journal of Cognition, Emotion & Education, 1(1): 29-42.

Schöpfer C and Hernandez J (2026). The critical time for critical thinking: Intellectual virtues as intrinsic motivations for critical thinking. Philosophical Psychology, 39(2): 624-645. https://doi.org/10.1080/09515089.2024.2430509

Shutaleva A (2023). Ecological culture and critical thinking: Building of a sustainable future. Sustainability, 15(18): 13492. https://doi.org/10.3390/su151813492

Teng MF and Yue M (2023). Metacognitive writing strategies, critical thinking skills, and academic writing performance: A structural equation modeling approach. Metacognition and Learning, 18: 237-260. https://doi.org/10.1007/s11409-022-09328-5