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Critical Thinking Skills and Information-Seeking Anxiety Relationship among Senior High School Students

Dedy Dwi Putra[1*], Maya Umi Hajar[2]
[1] Library and Information Science, Faculty of Science and Technology, UIN Maulana Malik Ibrahim, Malang, Indonesia
[2] Biology Education Departement, Faculty of Science and Mathematics, Universitas Negeri Malang, Indonesia

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*Corresponding Author Email:
dedyputra@uin-malang.ac.id

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Abstract: This study explores the relationship between critical thinking skills and information-seeking anxiety among senior high school students in the digital era. The research was motivated by students' difficulties in evaluating the validity and relevance of information, which often leads to anxiety during the search process. Using a mixed-methods case study approach, the study involved 36 tenth-grade students from a high school in Malang City, Indonesia. The intervention was implemented through three science learning cycles using a Problem-Based Learning (PBL) model. Data on students' critical thinking skills were obtained from classroom dialogue transcripts and analyzed using the Transcript-Based Lesson Analysis (TBLA) based on Paul and Elder's critical thinking framework. Information-seeking anxiety data were collected using the Information Seeking Anxiety Scale (ISAS) and supplemented with interview data. The findings revealed a progressive improvement in students' critical thinking skills across the three learning cycles, particularly in their ability to gather relevant information. Simultaneously, a strong negative correlation was found between critical thinking ability and information-seeking anxiety. Students with higher critical thinking skills experienced lower levels of anxiety, while students with lower critical thinking skills were more prone to anxiety, especially when encountering digital distractions and challenges in identifying credible information. The study highlights the importance of integrating active learning models, enhancing digital literacy, and providing structured training in information searching. These findings have implications for curriculum design and suggest future research should investigate additional factors, such as digital self-efficacy and learning motivation, that may influence the observed relationship.

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INTRODUCTION

The rapid advancement of technology is occurring alongside an extraordinary acceleration of knowledge and information in the 21st century. This century has witnessed a massive transformation in technology, industry, and information (Sato, 2012). The rapid acceleration of knowledge and information necessitates that individuals adapt with increasing urgency. Critical thinking has emerged as one of the fundamental skills required for individuals to navigate the challenges posed by technological and information advancements. Critical thinking involves the process of deeply analyzing and evaluating information, enabling individuals to make informed decisions when facing the challenges of the times (Anjarwati et al., 2022; Haryadi et al., 2022). The importance of critical thinking in education has made it a primary goal of education: to shape individuals who are capable of thinking critically, especially when using information and technology sources. Particularly for high school students, individuals should be able to categorize information based on their needs and evaluate the information they acquire. This critical thinking ability significantly impacts students' capacity to effectively utilize technology and process information in accordance with the requirements of the learning process in school.

However, the reality on the ground, based on previous research and observations conducted by the researcher at a high school, indicates that students face significant challenges in utilizing information in the digital age. Many students struggle to distinguish between valid and invalid information, such as

hoaxes, and the relevance of the information they encounter. They often find it difficult to access and assess trustworthy sources (Ajijola, 2024), and the spread of misinformation exacerbates this, as students struggle to differentiate between credible and unreliable sources (Yu et al., 2024). Additionally, information overload leads to confusion and hinders decision-making (Stebbins, 2005), while Taylor and Dalal (2017) highlight the fragmented and often unreliable nature of information, further complicating students' ability to recognize deficiencies in the information they encounter.

These conditions lead to the phenomenon of anxiety during the information-seeking process. Students often access unstructured information from social media, which can lead to confusion and anxiety during the information search process (Ahmatika, 2017; Sae & Radia, 2023). This anxiety, known as information-seeking anxiety, can hinder decision-making processes and affect students' ability to process information effectively (Rahmawati et al., 2022). Therefore, it is crucial to develop teaching strategies that can enhance students' critical thinking skills, such as the implementation of active learning models and problem-based learning (PBL), which have been proven effective in improving critical thinking abilities (Istianah, 2013; Kusmanto, 2014; Subarjo et al., 2023). Despite the growing body of literature on both critical thinking and information-seeking anxiety, there is still limited empirical research that explores the *relationship between these two variables*, particularly in the context of high school students. Most existing studies tend to focus on them separately, either emphasizing interventions to enhance critical thinking or investigating the sources and effects of information-seeking anxiety. This creates a research gap that calls for a deeper investigation into how students' levels of critical thinking might be associated with their levels of anxiety during the information-seeking process.

Previous research indicates that information-seeking anxiety experienced by adolescents in high school often stems from information overload (Rizky et al., 2022). Information overload refers to a situation in which an individual is exposed to an overwhelming amount of data at a pace that exceeds their cognitive capacity to absorb and process it effectively (Kominiarczuk & Ledzińska, 2014). This phenomenon reflects the intensity of demands in both professional and personal life (Zhang et al., 2022). The increasing use of technology, particularly smartphones, has fundamentally altered the amount of information individuals process daily. Some students believe that seeking large amounts of information is better than seeking only the necessary information. This leads to information overload and diminishes their ability to make informed decisions regarding the information they search for. The importance of critical thinking in processing information, as well as the significant influence of information-seeking anxiety on the information search process, underscores the need for further research to examine the relationship between information-seeking anxiety and the level of critical thinking skills, particularly among high school students. The findings from such research could serve as a reference for developing students' critical thinking abilities, enabling them to process the information they receive wisely and focus on the learning process ahead.

Therefore, this research aims to explore the relationship between critical thinking skills and information-seeking anxiety among senior high school students using a mixed-methods approach. By investigating this relationship, the study seeks to contribute to a better understanding of how cognitive and emotional aspects interplay in students' information-seeking behavior. The findings are expected to offer valuable insights for educators and policymakers in designing educational practices that promote critical thinking and help reduce anxiety during information processing, ultimately leading to more effective and confident learners. Through this research, it is hoped that the identified challenges related to information-seeking anxiety can be addressed by enhancing students' critical thinking abilities. In turn, this may support the development of practical strategies in classroom instruction that foster both cognitive and emotional readiness in navigating the complexities of digital information.

METHOD

The research approach employed in this study is a case study with a mixed-method research design, incorporating both quantitative and qualitative methods. The participants consisted of 36 tenth-grade students from a senior high school in Malang City, East Java Province, Indonesia, including 19 female and 17 male students. The sample selection was based on the purposive sampling technique. The primary

reason for choosing this sample was that previous documentation or recordings of classroom learning dialogues had been conducted in the same class with the same students. This ensured that the students participating in the study were no longer distracted by the presence of voice and video recorders during the learning process.

Table 1. Characteristic of Respondents

Gender	Number of Students	Percentage
Female	19	52.78%
Male	17	47.22%
Total	36	100%

The study was conducted over two semesters and consisted of three biology learning cycles. In each cycle, the learning process followed several structured steps: (1) the teacher presented a real-world problem related to the topic; (2) students identified what they knew and what they needed to learn; (3) students searched for relevant information using various media and learning resources such as the internet, books, and scientific articles; (4) students discussed their findings in groups to formulate possible solutions; and (5) students presented their solutions and engaged in whole-class discussions facilitated by the teacher. These steps reflect a combination of information-seeking activities and collaborative dialogues, which are crucial processes for generating the data used in this research. The learning topics covered sequentially were: (1) types of ecosystems, (2) interactions among biotic components in an ecosystem, and (3) biogeochemical cycles. The learning process used a Problem-Based Learning (PBL) model, which encouraged students to seek out information from various sources, such as the internet and textbooks, to solve problems. This environment provided rich opportunities to observe students' information-seeking behaviors and dialogue interactions.

Data on students' critical thinking skills were collected from transcripts of student dialogues and conversations during classroom discussions. In these discussions, students engaged in information-seeking activities based on the learning topics being covered. The dialogue transcripts were analyzed using both quantitative and qualitative methods, specifically the Transcript-Based Lesson Analysis (TBLA) method, which relies on transcriptions of classroom dialogues. The indicators of critical thinking ability were based on Paul & Elder's, (2020) The critical thinking framework consists of seven thinking elements: asking questions, collecting relevant data/information, identifying and clearly explaining concepts based on the gathered information, considering multiple perspectives rationally, stating assumptions, and drawing relevant conclusions based on processed information.

Meanwhile, data on information-seeking anxiety were obtained through questionnaire responses based on the Information Seeking Anxiety Scale (ISAS), developed by Erfanmanesh et al., (2012). The ISAS consists of 47 questions addressing six key aspects of information-seeking barriers: information sources, computers and the internet, libraries, information retrieval, technical barriers, and topic identification. In addition, in-depth interviews were conducted with selected students to obtain qualitative data on their anxiety during the information-seeking process.

The analysis of the relationship between critical thinking skills and information-seeking anxiety was conducted using two data analysis methods. First, quantitative measurements of students' critical thinking abilities, based on Paul & Elder's, (2020) indicators and TBLA analysis, were combined with quantitative measurements of information-seeking anxiety, derived from students' responses to the ISAS questionnaire. These data were analyzed using Pearson correlation analysis in IBM SPSS Statistics Version 29 to determine the statistical relationship between critical thinking skills and information-seeking anxiety. Second, a qualitative analysis was conducted to provide deeper insights into the relationship between these two aspects. This analysis was based on qualitative data obtained from TBLA and in-depth interviews, which were used to further explore students' anxiety during the information-seeking process.

This methodological design enables a comprehensive exploration of the interplay between students' critical thinking skills and their information-seeking anxiety, both statistically and contextually, providing robust insights to address the research objectives.

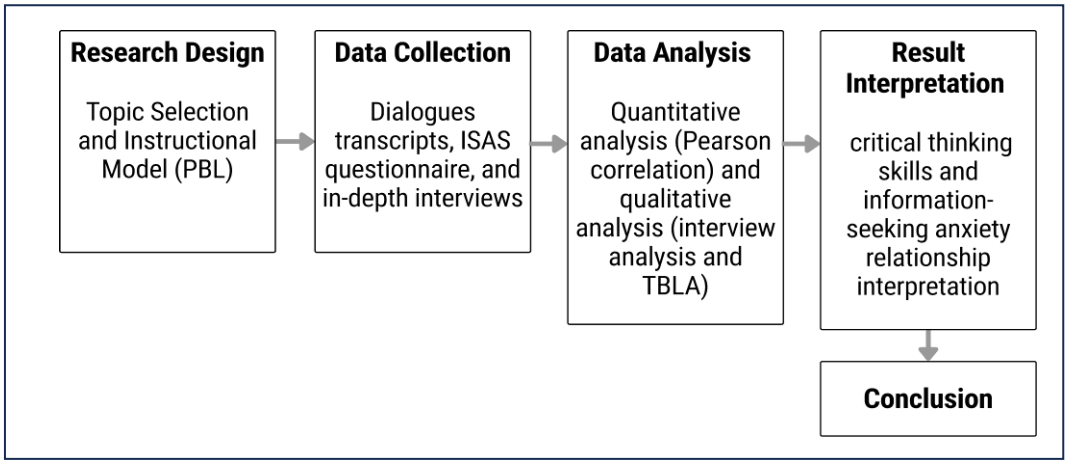

Figure 1. Research Stage

RESULT AND DISCUSSION

This section reports the study's findings based on quantitative and qualitative data, followed by a discussion informed by theory and prior research. It focuses on how students' critical thinking skills emerged through problem-based learning and examines their relationship with information-seeking anxiety. Each result is analyzed to address the research questions and provide insight into students' cognitive and emotional responses to digital information overload. Relevant comparisons and educational implications are also discussed.

The Level of Critical Thinking Skills among Senior High School Students

This study examined the relationship between students' critical thinking skills and anxiety in the information-seeking process during learning at the senior high school level. Data collection and analysis were carried out in two stages, employing both quantitative and qualitative approaches. Based on the data analysis of critical thinking skills using the Transcript-Based Lesson Analysis (TBLA) technique, which is grounded in Paul Elder's seven critical thinking elements, the quantitative analysis of students' critical thinking abilities yielded the following resultsin Figure 2.

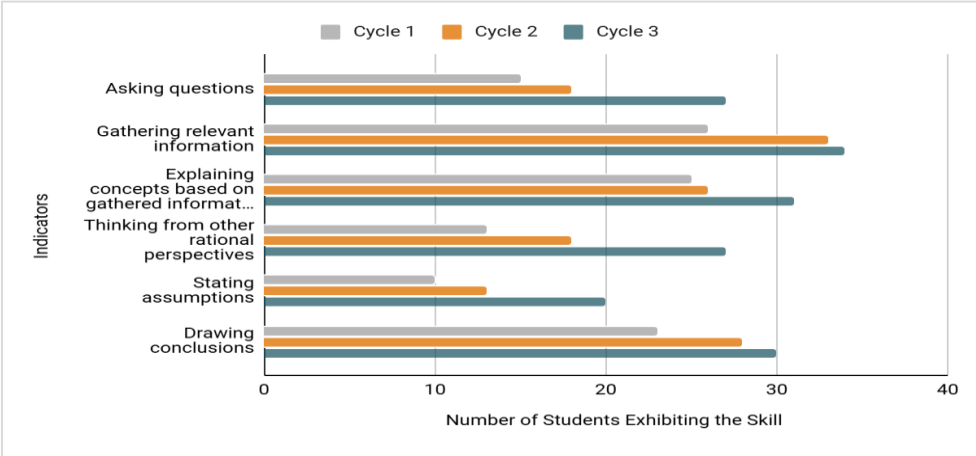

Figure 2. Student's Critical Thinking

Based on the data analysis results, it was found that there was an improvement in critical thinking skills from the first to the third cycle of learning. According to the analysis, the most prominent critical thinking skill was the ability to gather relevant information. The process of gathering information played a crucial role in identifying solutions to the problems presented by the teacher, and it required the longest duration within the learning process. Throughout the three learning cycles, students engaged in information-seeking activities using biology textbooks provided by the school and various educational

websites that offered relevant materials on ecosystem topics. This element exhibited a steady increase across the three cycles, with the number of students successfully gathering relevant information rising from 31 in the first cycle to 32 in the second cycle and 34 in the third cycle out of 36 students. This indicates that nearly all students were able to collect relevant information from learning resources, including biology textbooks and online websites.

The observed enhancement in the ability to gather relevant information demonstrates consistency with findings from other research that underscore the significance of accessible and diverse learning resources in fostering critical thinking skills (Facione, 2011). The presence of a wide array of educational materials, including traditional textbooks and contemporary online platforms, demonstrably aids students in knowledge construction and the refinement of their analytical capabilities. Moreover, Peter, (2012) highlights the crucial role of students' capacity to identify and synthesize information from multiple sources as a foundational element of effective critical thinking. Consequently, the improved information gathering proficiency documented in this study directly aligns with existing academic literature concerning the cultivation of critical thinking through the comprehensive exploration of rich learning environments.

The process of gathering information significantly influenced students' critical thinking skills. This claim is supported by an excerpt from a classroom discussion during the second learning cycle, as presented below.

S1: The issue here is that the presence of predator fish is causing the domestic fish population to decline. Let's try to find out what types of domestic fish are affected.
S2: No, that's not it. We should first identify the type of predator fish. Maybe we can check Wikipedia?
S1: I don't think Wikipedia is the best source. I found a classification of the red devil fish on the ITIS.com website. Apparently, they reproduce quickly and eat fish eggs, which is why the fish population is declining—their eggs are being consumed.
S3: According to this book, the decline in the fish population is also influenced by light exposure, not just the predator.
S2: Really? Let's search for more information on a different website.

The classification of critical thinking skills into high, medium, and low categories was conducted to obtain a more detailed understanding of the students' abilities. The results of this classification can be observed in Figure 3.

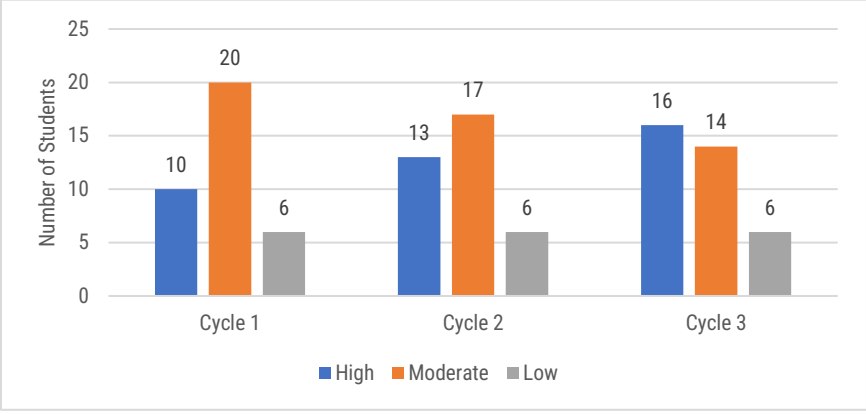

Figure 3. Student's Critical Thinking Skills

Based on the classification conducted on 36 students, the results indicate an improvement in students' critical thinking skills from the first to the third learning cycle. The number of students classified as having high critical thinking skills increased sequentially across the three learning cycles, with 10 students in the first cycle, 13 in the second, and 16 in the third. The analysis further revealed that this

improvement in critical thinking ability was accompanied by an increase in students' capacity to ask questions and identify relevant sources of information. However, during the information-seeking process in learning, several instances of information-seeking anxiety were observed.

Information-Seeking Anxiety and Its Relationship with Critical Thinking in High School Students

Data on information-seeking anxiety were collected through students' responses to the Information Seeking Anxiety Scale (ISAS), which they completed at the end of each learning cycle. A quantitative analysis of these responses yielded the following results in Figure 4.

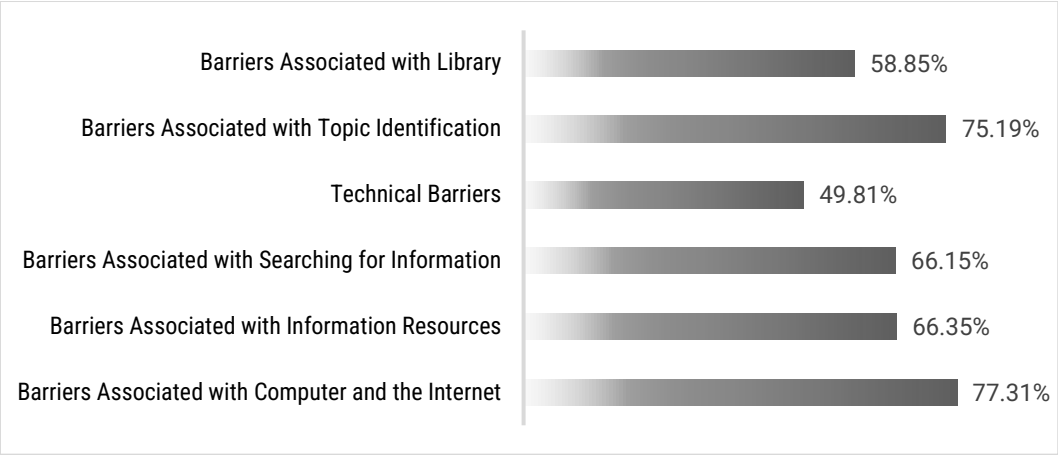

Figure 4. Students' Information Seeking Anxiety Scale (ISAS) Result

Based on the analysis results, it can be concluded that information-seeking anxiety is largely influenced by two primary barriers: obstacles related to computer and internet access and challenges in topic identification. Difficulties in accessing the internet at school and the limited ability to log into learning material accounts are specific factors that significantly contribute to barriers in the computer and internet aspect. On the other hand, within the dimension of topic selection challenges, uncertainty regarding how to initiate the information-seeking process emerges as a key factor exacerbating this anxiety. High school students often experience confusion when required to conduct an effective information search. The overwhelming volume of available information and difficulty determining its relevance to their specific needs further contribute to this challenge. A lack of understanding of how to access relevant resources or identify credible information on the internet can further intensify their anxiety.

Through qualitative data collection via in-depth interviews, another pattern emerged within the dimension of barriers related to computer and internet use. During the information-seeking process, students frequently encountered distractions from various software and applications on their devices, particularly social media and gaming applications.

S1: "Yes, sometimes I intend to search for information for my assignment, but then I suddenly feel the urge to check social media first. Especially when a notification pops up, I end up scrolling for too long and forget about the assignment."
S2: "Usually, I start focusing on finding information, but along the way, I get tempted to play a game for a while. Initially, I just want to take a short break, but then I end up spending too much time on it."
S3: "Sometimes, I deliberately complete my information search quickly so that I can play games or browse social media sooner. As a result, the quality of the information I obtain might not be optimal."

These digital distractions often disrupted their focus, leading them to deviate from their initial intent of searching for relevant information. For instance, notifications from social media platforms tempted

students to engage in prolonged scrolling, causing them to lose track of their academic tasks. Similarly, some students reported taking short breaks to play games, which often resulted in prolonged engagement, further delaying their information-seeking efforts. Additionally, some students admitted to intentionally rushing through the information search process to allocate more time for leisure activities, potentially compromising the quality and depth of the information they obtained. These findings highlight the significant impact of digital distractions on students' ability to engage effectively in critical thinking and research-based learning.

The temptation to access social media or play online games disrupts students' focus, diverting their attention away from the information search process. Some students choose to discontinue their search and instead engage with social media or gaming applications, further hindering their ability to retrieve relevant academic information. Additionally, information-seeking anxiety is significantly influenced by difficulties in topic identification. Challenges related to digital distractions and difficulties in identifying relevant information contribute to increased anxiety, ultimately disrupting students' learning processes. The anxiety may cause students to experience confusion, avoidance, or frustration during the learning process, ultimately affecting their academic performance and critical engagement with learning tasks (Akbarzadeh et al., 2020). To examine the relationship between information-seeking anxiety and students' critical thinking skills, a Pearson correlation analysis was conducted using SPSS based on the previously collected quantitative data. The results of this correlation analysis between the two variables are presented as follows in Table 2.

Table 2. Analysis of the Correlation Between Critical Thinking Skills and Information Seeking Anxiety

Variable	N	Sig.	Pearson Correlation	
			Critical thinking skills	Information-seeking anxiety
Critical thinking skills	36	0.042	1	-0.709
Information-seeking anxiety	36	0.042	1	1

The Pearson correlation analysis conducted to examine the relationship between critical thinking ability and information-seeking anxiety yielded a significance value of 0.042. This value is below the significance threshold of 0.05, indicating a statistically significant relationship between the two variables at a 95% confidence level. Therefore, it can be concluded that critical thinking ability and information-seeking anxiety are meaningfully correlated. Furthermore, the correlation coefficient obtained was -0.709, signifying a strong negative correlation between critical thinking ability and information-seeking anxiety. This finding suggests that as students' critical thinking ability increases, their level of information-seeking anxiety tends to decrease. Conversely, lower critical thinking ability is associated with higher levels of information-seeking anxiety.

These findings align with theoretical perspectives suggesting that individuals with strong critical thinking skills tend to be more confident in evaluating and filtering information. Critical thinking enables individuals to assess the credibility of sources, recognize biases, and process information systematically and logically. Research indicates that individuals with well-developed critical thinking skills are more adept at evaluating information effectively, which in turn enhances their confidence in making informed decisions regarding the information they encounter (Machete & Turpin, 2020; Tiruneh et al., 2014). Moreover, individuals with high confidence in their decision-making are generally more selective in choosing information that aligns with their perspectives, thereby reducing anxiety when confronted with diverse information (Robertson, 2021; Rollwage et al., 2020). Conversely, individuals with lower critical thinking skills often struggle to distinguish between relevant and credible information. They may experience confusion or even feel overwhelmed by the abundance of available information, particularly in the context of the current digital era. The inability to critically analyze information can heighten feelings of anxiety and uncertainty when searching for necessary information (Hämäläinen et al., 2021; Metzger et al., 2015).

Research further suggests that a lack of information literacy and critical thinking skills increases individuals' susceptibility to misleading information and fake news, which, in turn, can elevate their anxiety levels (Holincheck et al., 2022). Within this context, it is crucial for educational institutions to incorporate

critical thinking and information literacy training to equip individuals with the skills necessary to evaluate source credibility and mitigate information-seeking anxiety (Machete & Turpin, 2020; Tiruneh et al., 2014). This also pertains to the aspect of the information approval process in learning activities. As identified in previous research, the pattern of relationships within the information approval process can enhance the quality of learning dialogues, particularly in science education (Hajar & Putra, 2024). Thus, fostering critical thinking skills enhances individuals' ability to assess information critically and reduces anxiety when encountering diverse and often contradictory information. Consequently, educational strategies emphasizing the development of critical thinking and information literacy are essential in preparing individuals to navigate the complexities of information in the digital age (Robertson, 2021; Tiruneh et al., 2014).

Implication

The findings of this study have significant implications across various domains, particularly in education and information management. In the field of education, these results emphasize the importance of integrating critical thinking skill development into the curriculum. By enhancing critical thinking abilities, students can become more confident and effective in navigating diverse sources of information, ultimately reducing their anxiety in the information-seeking process. Critical thinking is also a highly valuable skill in the workplace and everyday life. Professionals across various sectors, especially those requiring in-depth information analysis, can greatly benefit from strong critical thinking abilities. Therefore, training programs and initiatives aimed at developing critical thinking skills can serve as effective strategies for reducing anxiety when dealing with complex information.

CONCLUSION

The level of critical thinking skills among senior high school students showed a significant improvement over the three cycles of problem-based learning (PBL). This finding suggests that the processes of information searching and processing within a problem-solving context contribute progressively to the development of students' critical thinking abilities. Repeated engagement in analyzing, evaluating, and applying information during learning activities fosters cognitive growth in this domain. In terms of correlation, the study revealed a strong negative relationship between critical thinking ability and information-seeking anxiety. Students with higher critical thinking skills tended to experience lower levels of anxiety when searching for information. In contrast, those with lower critical thinking skills were more susceptible to anxiety, particularly when faced with unstructured information or difficulties in utilizing digital tools.

The practical implications of these findings underscore the importance of integrating active learning strategies, such as PBL, into the curriculum to enhance critical thinking while simultaneously mitigating information-seeking anxiety in the digital era. Furthermore, strengthening digital literacy and providing structured training in information-searching skills are essential components of effective educational interventions. For future research, it is recommended to explore additional mediating or moderating variables that may influence the relationship between critical thinking and information-seeking anxiety, such as digital self-efficacy or learning motivation. Further investigations might also examine the effectiveness of alternative instructional models in promoting critical thinking and addressing information-related anxiety across broader educational contexts.

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