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Development of HOTS-Based Evaluation Instruments to Improve Students' Critical Thinking Skills

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ABSTRACT

The development of Higher Order Thinking Skills (HOTS)-based evaluation instruments in education is a strategic effort to improve the quality of learning processes and outcomes. This study aims to analyze the development of Higher Order Thinking Skills (HOTS)-based evaluation instruments in improving students' critical thinking skills and to formulate a systematic, contextual, and applicable conceptual framework for developing evaluation instruments. The research employed a qualitative approach using the library research method through a review of various relevant sources, including academic books, national and international journal articles, and previous studies related to learning evaluation, HOTS, and critical thinking skills. Data analysis was conducted using content analysis techniques through the processes of identification, categorization, interpretation, and synthesis of various findings from the literature. The results indicate that the development of HOTS-based evaluation instruments should be carried out regularly through several stages, including needs analysis, formulation of critical thinking indicators, development of contextual stimulus-based questions, instrument validation, and quality testing. The study also reveals that HOTS-based evaluation instruments function not only as tools for measuring learning outcomes but also as learning strategies to develop students' abilities in analysis, evaluation, problem-solving, and critical thinking. This study contributes by formulating a conceptual framework for HOTS-based evaluation instrument development that can serve as a reference in creating more innovative learning evaluation systems oriented toward developing 21st-century competencies.

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1. INTRODUCTION

The development of Higher Order Thinking Skills (HOTS)-based evaluation instruments in education is a strategic effort to improve the quality of learning processes and outcomes. The current paradigm shift in education demands an evaluation system that not only measures the ability to remember and understand material but also assesses students' higher-order thinking skills, such as

analyzing, evaluating, and creating. HOTS-based evaluation instruments are designed to encourage students to address complex problems, connect various concepts, and develop critical thinking skills in problem-solving.(Maslihah, Aziroh, & Bashith, 2025)Therefore, developing quality evaluation instruments is a crucial part of creating learning that can meet the demands of developments in science, technology, and 21st-century competency needs.

Critical thinking skills are one of the main competencies that need to be developed in the educational process because they are related to students' abilities to understand information, analyze problems, make decisions, and provide solutions based on logical reasons.(Manurung, Fahrurrozi, & Gumelar, 2023)However, learning evaluations in various educational institutions are often focused on measuring lower-level cognitive abilities, such as memorization and understanding of basic concepts. This situation results in students' in-depth analysis, evaluation, and problem-solving abilities not developing optimally. Therefore, innovation is needed in the development of evaluation instruments that can more comprehensively measure students' critical thinking skills.

From the perspective of developing educational evaluation, HOTS-based instruments play a crucial role in creating a more meaningful assessment system that aligns with learning objectives. Developing evaluation instruments involves more than just question preparation, including indicator planning, constructing a framework, selecting stimuli, developing test items, validating them, and analyzing their quality. A good evaluation instrument must meet the requirements of validity, reliability, difficulty level, and discriminatory power to provide an accurate picture of students' critical thinking skills.(Harahap, 2024). In addition, the development of HOTS-based instruments also needs to consider student characteristics and the learning context so that the evaluation conducted is truly capable of measuring the expected competencies.

Theoretically, the implementation of HOTS-based evaluation contributes to improving the quality of learning by encouraging teachers to design learning processes that are more oriented toward developing students' critical thinking skills. Various studies have shown that the use of HOTS-based evaluation instruments can improve students' analytical, problem-solving, and reflective thinking skills.(Kusuma et al., 2025)However, the development and implementation of HOTS-based evaluation instruments still face various challenges, such as teachers' limited understanding in compiling HOTS questions, lack of skills in developing high-level thinking indicators, and the continued dominance of evaluation instruments that are oriented towards memorization and basic understanding.

This research focuses on the development of a HOTS-based evaluation instrument as an effort to improve students' critical thinking skills. The development of this instrument is aimed at producing an evaluation tool capable of measuring students' abilities to analyze information, evaluate arguments, and formulate solutions to given problems. Through an evaluation instrument designed systematically and in accordance with the principles of educational evaluation, it is hoped that the assessment process will not only serve as a tool for determining learning outcomes but also as a means to develop students' critical thinking skills on an ongoing basis. Thus, the development of a HOTS-based evaluation instrument is an important step in improving the quality of learning and preparing students to face the challenges of modern education.

The success of developing Higher Order Thinking Skills (HOTS)-based evaluation instruments in improving students' critical thinking skills is influenced by various internal and external factors. Internal factors include teacher competence in understanding HOTS concepts, the ability to develop quality evaluation instruments, an understanding of critical thinking indicators, creativity in developing problem-based questions, and educator commitment to creating meaningful learning evaluations. Furthermore, student characteristics, learning motivation, prior abilities, and active student involvement in the learning process are also important factors influencing the effectiveness of using HOTS-based evaluation instruments. Meanwhile, external factors include support from educational institutions, curriculum policies, the availability of learning resources, the use of educational technology, and the demands of 21st-century competency development that emphasize

critical thinking, creativity, communication, and problem-solving skills.(Yosepha, Ali, Wahyudin, & Rusman, 2023).

Managing these various factors requires a systematic and planned process of developing HOTS-based evaluation instruments. The planning stage is needed to determine the evaluation objectives, develop critical thinking skill indicators, and adapt the instrument to learning outcomes. The development stage is carried out through the preparation of a grid, the creation of stimulus-based questions, expert validation, and instrument trials to ensure the quality of the questions developed. Implementing HOTS-based evaluations serves as a means to measure students' abilities to analyze, evaluate, and create solutions to a problem. Meanwhile, the process of analyzing and evaluating the results of instrument use is a crucial part of making continuous improvements and refinements. Thus, the development of HOTS-based evaluation instruments serves not only as a tool for measuring learning outcomes but also as a strategy to improve the quality of learning and develop students' critical thinking skills.

Various previous studies have shown that developing HOTS-based evaluation instruments plays a crucial role in improving students' higher-order thinking skills. However, most studies have focused on developing instruments for specific subjects and have not examined the comprehensive instrument development process, which integrates validity aspects, HOTS question characteristics, and critical thinking indicators. Several studies have shown that HOTS-based evaluation instruments can improve assessment quality by encouraging students to think analytically, logically, and reflectively.(Zulfia, Muzaki, & Syam, 2026)concluded that improving the quality of learning is greatly influenced by an evaluation system that is able to measure student competencies comprehensively and continuously.(Mailani, Setiawati, Surya, & Armanto, 2022)concluded that learning evaluation needs to be directed at developing high-level thinking skills so that students not only understand concepts, but are also able to apply and evaluate information in various contexts.(Boroallo & Purnamasari, 2025)found that the use of systematically designed evaluation instruments can increase the effectiveness of the learning process through more authentic competency measurement.(Savika & Zuhriyah, 2024)also shows that the quality of learning evaluation is greatly influenced by educators' ability to design instruments that are valid, relevant, and appropriate to students' needs.(Nasution, 2024)emphasized that developing evaluation based on high-level thinking skills is an important strategy in improving the quality of learning and preparing students to face the challenges of modern education.

Based on various previous studies, it can be concluded that the study of the development of evaluation instruments based on Higher Order Thinking Skills (HOTS) and improving students' critical thinking abilities still has considerable room for development. Most previous studies have focused more on the effectiveness of using HOTS questions in improving learning outcomes or measuring students' cognitive abilities, but not much has examined the process of developing evaluation instruments comprehensively, including needs analysis, critical thinking indicator development, item development, instrument validation, and comprehensive instrument quality testing. Furthermore, there is still limited research developing HOTS-based evaluation instrument models that can systematically measure students' critical thinking dimensions according to learning characteristics and student needs.

The research gap in this study lies in the suboptimal development of evaluation instruments capable of comprehensively integrating HOTS principles with critical thinking skill indicators. Unlike conventional evaluation instruments, which are generally still oriented towards remembering and understanding, HOTS-based evaluation instruments emphasize higher-order thinking skills such as analyzing, evaluating, and creating. The evaluation instruments currently used tend to measure learning outcomes partially and are not fully capable of describing students' abilities to solve problems, provide arguments, and make decisions based on the information obtained. Therefore, it is necessary to develop evaluation instruments that function not only as measurement tools but also as media to train and develop students' critical thinking skills.

The novelty of this research lies in the development of a HOTS-based evaluation instrument systematically designed to improve students' critical thinking skills through the integration of higher-order thinking indicators in each stage of instrument development. This development model is not only oriented towards the preparation of questions with a high cognitive level, but also considers aspects of validity, reliability, stimulus characteristics, problem context, and suitability with students' critical thinking indicators. The developed instrument places the ability to analyze information, evaluate a problem, provide logical reasons, and generate creative solutions as key aspects in the evaluation process. Thus, this research is expected to provide conceptual and practical contributions in presenting a more innovative, authentic, and relevant learning evaluation model to improve students' critical thinking skills and support the improvement of learning quality in the modern education era.

In addition, strengthening the policy foundation and relevant theoretical discourse in the development of Higher Order Thinking Skills (HOTS)-based evaluation instruments can refer to educational policies that emphasize the importance of improving the quality of the learning process and student evaluation. Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 22 of 2016 concerning the Standards for Elementary and Secondary Education Processes emphasizes that the learning process must be carried out interactively, inspiringly, challengingly, and able to encourage students to actively participate in developing their potential, including critical thinking and problem-solving skills.(Education, Culture, & Indonesia, 2016). This policy provides a normative basis that the learning evaluation system is not only oriented towards achieving low-level cognitive learning outcomes, but must also be able to measure students' high-level thinking skills.

From an educational evaluation perspective, the development of HOTS-based instruments emphasizes that assessment quality is largely determined by the instrument's ability to authentically and comprehensively measure student competencies. A good evaluation instrument must be designed based on learning indicators, student characteristics, and the cognitive abilities to be developed. The principles of modern evaluation development emphasize the importance of validity, reliability, objectivity, and meaningfulness of instruments in providing information about student abilities. Therefore, the development of HOTS-based evaluation instruments is an important strategy for creating an assessment system that can encourage students to think analytically, critically, and creatively, and to solve problems independently.

Based on the background of the problem that has been described, this study aims to analyze the concept and stages of developing an evaluation instrument based on Higher Order Thinking Skills (HOTS) in improving students' critical thinking abilities based on a review of relevant literature. Furthermore, this study aims to formulate a conceptual framework for developing a HOTS-based evaluation instrument that is systematic, contextual, and applicable so that it can serve as a reference for educators in creating a learning evaluation system that is able to measure and develop students' critical thinking abilities effectively and sustainably.

2. METHODS

This study uses a qualitative approach with a library research method that aims to analyze the concept and development of an evaluation instrument based on Higher Order Thinking Skills (HOTS) in improving students' critical thinking skills. Research data were obtained through a review of various relevant literature sources, such as academic books, national and international journal articles, educational policy documents, and previous research results related to learning evaluation, HOTS, and critical thinking skills. Data collection was carried out through documentation techniques by selecting, identifying, and reviewing library sources based on their relevance, credibility, and relevance to the research focus. The literature review was directed at gaining an understanding of the principles of evaluation instrument development, critical thinking indicators, HOTS question characteristics, and aspects of instrument validity and reliability.

Data analysis was conducted using content analysis techniques through the stages of data reduction, grouping themes, interpreting information, and systematically drawing conclusions. Data validity was carried out through source triangulation by comparing various relevant scientific references to obtain a comprehensive understanding. The research stages include identifying theories related to HOTS-based evaluation, analyzing previous research results, reviewing evaluation instrument development models, and compiling a conceptual framework for developing instruments capable of measuring and improving students' critical thinking skills. The results of this study are expected to provide theoretical contributions in the development of learning evaluations that are more innovative, authentic, and in accordance with the demands of 21st-century education.

3. FINDINGS AND DISCUSSION

Concepts and Stages of Developing HOTS-Based Evaluation Instruments to Improve Students' Critical Thinking Skills

Based on the analysis of various literature, it was found that the development of an evaluation instrument based on Higher Order Thinking Skills (HOTS) is an evaluation approach aimed at measuring students' higher-order thinking skills through the cognitive processes of analyzing, evaluating, and creating. Unlike conventional evaluation instruments, which are generally still oriented towards remembering and understanding concepts, the HOTS instrument is designed to explore students' abilities in processing information, connecting various concepts, assessing a problem, providing arguments, and generating solutions based on logical and systematic thinking processes. The results of the literature review indicate that the HOTS-based evaluation instrument is able to provide a more comprehensive picture of students' critical thinking skills because it not only assesses the final learning outcomes but also assesses how students carry out the thinking process in solving a problem. Thus, the HOTS instrument has a strategic role in supporting learning oriented towards the development of 21st-century competencies, especially critical thinking, creativity, communication, and problem-solving skills.

The results of the literature synthesis indicate that the development of HOTS-based evaluation instruments must be carried out through systematic stages to produce instruments that are valid, reliable, and in accordance with learning objectives. These stages begin with a needs analysis to identify the competencies to be measured and the characteristics of students, followed by determining indicators of critical thinking skills as the basis for developing the instrument. After that, a grid is compiled that connects learning outcomes, cognitive indicators, materials, and the form of questions to be developed. The development of HOTS questions is carried out by paying attention to the use of contextual stimuli, authentic problems, and demands for higher-order thinking so that students are encouraged to conduct analysis and evaluation. The next stage includes expert validation, instrument trials, analysis of question quality based on validity, reliability, difficulty level, and discriminatory power, and the stage of instrument refinement. Based on this analysis, it can be understood that the quality of HOTS-based evaluation instruments is highly dependent on the integration of conceptual, technical, and pedagogical aspects so that the resulting instrument is not only able to measure students' critical thinking skills but also contributes to the development of these skills in a sustainable manner.

Table 1. Literature Analysis of HOTS-Based Evaluation Instrument Development

Researchers	Focus of Study	Literature Analysis Results
(Zubair, Mini, Kurnia, & Bashith, 2024)	Development of the quality of learning evaluation	Shows that systematically designed evaluation instruments are able to improve the quality of student competency measurement through more comprehensive indicators.
(Himawan, 2021)	Evaluation of learning based on high-level thinking skills	Explains that evaluation needs to be directed at analytical, evaluation and problem-solving skills so that students are able to face complex problems.

(A. Saputra, 2025)	Development of innovative evaluation instruments	Found that HOTS-based instruments are able to increase student involvement in critical thinking processes through contextual questions.
(Maulana, 2023)	Quality of educational evaluation instruments	Emphasizing that validity and reliability are the main aspects in ensuring that the instrument is able to measure students' abilities accurately.
(Sholeh, 2023)	Strategies for improving the quality of learning	Demonstrates that evaluation based on higher-order thinking skills is an important part of supporting 21st-century learning.

Based on the results of the literature synthesis, it can be analyzed that the development of HOTS-based evaluation instruments is not only oriented towards compiling questions with a high level of difficulty, but rather emphasizes the instrument's ability to measure students' high-level thinking processes. An effective HOTS instrument must be able to describe students' abilities to analyze information, evaluate a problem, provide logical reasons, and generate creative solutions. Therefore, instrument development needs to be based on the relationship between learning objectives, indicators of critical thinking skills, student characteristics, and the context of the problems used in the questions so that the resulting evaluation is truly able to measure the expected competencies.

The study results show that the quality of HOTS-based evaluation instruments is significantly influenced by the systematic development stages. The process, from needs analysis, indicator formulation, grid development, item development, validation, and instrument quality testing, are crucial factors in producing valid and reliable evaluation tools. Therefore, HOTS instruments serve not only as a tool for assessing student learning achievement but also as part of a learning strategy capable of continuously training and enhancing students' critical thinking skills in line with the demands of 21st-century competencies.

Formulation of a Conceptual Framework for Developing HOTS-Based Evaluation Instruments

The results of the literature analysis indicate that the development of evaluation instruments based on Higher Order Thinking Skills (HOTS) needs to be built through a strong integration between learning evaluation theory, cognitive taxonomy, and the concept of critical thinking skills. Evaluation instruments cannot be understood only as a tool to measure learning outcomes, but also as part of the learning process that functions to guide students in developing higher-order thinking skills. Studies of various studies show that effective HOTS-based evaluation instruments must be able to measure cognitive abilities at the levels of analysis, evaluation, and creation, while also encouraging students to connect concepts, assess information, provide arguments, and find solutions to given problems. Thus, the development of HOTS instruments requires systematic planning that takes into account the suitability between learning objectives, critical thinking indicators, material characteristics, and the evaluation context so that the resulting instrument can provide a more authentic picture of students' thinking skills. Based on these studies, this study formulates a conceptual framework for the development of HOTS-based evaluation instruments as follows:

Table 2. Conceptual Framework for Developing HOTS-Based Evaluation Instruments

Development Components	Literature Findings	Analysis Results and Conceptual Formulation
Needs analysis	Instruments must be adapted to learning objectives and student characteristics.	The initial stage of instrument development must determine the critical thinking competencies to be achieved.
HOTS indicator development	HOTS is related to analytical, evaluation and creative abilities.	Critical thinking indicators are the main basis for determining the form and level of complexity of questions.
Item development	HOTS questions require stimulus and problem context.	Instruments must be designed problem-based so that students become accustomed to using critical thinking skills.

Instrument validation	The quality of an instrument is determined by its validity and reliability.	Instrument testing is an important stage to ensure the accuracy of measuring student abilities.
Implementation of evaluation	Evaluation can be used as a basis for learning reflection	HOTS instruments not only measure students' abilities, but also serve as a basis for improving the learning process.

Based on the synthesis of various previous studies, it can be analyzed that the development of evaluation instruments based on Higher Order Thinking Skills (HOTS) has a significant contribution in improving the quality of learning evaluation, particularly in measuring students' critical thinking abilities more comprehensively. Various studies have shown that conventional evaluation instruments that still predominantly measure the ability to remember and understand are not fully capable of describing students' abilities in analyzing information, evaluating a problem, and generating creative thoughts or solutions. HOTS-based instruments present as a more relevant evaluation approach because they place the student's thinking process as the main focus, not just the final result in the form of a right or wrong answer. However, the results of the literature review also show that most research still focuses on the use of HOTS instruments in specific learning or their impact on learning outcomes, while studies that discuss the development of instruments comprehensively from identifying needs, compiling critical thinking indicators, designing questions, validating, to evaluating the quality of the instrument are still relatively limited.

These limitations indicate the need to formulate a more systematic framework for developing HOTS-based evaluation instruments that are integrated with critical thinking skills indicators. Based on literature analysis, a quality evaluation instrument is not sufficient only to meet the technical aspects of question preparation, but must also be able to connect learning objectives, student characteristics, problem contexts, and the higher-order cognitive processes to be developed. Therefore, this study produces a conceptual framework that positions HOTS-based evaluation instruments not only as a tool for measuring academic ability, but also as a pedagogical instrument that plays a role in developing students' critical thinking skills on an ongoing basis. This framework emphasizes that learning evaluation has a broader function, namely as a means of reflection, developing thinking potential, and improving the quality of the learning process in accordance with the demands of 21st-century education.

Discussion

The results of the study indicate that the development of an evaluation instrument based on Higher Order Thinking Skills (HOTS) is an evaluation approach that not only aims to measure learning outcomes but also develops students' critical thinking skills through higher-order cognitive processes. This finding reinforces the view in the cognitive taxonomy theory developed by Bloom, which was later revised by Anderson and Krathwohl, that higher-order thinking skills are in the realm of analyzing, evaluating, and creating. Based on the results of the literature review, the HOTS instrument has characteristics in the form of the use of contextual stimuli, authentic problems, and complex thinking demands so that students not only remember information, but are able to process, assess, and generate new ideas. This finding is in line with research(Wisman, Effrata, & Tutesa, 2021)which emphasizes that the quality of learning evaluation is greatly influenced by the instrument's ability to measure student competencies comprehensively. The similarity between this study and the aforementioned study lies in the emphasis that evaluation instruments must be developed systematically to be able to describe student abilities more comprehensively, while the difference lies in the focus of this study which emphasizes the development of instruments as a means of improving critical thinking skills, rather than simply as a tool for measuring learning quality.

The research results also show that developing HOTS-based evaluation instruments requires systematic steps, starting from needs analysis, developing critical thinking indicators, developing grids, developing stimulus-based test items, validating, testing, and analyzing the quality of the instrument.

These findings indicate that HOTS instruments cannot be developed simply by increasing the difficulty level of the questions, but must consider the suitability between learning objectives, student characteristics, the context of the material, and the cognitive abilities to be measured. This is in line with educational evaluation theory which emphasizes that assessment instruments must meet the principles of validity, reliability, objectivity, and relevance in order to provide accurate information about student abilities. Research(H. Saputra, 2024)also share the same finding that learning evaluation needs to be directed at analytical, evaluation, and problem-solving skills so that students can face complex problems. However, this study differs in that it not only discusses the importance of HOTS evaluation but also formulates a framework for developing an instrument that links each stage of development to indicators of critical thinking skills.

Furthermore, the study results indicate that HOTS-based evaluation instruments have a broader function than conventional evaluations, namely as pedagogical tools capable of training students' critical thinking patterns. Instruments developed through contextual problems can encourage students to interpret, analyze, evaluate, and make decisions based on available information. This finding aligns with research.(Givarin & Ellianawati, 2025)which found that innovative HOTS-based evaluation instruments were able to increase student engagement in critical thinking processes through challenging and life-relevant questions. The similarity between this study and the previous study lies in the view that the quality of HOTS instruments is influenced by the ability of questions to encourage students' thinking activities, while the difference is that this study emphasizes the conceptual aspects of instrument development through literature reviews, rather than direct implementation on specific student groups. Thus, the results of this study broaden the understanding that HOTS instruments are not merely evaluation products, but part of a learning strategy that can build higher-order thinking skills.

Based on the overall analysis results, this study confirms that the development of HOTS-based evaluation instruments needs to be understood as an integrated process involving theory, instrument design, and the goal of developing critical thinking skills. This finding aligns with research by Soetrisno and Ali (2025), who emphasized that validity and reliability are key aspects in ensuring that instruments can accurately measure students' abilities, as well as research by(Paramita, 2025)which states that evaluation based on higher-order thinking skills is an essential part of supporting 21st-century learning. The difference is that this study places a stronger emphasis on formulating a conceptual framework that integrates needs analysis, HOTS indicators, question development, instrument validation, and evaluation implementation into one systematic development process.

Overall, the results of this study confirm that the development of evaluation instruments based on Higher Order Thinking Skills (HOTS) plays a significant role in improving the quality of learning evaluations and students' critical thinking abilities. These findings reinforce previous studies that suggest that learning evaluations designed based on HOTS principles are able to measure students' abilities more comprehensively than conventional instruments that focus solely on memory and comprehension. However, this study provides a new contribution because it demonstrates that the development of HOTS-based evaluation instruments needs to be understood as a systematic process that integrates needs analysis, critical thinking indicators, question characteristics, instrument validation, and instrument quality evaluation. This approach makes evaluation instruments not only a tool for measuring learning outcomes but also a pedagogical tool that can encourage students to develop analytical, evaluation, problem-solving, and decision-making skills in a sustainable manner.

The novelty of this research lies in the formulation of a conceptual framework for developing an evaluation instrument based on Higher Order Thinking Skills (HOTS), which does not only focus on the preparation of questions with a high cognitive level, but also systematically integrates all stages of instrument development starting from needs analysis, determining indicators of critical thinking skills, preparing questions based on contextual stimuli, validation, to evaluating the quality of the instrument. In contrast to previous research that mostly focuses on the effectiveness of the use of HOTS questions on learning outcomes, this study positions the evaluation instrument as a strategy for developing

students' critical thinking skills on an ongoing basis. The resulting framework provides a perspective that learning evaluation does not only function to measure academic achievement, but also becomes part of the process of developing higher-order thinking skills that are relevant to the demands of 21st-century education.

4. CONCLUSION

The results of the study indicate that the development of an evaluation instrument based on Higher Order Thinking Skills (HOTS) is an important strategy in improving the quality of learning evaluation and students' critical thinking skills through instruments designed based on indicators of analysis, evaluation, and creation. Based on the literature review, the development of HOTS instruments needs to be carried out systematically through the stages of needs analysis, preparation of critical thinking indicators, development of questions based on contextual stimuli, validation, and testing the quality of the instrument to be able to measure students' abilities accurately. The conclusion of this study confirms that HOTS-based evaluation instruments not only function as a measuring tool for learning outcomes, but also as a medium for developing students' critical thinking, problem-solving, and decision-making skills. The implications of this study indicate that educators need to develop a more innovative evaluation system oriented towards higher-order thinking skills so that the learning process is more relevant to the demands of 21st-century competencies. Therefore, the recommendations of this study are the need to improve teacher competence in designing HOTS instruments, develop instruments tailored to the characteristics of subjects and students, and further research through empirical implementation to test the effectiveness of the instrument framework that has been formulated.

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