

An Analysis of Vocational High School Students' Critical Thinking Skills Using the Expository Method in the Subject of Sanitation, Hygiene, and Work Safety (SHWS)

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Abstract

This study aims to analyze the critical thinking skills of vocational high school (SMK) students and to identify the factors influencing their development within the context of expository teaching in the subject of Sanitation, Hygiene, and Work Safety (SHWS). The research employed a one-shot case study design using both quantitative and qualitative approaches. A total of 20 tenth-grade students from a public vocational high school in Central Lombok were selected as research participants. Quantitative data were collected through open-ended tests designed to measure critical thinking skills across five key indicators, while qualitative data were obtained from open-ended interviews with subject teachers. The results showed that students' critical thinking skills fell into the "moderately critical" category, with an average score of 2.380 on a 5-point scale. The data also revealed significant variation among students, with no participants achieving the "critical" or "highly critical" categories. Thematic analysis of teacher interviews identified four main factors affecting the development of critical thinking: student learning readiness, the effectiveness of the expository method, limited practical facilities, and structural challenges in instructional implementation. The study concludes that the expository method is not fully effective in fostering students' critical thinking skills, particularly in practice-based subjects such as SHWS. These findings highlight the importance of implementing more participatory and contextual learning strategies, improving access to practical resources, and strengthening teacher capacity in critical thinking pedagogy to produce vocational graduates who are cognitively competent and adaptive.

Keywords: Critical thinking; Vocational high school; Expository method; SHWS; Analysis

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INTRODUCTION

Critical thinking skills are one of the essential components of 21st-century education, requiring students to process information deeply, evaluate arguments, and make rational and responsible decisions. In the context of vocational education such as Vocational High Schools (SMK), the need for critical thinking skills is becoming increasingly urgent, considering that the primary goal of such education is to prepare graduates who are job-ready and able to adapt to dynamic and complex industrial environments (Rahmadani et al., 2023). Therefore, mastery of critical thinking is not merely part of learning outcomes but serves as a foundational element in designing learning strategies responsive to workplace demands.

Vocational education should not solely focus on technical skill attainment but must also foster cognitive development that supports flexible thinking and decision-making. Hidayat et al. (2018) emphasized that the instructional approach in SMKs

should be holistic, providing students with opportunities to develop critical thinking skills through active engagement in the learning process. This is supported by findings from Ramadhani et al. (2021), who showed that instructional designs integrating creativity and problem-solving elements can enhance learning effectiveness and facilitate the development of critical thinking abilities. Within the Merdeka Belajar curriculum, which emphasizes learning autonomy and student-centered instruction, the urgency to strengthen critical thinking becomes increasingly pronounced.

Various pedagogical approaches have been explored as effective strategies to develop students' critical thinking skills. Problem-based learning, project-based learning, and scientific approaches have proven effective in stimulating students to think analytically and reflectively (Redhana, 2013). In the context of vocational education, the use of textbooks and instructional media based on scientific approaches has also demonstrated significant effectiveness in encouraging active student participation in critical thinking processes (Hidayat et al., 2018; Wahono et al., 2022). Saffanah and Hamdu (2023) emphasized the importance of explicit and structured assessment rubrics to evaluate and provide feedback on students' critical thinking, making learning more meaningful and targeted.

However, field realities indicate that SMK students still face numerous obstacles in optimally developing their critical thinking skills. Many studies report low levels of critical thinking ability across various educational levels, including in vocational schools. This poses a significant challenge, especially considering that globalization and rapid technological advancement demand graduates with not only technical proficiency but also adaptive and critical thinking abilities (Rahmadani et al., 2023). Therefore, a comprehensive evaluation is needed to understand the current state of SMK students' critical thinking skills, particularly in the subject of Sanitation, Hygiene, and Work Safety (SHWS), and to identify the influencing factors in depth.

A major issue in the development of critical thinking lies in the poorly directed design and implementation of learning strategies. Zeng and Ravindran (2025) stated that while peer feedback has significant potential to cultivate reflective thinking, without scaffolding such as rubrics, guiding questions, or concrete examples, its implementation tends to be merely descriptive and evaluative. In practice, many teachers are still unable to facilitate learning environments that truly encourage students to explore and reflect critically on their thoughts.

Another influential aspect is the availability of valid and reliable assessment instruments. Hu and Bi (2025) developed the Scientific Critical Thinking (SCT) model consisting of three main components—background knowledge, critical thinking skills, and thinking disposition—along with eleven subcomponents. Although this model has been validated for middle-level science students, its applicability in vocational education remains limited due to differences in student characteristics and learning objectives. This highlights the need for adapting assessment tools to fit the context and objectives of vocational learning.

Teacher attitudes and beliefs also play a crucial role in the successful implementation of critical thinking pedagogy. Leibovitch et al. (2025) found that many teachers perceive critical thinking instruction as an additional burden that interferes with curriculum coverage. However, through intensive professional

development based on action research and collaborative reflection, teacher perceptions can shift toward greater adaptability in integrating critical thinking into the learning process. Nevertheless, similar professional development programs remain scarce in vocational school environments, limiting teachers' understanding and skills in teaching critical thinking.

Experimental studies in various contexts have shown that long-term interventions with structured approaches can significantly improve students' critical thinking. For instance, Gallardo-Estrada et al. (2024) reported that an 18-week structured reading intervention among rural elementary students in Chile improved both grit and critical thinking simultaneously. However, the effectiveness of similar interventions in SMK contexts remains untested due to differences in learning motivation, curriculum demands, and limited instructional time in vocational education.

In Indonesia, Prayogi et al. (2024) demonstrated that the inquiry-creative learning approach—combining inquiry and scientific creativity—resulted in the most significant improvement in critical thinking skills compared to traditional and pure inquiry approaches. Nevertheless, further research is needed to assess its effectiveness among SMK students, who often have diverse backgrounds and learning preferences.

Reading skills are also strongly correlated with critical thinking. Medranda-Morales et al. (2023) found a high positive correlation between reading comprehension and critical thinking among middle and high school students. However, the specific types of texts or reading materials that are most effective in fostering critical thinking remain unclear, especially in SMK contexts where instructional content is often technical and applied.

Student perceptions of instructional methods also matter. Campo et al. (2023) reported that students tend to regard debate, problem-based learning, and real-world practice as the most effective approaches for developing critical thinking. Conversely, traditional lecture methods are perceived as less supportive. Interestingly, these preferences do not always align with students' theoretical understanding of critical thinking, indicating a mismatch between pedagogical implementation and student perception.

Given the complexity of issues surrounding the development of critical thinking in vocational schools, a comprehensive study is essential to understand its actual condition in the field. This research aims to conduct a descriptive analysis of SMK students' critical thinking skills using the expository method in the SHWS subject and to identify the influencing factors. The main focus is on routine learning based on the expository method within the Merdeka Belajar curriculum framework as a relevant intervention context. Through this study, it is expected that a comprehensive picture of existing challenges and opportunities can be obtained to formulate more effective and adaptive learning improvement strategies tailored to vocational students' needs.

The novelty of this study lies in its empirical exploration of critical thinking skills in the SMK environment, taking into account pedagogical, psychological, and structural factors. By examining the interaction between expository instructional approaches and student responses within the Merdeka curriculum context—particularly in the practical and contextual subject of SHWS—this research

contributes to the development of evidence-based vocational education. The study scope includes measuring students' critical thinking levels, identifying supporting and inhibiting factors, and analyzing the effectiveness of instructional strategies employed. The results are expected to serve as a foundation for policy development and instructional innovation in SMKs, aiming to produce graduates who are not only technically competent but also proficient in critical thinking and adaptable to changing times.

METHODS

This study employed an experimental method using a one-shot case study design, combined with both quantitative and qualitative descriptive analysis approaches. The one-shot case study design was selected because the study did not compare outcomes between experimental and control groups but rather focused on observing students' critical thinking skills following a learning intervention. The intervention involved the application of the expository method in the subject "Sanitation, Hygiene, and Work Safety (SHWS)," conducted over one academic semester in the 2024/2025 school year, with food safety as the main instructional topic. The curriculum used refers to the Merdeka Belajar Curriculum policy implemented in vocational high schools.

The quantitative approach was applied to objectively and numerically measure students' achievement in critical thinking skills following the learning intervention. Meanwhile, the qualitative approach was employed to explore the factors influencing critical thinking skills based on the perceptions of subject teachers directly involved in the learning process. This mixed-method approach enabled the acquisition of comprehensive data, covering both students' performance outcomes and the contextual elements influencing those outcomes.

The study was conducted at a public vocational high school in Central Lombok Regency, West Nusa Tenggara, Indonesia. The research subjects consisted of 20 tenth-grade students who participated in SHWS learning during the second semester of the 2024/2025 academic year. Participants were selected using purposive sampling, considering their active engagement in the learning process, which was the focus of the intervention. Demographically, the participants included 5 male and 15 female students, with an average age of 16 years. The involvement of students in this study was conducted ethically and formed an integral part of their regular school learning activities. Approval for the research implementation was obtained from the school authorities, ensuring that the research activities did not disrupt the teaching and learning process.

Quantitative data were collected through an essay-based test designed to assess students' critical thinking skills. The test instrument consisted of five essay questions, each representing one of the five key indicators of critical thinking skills: (1) problem clarification, (2) information interpretation, (3) analysis, (4) inference and reasoning, and (5) evaluation and reflection. Each question was designed to reveal students' ability to solve problems relevant to the topic of food safety in the SHWS learning context.

The results of the essay test were then analyzed using descriptive analysis methods. Students' test scores were classified based on the scoring range and critical thinking categories, as shown in Table 1.

Table 1. Score range and categories of students' critical thinking skills

Score Range	Category	General Description
4.51 - 5.00	Highly Critical	Demonstrates excellent skills in problem clarification, interpretation, analysis, inference and reasoning, as well as evaluation and reflection.
3.51 - 4.50	Critical	Demonstrates good ability in all critical thinking skill indicators.
2.51 - 3.50	Moderately Critical	Demonstrates adequate ability in critical thinking.
1.51 - 2.50	Less Critical	Exhibits weak and inconsistent performance across critical thinking indicators.
1.00 - 1.50	Not Critical	Fails to adequately demonstrate critical thinking indicators.

This classification was used to systematically map students' critical thinking performance and served as the basis for evaluating the effectiveness of the learning strategy implemented during the intervention. The test data were further analyzed by calculating the mean score, standard deviation, and coefficient of variation to describe the distribution and consistency of students' performance outcomes.

Meanwhile, the qualitative approach focused on collecting data from SHWS teachers who were directly involved in implementing the expository learning intervention. Data were gathered through open-ended interviews conducted after the intervention period had ended. These interviews aimed to uncover teachers' views and experiences regarding the learning process and to identify various factors perceived to influence students' critical thinking skills.

The interview guide was developed in a semi-structured format to allow flexible and in-depth exploration of teachers' responses. Key themes explored included: (1) teachers' perceptions of students' initial learning readiness, (2) the effectiveness of expository method implementation in the SHWS learning context, (3) support from practical learning facilities at school, and (4) obstacles and challenges encountered during the learning process. The interview responses were then analyzed using thematic analysis to identify thematic patterns emerging from the participants' narratives.

Through the combination of quantitative and qualitative approaches, this study aimed to provide a holistic picture of vocational high school students' critical thinking skills within the context of the Merdeka Belajar curriculum. The findings are expected to offer relevant insights for designing improved learning strategies in vocational education settings.

RESULTS AND DISCUSSION

This study aimed to descriptively analyze the critical thinking skills of vocational high school (SMK) students and identify the factors influencing their development. The descriptive analysis results are presented in Table 2, accompanied by a descriptive plot in Figure 1.

Table 2. Descriptive analysis of students' critical thinking skills

No	Variabel	Skor/value variabel
1	Valid	20
2	Mean	2.380

No	Variabel	Skor/value variabel
3	Std. Error of Mean	0.146
4	Std. Deviation	0.652
5	Coefficient of variation	0.274
6	Skewness	-0.712
7	Std. Error of Skewness	0.512
8	Minimum	1.000
9	Maximum	3.000

The descriptive analysis of critical thinking skills, which was the primary focus of this study's first objective, shows that students' abilities varied, with a tendency toward moderate to low levels. As shown in Table 2, the mean score of students' critical thinking skills was 2.380 out of a maximum of 5.00. This places their performance in the "moderately critical" category, based on the classification used in this study. It indicates that students demonstrated abilities in problem clarification, information interpretation, analysis, inference and reasoning, and evaluation and reflection, although these abilities were neither optimal nor consistent.

The score dispersion, reflected by a standard deviation of 0.652, suggests variation in critical thinking skills among students. A coefficient of variation of 0.274 indicates a moderate spread of data around the mean, meaning that student performance in the classroom was relatively varied yet still within a homogeneous range. The lowest score recorded was 1, categorized as "not critical," while the highest score was 3, at the lower threshold of the "critical" category. These findings affirm that no students reached the "highly critical" level and that significant individual disparities in achievement exist.

The data distribution also showed a negative skewness of -0.712, indicating that most students scored above the median but not high enough to reach the upper categories. This skewness reveals that while some students demonstrated moderate mastery of critical thinking components, the majority remained below the optimal level. The violin plot presented in Figure 1 reinforces this finding, where most scores clustered between 2 and 3, with a few outliers falling into very low ranges.

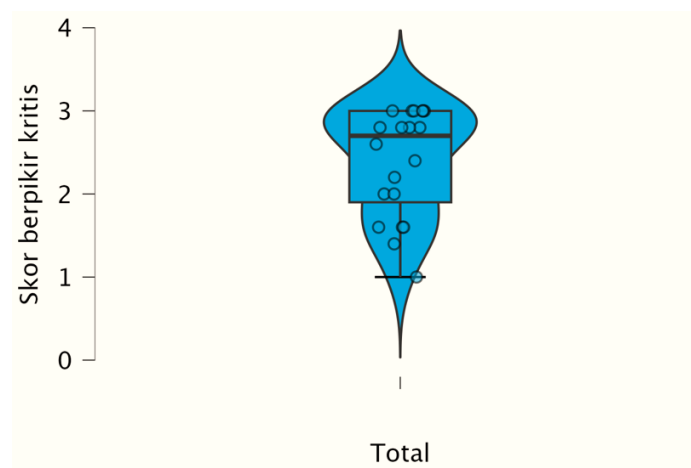


Figure 1. Descriptive plot of students' critical thinking skills

Furthermore, the visualization in Figure 1 shows a dense clustering of values in the mid-score range, suggesting that most students were operating at a level of critical thinking that still requires reinforcement. The symmetrical shape of the boxplot integrated into the violin plot confirms that although there were no extreme deviations in score distribution, the overall scores were concentrated in the lower-middle range. This indicates that students' critical thinking skills have not developed evenly and still require more structured and contextualized pedagogical intervention.

Overall, these findings imply that the expository teaching method implemented within the Merdeka Belajar curriculum framework has not yet successfully elevated students' critical thinking skills to the expected level. The low average score and the absence of students in the "highly critical" category suggest that this teacher-centered approach has limitations in fostering deep cognitive processing. Therefore, alternative or complementary teaching strategies are needed to actively engage students in analysis, reflection, and evaluation of contextual problems—especially in practical subjects like SHWS.

The analysis of qualitative data obtained from open-ended interviews with SHWS subject teachers revealed several key factors that influence the development of students' critical thinking skills. The interviews were conducted after the one-semester expository teaching intervention was completed. Thematic analysis was applied to the interview data, resulting in four major themes: (1) student learning readiness, (2) the effectiveness of instructional methods, (3) the condition of practical facilities, and (4) structural challenges in instructional implementation. These themes were identified based on the consistency and narrative strength that emerged from the interview transcripts.

Student Learning Readiness

The first dominant theme emerging from the interviews was the students' low learning readiness in developing critical thinking skills. Teachers noted that most students still demonstrated reactive and passive learning behaviors, often waiting for instructions. This attitude serves as a primary obstacle to cultivating reflective and analytical thinking. One teacher remarked:

"Most of our students only study when there's an assignment. They're not used to thinking deeper or questioning the material I deliver. So when I give them open-ended questions, most of them get confused and merely repeat what's in their notes rather than analyze."

This statement reflects that critical thinking development has yet to become embedded in students' learning habits. They are not trained to question information, compare perspectives, or evaluate arguments independently. This issue is closely tied to students' prior educational backgrounds and learning cultures shaped since elementary school.

Effectiveness of Teaching Methods

Teachers also pointed out that the instructional method applied during the intervention—the expository method—was not effective in promoting active student engagement in higher-order thinking. This method emphasized verbal and systematic delivery of material by the teacher, while opportunities for students to

engage in discussions, explore ideas, or solve problems collaboratively were very limited. One teacher explained:

"I use the expository method because it's the most practical and fits within the time allocation. But I admit, this method makes students more passive and mostly just listen. It's rare for them to initiate questions or engage in arguments. When I give analytical assignments, their answers are short and based on memorization."

This illustrates that the expository method has limitations in fostering a learning environment that supports critical thinking development. Although efficient in delivering content quickly, it does not offer sufficient space for students to build understanding through deep cognitive interaction. Therefore, more interactive and problem-based teaching methods should be considered for future instruction.

Condition of Practical Facilities

Another major factor influencing students' critical thinking development is the lack of adequate practical facilities in schools. Teachers expressed concerns that the SHWS laboratory remains under-equipped, both in terms of tools and materials. Consequently, what should be contextual and hands-on learning becomes overly theoretical. A teacher shared:

"Our practical facilities are very limited. Many tools that should be used for simulation are unavailable. So I mostly explain things using slides. If the tools were available, students could try, analyze, and draw conclusions themselves. But due to these limitations, their analytical process becomes weak."

This comment suggests that the lack of direct practical experience hinders students from developing the ability to think critically about the phenomena they learn. Practical experience is essential in vocational education, as it stimulates problem-solving skills and reflection on actions and outcomes. Therefore, improving infrastructure and learning resources is urgently needed to support learning activities aimed at enhancing critical thinking.

Challenges in Instructional Implementation

The final theme that emerged was the presence of structural challenges in instructional implementation, such as limited instructional time, curriculum demands, and the heterogeneity of students' academic backgrounds. Teachers reported that within the available time, it was difficult to develop reflective and in-depth learning experiences. One teacher stated:

"We have no more than three hours a week for SHWS, and even that is sometimes disrupted by practical schedules or other school activities. So it's hard to implement project-based learning or in-depth discussions. On top of that, some students grasp concepts quickly, while others struggle even with the basics."

This problem is exacerbated by administrative burdens and pressure to complete the syllabus, leading teachers to opt for simpler, time-efficient teaching methods. As a result, critical thinking instruction—which requires time, process, and

repetition—cannot be conducted optimally. Teachers also expressed the need for systemic support from the school and policymakers to redesign instructional schedules and frameworks to better support high-level competency-based learning.

Overall, the interview results indicate that the development of critical thinking skills among vocational school students is not solely determined by individual student characteristics but is also shaped by classroom dynamics, instructional policies, facility conditions, and pedagogical strategies. The combination of these factors creates structural and cognitive barriers that must be addressed comprehensively. These findings underscore the importance of integrative and contextual approaches in designing learning interventions aimed at enhancing students' critical thinking skills, particularly within vocational education settings such as SMKs.

Findings from the quantitative and qualitative analyses in this study indicate that the critical thinking skills of vocational high school students, although showing development in certain aspects, remain at a suboptimal level. The average critical thinking score was 2.380, placing students in the "moderately critical" category. This result suggests that students have begun to demonstrate reflective and analytical thinking but have not yet consistently performed critical thinking functions. Achievement disparities were evident, with minimum scores at 1 and maximum scores reaching only 3 out of 5. This highlights skill gaps that require more adaptive and contextual educational approaches.

From the qualitative perspective, teachers reported that students' learning readiness was a primary obstacle. Many students lacked independent study habits and continued to rely on rote memorization to understand material. This finding aligns with Sudana and Apriyani (2018), who noted that SMK students generally are not accustomed to solving problems independently, a key prerequisite for critical thinking. This lack of readiness stems from diverse educational backgrounds and insufficient exposure to learning approaches that emphasize exploration and reflection. Academic pressure focused on test results further reinforces surface learning over meaningful learning (Moodie & Wheelahan, 2012). In this context, the teacher's role is crucial in building such readiness through personalized, contextual, and student-responsive instruction.

Furthermore, the effectiveness of the teaching method used during the intervention was also a concern. The expository method, applied throughout one semester, tended to position students as passive recipients of information. While the method helped manage the class within limited time, it failed to provide opportunities for students to engage in high-order thinking processes. This reinforces the findings of López et al. (2023), who argued that lecture-based methods are ineffective in developing critical thinking skills. In contrast, problem-based learning and reflective discussions have been shown to foster deeper and more analytical thinking. Therefore, instructional innovations such as case studies, collaborative projects, and guided discussions are needed to help students actively build critical thinking skills.

Practical facility conditions were also found to be structural barriers to critical thinking development. Interviews revealed that limited laboratory resources and tools resulted in SHWS instruction being delivered mostly in a theoretical manner.

The lack of hands-on experiences restricted students' ability to observe, analyze, and draw conclusions from empirical experiences. Misbah et al. (2019) emphasized that inadequate facilities directly limit students' opportunities to apply theoretical knowledge in practice, thereby hindering the development of critical thinking skills. This is particularly regrettable in the context of vocational education, which ideally prioritizes applied learning. Thus, upgrading infrastructure and providing better access to practical equipment must become a priority for vocational education institutions.

In addition to internal and pedagogical factors, the findings also highlight structural challenges in learning implementation that limit the development of critical thinking. Teachers noted that the limited time allocated for SHWS lessons is often disrupted by non-academic activities. This situation prompts teachers to choose time-efficient methods that often exclude exploratory activities. Wang and Liu (2024) found that insufficient teacher training and a lack of consistent systemic support for critical thinking programs hinder effective implementation of appropriate instructional strategies. This was also reflected in this study, where teachers expressed the need for more structured training in reflective and argumentation-based teaching. Policy reform and professional development for teachers are crucial steps to address these structural issues.

In conclusion, the findings of this study emphasize that the development of critical thinking skills in vocational schools cannot rely on a single factor. A systemic approach is necessary—one that considers student readiness, innovations in teaching strategies, adequate practical facilities, and structural reforms in vocational education systems. A learning environment designed to encourage independent thinking, information evaluation, and reflection is essential to prepare students for the increasingly complex and uncertain demands of the workforce.

CONCLUSION

This study aimed to analyze the critical thinking skills of vocational high school (SMK) students and to identify the factors influencing their development within the context of expository teaching in the subject of "Sanitation, Hygiene, and Work Safety (SHWS)." The descriptive analysis results indicated that students' critical thinking skills were still within the "moderately critical" category, with an average score of 2.380 out of a maximum score of 5. This finding suggests that most students tend to process information at a surface level without strong analytical, inferential, or evaluative skills. The wide variation in student achievement also highlights the need for a more adaptive learning approach that considers individual student needs in developing higher-order thinking skills.

Furthermore, qualitative data from teacher interviews revealed that the development of students' critical thinking skills is influenced by four main factors: student learning readiness, the effectiveness of instructional methods, the condition of practical facilities, and structural challenges in instruction. Low learning readiness, the dominance of expository methods, limited practical facilities, and the lack of systemic support have prevented instructional practices from optimally nurturing students' reflective and critical thinking. While teachers recognize the importance of these skills, they are often constrained by time, curriculum load, and insufficient pedagogical training. Thus, a more in-depth and contextualized

instructional approach is needed to support students' comprehensive development.

In general, the findings of this study suggest that critical thinking skills are not simply the result of short-term learning interventions but are competencies that require long-term support through integrated instructional strategies, a conducive learning environment, and policies that promote professional teacher development. In the context of SMK, where students are being prepared for direct entry into the workforce, critical thinking skills are essential to face the dynamics of industry. Therefore, all educational elements—from teachers and curriculum to school management—must collaborate systematically to create a learning ecosystem that fosters critical thinking in a sustainable manner.

RECOMMENDATION

Based on the findings of this study, it is recommended that vocational schools, particularly SMKs, begin integrating problem-based learning, reflective discussion, and collaborative projects into their daily curriculum design. Additionally, efforts to enhance teacher capacity through ongoing training in critical thinking pedagogy, provide adequate practical tools and facilities, and offer greater flexibility in curriculum policy should become key priorities for educational stakeholders. Transformative and participatory instructional interventions will be crucial in encouraging students to develop critical thinking skills relevant to the demands of the modern workforce

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