

THE IMPLEMENTATION OF A PROBLEM SOLVING MODEL USING HIGHER ORDER THINKING SKILLS QUESTIONS TO DEVELOP VOCATIONAL HIGH SCHOOL STUDENTS' CRITICAL THINKING SKILLS

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ABSTRACT

This study describes the implementation of a problem-solving model through Higher Order Thinking Skills (HOTS) questions to develop students' critical thinking skills in the Public Relations and Protocol Management subject at SMK Negeri 48 Jakarta. It covers the planning and implementation of learning, the quality of the developed HOTS instrument, and the emergence patterns of Facione's six critical thinking indicators, namely interpretation, analysis, evaluation, inference, explanation, and self-regulation, among students with different critical thinking levels. The study employed a qualitative descriptive approach with a case study design. The unit of analysis comprised 34 eleventh-grade students of the Office Management and Business Services program, with six students and two teachers selected as interview informants through purposive sampling. Data were collected through classroom observation, in-depth interviews, a HOTS case-study test based on a Gala Dinner crisis scenario, and instrument testing using Pearson Product Moment correlation and Cronbach's Alpha. Data analysis was conducted through data reduction, data display, and conclusion drawing, combined with a Thinking Process Matrix Rubric to categorize students into High, Moderate, and Low critical thinking groups, validated through source triangulation. The HOTS instrument was valid for 10 of 15 items, with r values ranging from 0.389 to 0.610, and reliable with a Cronbach's Alpha of 0.636. Polya's problem-solving model was implemented systematically through four phases and elicited all six critical thinking indicators across all student categories, though with varying quality: the High category demonstrated mature and comprehensive abilities, the Moderate category tended to be normative, while the Low category remained very limited. The study recommends sustained application of a single-case HOTS-based problem-solving model with more intensive scaffolding for low-ability students, and the development of similar assessment instruments for other vocational subjects.

Keywords: *Problem Solving Model, Higher Order Thinking Skills, Critical Thinking, Protocol Management, Vocational Education.*

A. Introduction

Education plays an important role in preparing human resources capable of facing the challenges of scientific, technological, and

workforce developments in the 21st century (Mardhiyah et al., 2021). The learning process no longer emphasizes only the mastery of knowledge, but also the development

of higher-order thinking skills (HOTS), which encompass critical, creative, and analytical thinking abilities in solving problems (Tasrif, 2022). In the context of vocational education, mastery of HOTS is important because teachers are required to be able to integrate it into learning so that students are prepared to face increasingly complex workplace demands.

Critical thinking enables students to interpret information, analyze the truth of a statement, evaluate arguments, and draw logical inferences (Hasanah et al., 2023). In the context of office administration learning, particularly in the Public Relations and Protocol Management subject, critical thinking ability becomes an essential competency because students are required to analyze communication situations, make decisions in various public relations contexts, and develop solutions to dynamic and contextual problems (Kurniawan, 2018). However, various studies indicate that students' critical thinking ability remains relatively low, particularly on the indicators of evaluating and weighing trustworthy sources or

arguments (Karim & Nurlaelah, 2023; Suciono et al., 2020).

One factor associated with students' low critical thinking ability is learning and assessment practices that are not yet fully oriented toward HOTS (Rustam & Priyanto, 2022). Teachers' knowledge of HOTS is also still inadequate, and misconceptions frequently arise, such as equating HOTS solely with question difficulty level (Driana et al., 2021). Although vocational teachers hold very positive perceptions of HOTS, they still experience significant difficulties in integrating the concept into learning planning and implementation (Prayitno & Jaedun, 2022). To address this condition, a learning strategy that encourages students to actively engage in the thinking process is needed (Freeman et al., 2014), one of which is the problem-solving learning model, which places students in the activities of understanding the problem, devising a resolution strategy, carrying out the resolution steps, and reviewing the results obtained (Mustajab & Sutarni, 2024). This model has been shown to have a substantial influence on students' critical thinking ability (Evi &

Indarini, 2021; Chrisdiyanto & Hamdi, 2023).

A preliminary study conducted with 10 eleventh-grade students of the Office Management and Business Services (MPLB) program showed that classroom learning already involved discussion and the provision of case examples, but problem-solving activities requiring in-depth analysis had not yet taken place consistently. Students tended to understand the material delivered by the teacher, but were not yet accustomed to presenting logical and evaluative reasoning when facing complex problems, nor to working on HOTS questions on a regular basis.

Previous studies on critical thinking ability and HOTS have still been dominated by quantitative-experimental approaches testing the effectiveness of learning outcomes, and have therefore not yet revealed the process-oriented aspect, namely how the internal dynamics of students' critical thinking processes emerge and develop naturally during learning. The locus of previous research has also still been dominated by general education levels and exact science subjects, while studies in the vocational education (SMK) context,

particularly in the humanities cluster such as Public Relations and Protocol Management, remain relatively limited. The novelty of this study lies in its use of a qualitative single-case study approach that examines in depth the organic integration between Polya's (2004) problem-solving model as a learning strategy and a digital HOTS case-study test instrument (Anderson & Krathwohl, 2001) as a cognitive stimulus, in order to fully capture how Facione's (2015) six critical thinking indicators manifest in students when confronted with dynamic and applicable protocol-management case scenarios.

Based on the above description, this study aims to (1) describe and analyze the process of designing and implementing the problem-solving learning model through HOTS questions in the classroom; (2) identify and analyze the characteristics of HOTS question use in supporting the implementation of the problem-solving model; and (3) analyze and interpret the emergence and development of students' critical thinking ability indicators during the implementation of the problem-solving model through HOTS questions in the Public

Relations and Protocol Management subject at a vocational high school.

B. Research Method

This study employed a qualitative descriptive approach with a single-case study design, examining in depth, detail, and holistically the instructional activity process in one class, namely the eleventh-grade MPLB program class in the Public Relations and Protocol Management subject at SMK Negeri 48 Jakarta during the even semester of the 2025/2026 academic year. The qualitative approach was chosen because the study's main focus was to describe and deeply understand the flow of students' critical thinking processes when confronted with HOTS question stimuli within the problem-solving learning model (Sugiyono, 2019). The case boundaries were fixed on three dimensions: the implementation process of the problem-solving model, the characteristics of HOTS question use, and the dynamics of the emergence of students' critical thinking ability during learning.

Research informants were determined using a purposive sampling technique, consisting of one subject teacher as the main informant,

six students (two students representing each of the High, Moderate, and Low critical thinking ability categories), and one expert teacher of the MPLB specialization as a triangulation source. Primary data were obtained through classroom observation, in-depth interviews, and students' digital written answers on the HOTS Case Study Test Sheet based on a Gala Dinner operational crisis scenario, while secondary data consisted of the teacher's teaching materials and the school's administrative documents.

The main research instrument consisted of 15 HOTS essay items developed based on Anderson and Krathwohl's (2001) revised Bloom's Taxonomy at the cognitive levels of C4 (analyzing), C5 (evaluating), and C6 (creating). Before use, the instrument was validated through expert judgment by one expert teacher and empirically tested on 30 twelfth-grade MPLB students who were not the main research subjects. Item validity was tested using Pearson Product Moment correlation with the aid of SPSS, while reliability was tested using Cronbach's Alpha, referring to Sugiyono's (2019) categorization. This statistical procedure served solely as part of

instrument development and feasibility testing, not as a mixed-methods approach, since the main analysis used to answer the research questions remained a qualitative descriptive approach.

The data analysis technique referred to the Miles and Huberman interactive model, comprising data collection, data reduction (transcription, coding, and data selection), data display in the form of narrative descriptions and table matrices, and conclusion drawing and verification. Data validity was strengthened through source triangulation, namely cross-checking interview data from the subject teacher, the six student informants, and the expert teacher, so as to obtain objective and trustworthy conclusions regarding the emergence of students' critical thinking ability in vocational learning.

C. Results and Discussion

1. Implementation of the Problem-Solving Model through HOTS Questions

The teacher's planning and implementation of the problem-solving learning model were carried out systematically through four phases based on Polya's (2004) model. At the

planning stage, the teacher designed an In-Depth Learning Plan (RPM) that directly integrated the problem-solving syntax with a HOTS question instrument based on a single Gala Dinner operational crisis case study, enabling the testing of ten public-relations competency indicators within one coherent and interdisciplinary context, covering protocol principles, seating arrangement, logistics management, and written complaint handling.

At the implementation stage, which took place on 4 June 2026 with a time allocation of 3 lesson hours (135 minutes), the four phases of the problem-solving model proceeded continuously. The first phase, Understanding the Problem, encouraged students to interpret the core of the crisis and analyze the root problem independently without relying on direct guidance from the teacher. The second phase, Devising a Plan, generated active evaluative discussion dynamics, in which students tested the validity of each other's arguments in weighing the boundaries of responsibility between the committee and the hotel. The third phase, Carrying out the Plan, encouraged students to create new,

systematic operational solutions, such as a draft complaint-handling workflow, an usher work-control SOP, and a formal letter of apology. The fourth phase, Looking Back, revealed students' self-regulation awareness in independently reviewing and correcting their work before submission.

"This learning intervention model proved to be highly effective and relevant as a stimulus. The integration between the Problem Solving (Polya) stages and the ten designed HOTS items has a tight causal flow, so students cannot guess speculatively." (Expert Teacher, Interview, 8 June 2026)

This finding is consistent with Polya's (2004) view that the problem-solving model emphasizes a systematic thinking process through interconnected stages, and supports the findings of Evi and Indarini (2021) and Chrisdiyanto and Hamdi (2023), which showed that the problem-solving model has a substantial influence on students' critical thinking ability. The strength of this study lies in the organic integration of the problem-solving model with a single-case-study-based HOTS question, which creates a tight cognitive causal flow:

students are compelled to analyze the root problem (C4), evaluate the boundaries of responsibility (C5), and finally create a crisis-handling SOP (C6) in sequence. However, students in the Low critical thinking category experienced significant obstacles at the resolution-execution phase (C6) due to cognitive overload and weak procedural thinking ability, indicating that implementation of this model needs to be accompanied by more intensive scaffolding strategies for students at the early stage of critical thinking ability development.

2. Characteristics and Validity of the HOTS Question Instrument

The HOTS questions were developed as an essay test based on a single Gala Dinner operational crisis case study, in which students were positioned as public relations staff acting simultaneously as Master of Ceremony and protocol coordinator. Of the 15 items tested on 30 twelfth-grade MPLB students, 10 items were found valid (H1, H2, H3, H4, H5, H6, H8, H9, H10, H15) with calculated *r* values ranging from 0.389 to 0.610, comprising 3 C4 items, 3 C5 items, and 4 C6 items (Table 1). The five invalid items shared a common issue in sentence construction, namely

multi-interpretable question wording or the inclusion of more than one work instruction, indicating that the invalidity was caused more by item-construction factors than by the difficulty of the cognitive level.

Tabel 1 Summary of the HOTS Question Instrument Feasibility Test Results

Instrument Testing Aspect	Result
Number of items tested	15 items
Number of valid items (Pearson Product Moment)	10 items (3 C4, 3 C5, 4 C6)
Range of r values for valid items	0.389 – 0.610
Cronbach's Alpha reliability (15 items)	0.568 (low)
Cronbach's Alpha reliability (10 valid items)	0.636 (adequate/acceptable)

Source: SPSS Output and Instrument Validation Sheet, processed by the Researcher (2026)

The Cronbach's Alpha reliability value increased from 0.568 (low category, 15 items) to 0.636 (adequate/acceptable category, 10 items) after the invalid items were removed. This value has not yet reached the high category, but this is understandable given that the instrument takes the form of essays with a descriptive-interpretive scoring rubric that naturally produces greater variation in answers compared to objective instruments; Sugiyono (2019) states that a Cronbach's Alpha

value ≥ 0.60 is already adequate for performance-assessment-based instruments. The expert validation results reinforced the instrument's qualitative feasibility with an average score of 4.75 out of a scale of 5 (very good), with the highest score on the scoring-rubric construct aspect (5.00). The characteristic of C4–C6 cognitive tiering within a single case-study base proved capable of facilitating the gradual and comprehensive emergence of students' critical thinking processes, consistent with Anderson and Krathwohl's (2001) view that each higher cognitive level is built upon the foundation of the cognitive level below it.

3. Emergence and Development of Students' Critical Thinking Ability

Of the 34 eleventh-grade MPLB students who completed the HOTS Case Study Test Sheet, 15 students (44.1%) fell into the High category, 12 students (35.3%) into the Moderate category, and 7 students (20.6%) into the Low category (Table 2). These data formed the basis for selecting the six interview informants representing each category.

Tabel 2 Distribution of Students' Critical Thinking Ability Level Categories

Critical Thinking Ability Category	Number of Students	Percent age
High	15	44.1%
Moderate	12	35.3%
Low	7	20.6%
Total	34	100%

Source: Critical Thinking Category Test Results, processed by the Researcher (2026)

Facione's (2015) six critical thinking indicators — interpretation, analysis, evaluation, inference, explanation, and self-regulation — emerged in all student categories with differing intensity and quality. Students in the High category showed a mature, systematic, and integrated emergence of all six indicators. On the interpretation indicator, for example, High-category students were able to sort essential information from distractors through structured, staged reading, as expressed by one informant below.

"The way I sort the information is by doing a structured two-pass reading. In the first pass, I immediately eliminate non-essential technical data, because that's just distractor information that has no direct impact on the core of the operational crisis."
(S-1, Interview, 9 June 2026)

On the evaluation indicator, High-category students weighed the boundaries of responsibility between

the committee and the hotel based on industry accountability principles, whereas Moderate-category students tended to display a "right direction but not yet in-depth" pattern, for example judging a particular party at fault without balanced case-evidence-based argumentation. Low-category students showed one-sided evaluations not grounded in case evidence. On the self-regulation indicator, High-category students independently detected and corrected logical errors and word-choice issues in their answer drafts before submission, while Low-category students showed almost no re-checking process, as explicitly acknowledged by one informant below.

"If you're asking what mistakes I managed to find and fix myself... honestly, the answer is none at all! I didn't find any typos or flow errors because I really didn't read it again."
(S-6, Interview, 9 June 2026)

Overall, these findings confirm Hasanah et al.'s (2023) view that critical thinking enables students to interpret information, analyze the truth of a statement, evaluate arguments, and draw logical inferences. Moderate- and Low-category students

faced their main obstacle in transforming conceptual understanding into structured operational work instructions (the explanation indicator), consistent with Nurmalia and Sari's (2023) finding that students' critical thinking ability remains low, particularly on the inference, explanation, and self-regulation indicators, which demand more complex reasoning. According to the expert teacher, this obstacle is caused by cognitive overload and weak procedural thinking ability, so that Moderate- and Low-category students require more intensive scaffolding through continuous HOTS question practice. These results confirm that implementing the problem-solving model through HOTS questions is an effective learning strategy for developing critical thinking competency in the context of vocational education, particularly in humanities-based fields such as Public Relations and Protocol Management (Kurniawan, 2018).

D. Conclusion

The teacher's planning and implementation of the problem-solving learning model were carried out systematically through four phases based on Polya's (2004) model,

directly integrated with a HOTS question instrument based on a single Gala Dinner case study, enabling the testing of ten public-relations competency indicators within one coherent context. The developed HOTS question instrument, in the form of a tiered essay test spanning cognitive levels C4 to C6, underwent expert validation with an average score of 4.75 out of a scale of 5 (very good) as well as empirical validity testing that produced 10 of 15 valid items with a Cronbach's Alpha reliability of 0.636 (adequate/acceptable).

Facione's (2015) six critical thinking indicators — interpretation, analysis, evaluation, inference, explanation, and self-regulation — emerged across all student ability categories (High 44.1%, Moderate 35.3%, Low 20.6% of the 34 students), though with differing intensity and quality: the High category showed mature, systematic, and integrated emergence; the Moderate category showed adequate but rather normative emergence; while the Low category showed very limited emergence due to cognitive overload and weak procedural thinking ability. Overall, this study concludes that

implementing the problem-solving model through HOTS questions has proven effective as a learning stimulus capable of generating and developing vocational high school students' critical thinking ability in a gradual and contextual manner.

This study recommends that teachers continuously apply the single-case-study HOTS-based problem-solving model, accompanied by more intensive scaffolding strategies for low-ability students. Given that this study was limited to one class and a single session, future research is recommended to use a longitudinal design across several schools and other vocational subjects, and to explore adding more raters (inter-rater reliability) to strengthen the consistency of the descriptive-rubric-based HOTS assessment instrument.

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