

HOTS Based on Revised Bloom's Taxonomy: Analysis in English Examination Test Items Used in High School Level

Kania Sausan^{1*}, Rohmatillah¹, Yulan Puspita Rini¹

¹UIN Raden Intan Lampung

^{1*}Email: kantiasausan1010@gmail.com

Abstract. *In the contemporary era, the ability to think critically is vital for individuals to effectively navigate the myriad challenges they encounter. Recognizing the need to enhance Indonesia's performance in the Programme for International Student Assessment (PISA) survey, the government introduced the 2013 curriculum, which places particular emphasis on fostering critical and creative thinking skills. Against this backdrop, the present study sought to examine the extent to which questions in the high school English midterm and final exams for the 10th and 11th grades in the second semester of the 2021–2022 academic year at MAN 1 Lampung Tengah reflect the principles of Higher Order Thinking Skills (HOTS) and exhibit characteristics associated with such skills. Employing a qualitative content analysis design, this research aimed to shed light on the nature of these assessment instruments and their alignment with the curriculum's goals. The study found that in the mid-term 10 grade, there were 6 items, or 20%, labeled "very low," whereas in the mid-term 11 grade, 14 items, or 46.67%, were labeled "enough." For the final Exam 10 class, 5 items were found at 12.50%, referred to as "very low," and 13 items were found at 32.50%, referred to as "low." The outcomes of HOTS-based questions were 86.84%, with questions about critical thinking abilities being the most prominent. This was followed by HOTS questions that help students develop creative thinking abilities (10.52%) and questions that aid in the development of problem-solving skills (2.63%).*

Keywords: *characteristics of hots; higher order thinking skills (hots); revised bloom's taxonomy; test*

A. INTRODUCTION

Globalization unavoidably contributes to the rapid change of human existence in all fields in the twenty-first century. One of those fields is school education (Duman & Karagoz, 2016). As a result, in order to face civilization in this millennial period, everyone, particularly students and educators, must be able to think critically. The 21st-century learning process, according to Apandi (2018), will impart a variety of skills, including communicative, collaborative, critical thinking, problem-solving, and creative and innovative thinking. These skills will become provisions for developing generations of nations that are able to compete on a global and regional scale. Because critical thinking abilities are so important in today's world, the Indonesian Ministry of Education and Culture has been implementing a critical thinking education program to help Indonesian students catch up in worldwide rankings. The PISA research, conducted six times between 2000 and 2015, consistently revealed Indonesia's performance below the average score of the Organisation for Economic Co-operation and Development (OECD) study. This designation has prompted a recognition of the need for significant improvements in the Indonesian education system. (Chintia et al., 2018). Based on Indonesian Ministry of Education and Culture (2017), this might occur because Indonesian students have a low capacity to: (1) absorb difficult material; (2) understand theory; (3) evaluate and solve issues; (3) use tools, adhere to protocols, and troubleshoot issues; (4) conduct an investigation.

The government's approach to improving educational quality in line with the development of 21st-century learning is to analyze and revise the curriculum standards currently in use (Apandi, 2019). These efforts can be carried out with the cooperation of teaching staff, educational institutions, and students. According to the implemented curriculum, K-13 Revision, it is the teacher's responsibility to assist students in the process of analyzing, critical thinking, and problem-solving, also known as "higher order thinking skills" (Harususilo, 2018). The Indonesian

Curriculum 2013 has been officially adopted by the government as of the 2013–2014 academic year and is currently being steadily implemented at all levels of education throughout Indonesia. Students of all ages are prepared for globalization through this curriculum. In 2013, the government created a curriculum to improve students' ability to take themselves seriously in the 21st century (Narwianta et al., 2019). The Indonesian government exhorts teachers to give students the skills they need to strengthen their critical thinking abilities, which often manifest as the HOTS (higher-order thinking skills) specified in the 2013 curriculum and include analyzing, evaluating, and creating. Higher order thinking skills (HOTS) are required to solve problems in the 21st century (Brookhart (2010), Ganapathy and Kaur (2014), Tan and Siti Hajar (2015), and Widana (2017). HOTS is a vital talent for developing creative and innovative personalities (Ganapathy & Kaur, 2014).

Accordingly, HOTS may be defined as analytical, creative, and problem-solving skills that include communication, cooperation, and self-development (Council, 2013). The term "HOTS" has several meanings. HOTS was defined by Anderson and Krathwohl (2001) as analyzing, evaluating, and creating. Higher-order thinking abilities are at a higher level of thought than memorization or reciting anything that has been demonstrated to someone, as stated by Thomas and Thorne (2009). Furthermore, King, Goodson, and Rohani (2013) contend that higher-order thinking abilities are the capacity for thought that entails more than only memory.

HOTS is connected with the term "critical thinking" (higher order thinking skills). Bloom's (1956) classification of HOTS (Higher Order Thinking Skills) is directly tied to cognitive level. Bloom (1956) distinguishes six stages of cognition. The cognitive level ranges from simple to complex thinking abilities. It integrates the knowledge dimension with the cognitive process. Bloom (1956) proposes six degrees of cognitive ability. Knowledge, comprehension, application, analysis, synthesis, and evaluation are at the most basic level. Krathwohl (2001), on the other

hand, altered Bloom's taxonomy. Anderson and Krathwohl (2001) cited in Fitriani (2019) explain the characteristics of thinking skills in the updated version taxonomy as follows, from lower-order thinking abilities to higher-order thinking skills. Remembering is the first lowest cognitive level under the phrase lower-order thinking skills. It entails the capacity to recall important information from long-term memory. The second cognitive level, known as lower-order thinking skills, is the ability to understand. It entails the ability to derive meaning from instructional information via oral, writing, and visual communication. The final cognitive level is referred to as lower-order thinking capabilities. It entails the capacity to carry out or conduct a method to solve issues and apply information in the real world. Furthermore, the cognitive levels associated with higher-order thinking abilities are analysis, evaluation, and production. The capacity to break down a substance into its basic pieces and discern how the parts connect to one another and the overall structure or purpose is known as analysis. The ability to make a decision based on specific criteria and standards is referred to as evaluating. The capacity to put components together to make a cohesive or functioning whole, or reorganize elements into a new pattern or structure, is referred to as creativity. Higher-order thinking skills are comprised of three cognitive processes: analysis, evaluation, and creation (Brookhart, 2010 as cited in Fitriani, 2019).

In pursuance of Barnett and Francis (2012), cited by Kusuma et al. (2017) cited by Fauziyah (2021), higher-order thinking questions can persuade students to consider a topic in great detail, enabling the higher-order thinking instrument to serve as a stimulus as an assessment for learning in order to enhance students' higher-order thinking. In actuality, it is crucial to analyze the HOTS for the test items. The outcomes of the question analysis are required as a foundation for judgments regarding the follow-up in order to increase the quality of learning, in addition to demonstrating the professionalism of the teacher. (Suyati and Priyadi, 2021). In spite of the fact that item analysis is a crucial topic, no study of the fulfillment of

HOTS types in these queries has ever been done. These things serve as the foundation for the study under this title.

Based on the description above, it is clear that it is essential to do a HOTS analysis on test questions provided by instructors, especially since teachers are obligated to assemble exam questions that may assess students' critical thinking abilities. There has been various researches conducted on HOTS analysis on exam questions. The first study was conducted by Auliyana (2019), who discovered that LOTS were more prevalent than HOTS. Another study, by Ilham et al., (2020), found that the HOTS items are fairly excellent, even though the distribution of cognitive skills remains monotonous. The research from Hartini, et al., (2021) According to the results of an expert-validated analysis of teacher-made assessment instruments, 81.25% of the items are in the LOTS category, while 18.75% are in the HOTS category, so it can be concluded that: (1) the instruments used by elementary school teachers in East Jakarta have fulfilled the content validity requirement; (2) the LOTS and HOTS on the instruments used by elementary school teachers are proportional; and (3) the quality of assessment is high.

According to the aforementioned previous studies, it is crucial to conduct a HOTS analysis on questions created by teachers or educational institutions so that the results of the analysis can be used as a basis for teachers or institutions to improve the quality of the questions so that the quality of the HOTS-based items is sufficient in light of the fact that questions supporting critical thinking skills are crucial for students in this century. The aim of this study was to quantify the proportion of HOTS-based questions and HOTS features in terms of three characteristics: critical thinking, creative thinking, and problem-solving skills. For the academic year 2021–2022, questions from the midterm and final exams for grades 10th and 11th in the second semester were utilized by the teacher at MAN 1 Lampung Tengah was the research objects of this research.

B. RESEARCH METHOD

Research Design

This study's research design combined content analysis or document analysis with descriptive qualitative methods. The purpose of content analysis in this qualitative descriptive research was to describe the items that are classified as HOTS-based questions and to describe the characteristics of HOTS questions on three characteristics: critical thinking skills, creative thinking skills, and problem-solving skills. Saryono (2007) said that qualitative research is research that is used to investigate, find, describe, and explain the quality or privilege of social influences that cannot be explained, measured, or described through a quantitative approach. According to Weber, content analysis is a research method using a set of procedures to make valid inferences from texts.

Source of Data

The data for this research was taken from the English teacher. The data was taken in the form of a Google Form link to obtain the test questions for the mid-term and final exam tests for grades X and XI at MAN 1 Lampung Tengah in the academic year 2021/2022, using purposive sampling technique. Purposive sampling was chosen in this instance because of the following factors while gathering the research data to be analyzed: 1) All classes 10th and 11th successfully completed the midterm and final semester assessments that the teacher administered. 2) With the exception of class 12th, which does not administer the midterm due to the completion of the government-conducted *Ujian Sekolah* and *Ujian Madrasah* examinations. 3) The English teacher in charge of class 10th can also access and provide questions for the midterm and final exams for grades 10th and 11th. Therefore, the English exam questions for grades 10th and 11th utilized at MAN 1 Lampung Tengah for the academic year 2021-2022 in the second semester were used as the sample in this study, which consisted of 30 item questions for the midterm in each grades 10th and 11th, and 40 item questions for the final exams in

each grades 10th and 11th. Finally, the total of 140 item questions represents a sample of this research.

Instrument of Research

The primary research instrument employed in this study was the researchers themselves, who actively conducted the data collection and analysis. Additionally, an analytical framework was utilized as another research instrument to guide the analysis process. The instrument in the form of an analytical framework in this study was prepared based on the theoretical basis of HOTS (Higher Order Thinking Skills) based on Anderson and Krathwohl (2001). The researchers also used checklist tables and analysis card as tools to help with the process of putting data into groups.

Validity of Data

In this study, the researchers opted to employ the source triangulation method as a means of data validation. To ensure the validity of the research data, multiple sources were utilized, including experts in the field of higher-order thinking skills (HOTS), teachers, and colleagues. These individuals were approached to provide their opinions and insights, thereby validating the findings of the research. Then, after the researchers knew the perspective of each subject on the research data, the researchers drew conclusions that produced valid data results. The data validation sheet was used as a data validation tool for the validator.

Technique of Data Analysis

After the data is collected, the researchers had analyzed it descriptively and qualitatively. The researchers had used the analysis cards as a reference for deciding on cognitive domain categories. After that, all the questions were distributed in the form of a checklist table to categorize and compare the distribution of HOTS and LOTS on midterm and final semester exam questions. The checklist table form

consists of a list of test questions and columns for all cognitive skills, namely C1–C6 of the revised Bloom's Taxonomy. The researchers had calculated, using a formula, the number of each cognitive skill in the item and compared it at each level to find out the exact number of HOTS distributions in the midterm and final exam items. The researchers focused on the HOTS distribution even though it comprises all the cognitive skills in the revised edition of Bloom's taxonomy. Then, the researchers had analyzed the characteristics of the HOTS items in terms of; critical thinking skills, creative thinking skills, and problem solving skills.

HOTS and LOTS Percentage Formula:

$$P = \frac{F}{N} \times 100\%$$

Description: P = HOTS or LOTS percentage

F = Frequency (achieved total value)

N = The total of all questions

C. FINDINGS AND DISCUSSION

Findings

There will be two primary sections used to present the study's findings. First, the percentage of test items that contain HOTS-based questions. The HOTS-based question characteristics are the next.

The Proportion of HOTS-Based Question on the Test Items

1) Mid-term on the Second Semester for X Grade

Findings from the HOTS analysis of class X midterm test questions from the second semester. The questions of the HOTS type come in the following numbers: 13, 14, 18, 19, 26, and 27, for a total of six inquiries. The findings revealed that of the 30 multiple-choice questions, 6 items—5 analytical skills items (C4), 1 evaluating skills item (C5), and 0 creative skills items

(C6)—were included in HOTS-oriented questions. According to the HOTS-based item percentage categorization, this test is classified as "very low" because the overall HOTS item score on it surpasses 20%.

2) *Mid-term on the Second Semester for XI Grade*

The results of HOTS analysis on midterm test questions for class XI in the second semester showed that out of 30 multiple-choice questions, there were 14 questions that were included in HOTS-oriented questions, consisting of 11 items of analyzing skills (C4), 3 items of evaluating skills (C5), and 0 items of creating skills (C6). So it can be concluded that the proportion of HOTS questions in this test is 46.67%. Based on the percentage classification, it means "sufficient."

3) *Final exams on the Second Semester for X Grade*

The HOTS on the second semester X class final exam test questions were analyzed by the researchers. The distribution revealed that the HOTS-oriented questions contain 5 items out of 40 multiple-choice questions, with 5 items for analyzing skills (C4), 0 items for assessing abilities (C5), and 0 items for producing skills (C6). The following questions are included in the HOTS-type questions: 1, 7, 11, 19, and 20. The "very low" category is included in the percentage categorization for the total score of 12.50%.

4) *Final exams on the Second Semester for XI Grade*

The HOTS on the first semester XI class final exam test questions were analyzed by the researcher. The results show that 13 of the 40 multiple-choice questions are HOTS-oriented, with 8 items for analyzing skills (C4), 5 items for assessing abilities (C5), and 0 items for creating skills (C6). The number of HOTS-type questions is as follows: 4, 6, 7, 18, 19, 20, 21, 22, 28,

34, 35, 38, and 40. The overall score was 32.50%, indicating "low" based on the percentage categorization.

The HOTS-Based Question's Characteristics

This study analyzed the data by presenting the characteristics of HOTS-based questions. By analyzing the characteristics of HOTS-based questions, based on the theory of Watson and Glaser (1980) about questions that can support critical thinking skills, Torrance's theory (1990) about questions that can support creative thinking skills, and Polya's theory (1973) about questions that are able to develop problem-solving skills, Then the characteristics of the HOTS questions would be known. It would be explained as followed.

- **Critical Thinking Skills**

According to Halpern (2014), Sani (2019), and Ulva (2020), critical thinking is related to the use of cognitive thinking skills or strategies that increase the likelihood of obtaining the desired impact. When solving a problem and making decisions, critical thinking is required. Based on Watson and Glaser's five criteria in critical thinking, namely: 1) inference (questions that give rise to reasons involved in supporting logical judgments); 2) assumptions (questions that support statements that are considered true and conclusions can be drawn by students); 3) deduction (questions that support students to be able to conclude something); 4) interpretation (a matter of providing clarity about something so that it can support students to be able to represent without doubt); and 5) argument evaluation (a matter of conveying an argument so that it causes students to judge whether the argument is appropriate or not exactly).

- Creative Thinking Skills

Creativity can be defined as the process of producing something new from existing elements by rearranging these elements (Ulva, 2020). Creativity criteria according to Torrance (1990) regarding questions that can support creative thinking skills include: 1) Fluency questions are those that assist students in answering relevant questions based on statements, so that they are answered with the greatest number of relevant responses. 2) Authenticity is a question that supports students in producing an idea that is not common but is inseparable from the concept of knowledge. 3) Flexibility is a question that encourages students to produce a variety of ideas that can be developed. 4) Elaboration is a question that supports students in generating more detailed ideas about a problem.

- Problem-Solving Skills

According to Polya (1973), Sani (2019, p. 58), and Ulva (2020), issue solving is an effort to overcome a challenge in order to accomplish a goal that is not immediately achievable. Polya (1973) asserts that the following inquiries can be used to assess problem-solving skills: 1) understanding the problem, questions such as mentioning what is known and being asked can support students in presenting information. 2) Planning problems and questions describing a problem that support students in being able to simplify a problem 3) Carry out the problem. The problem describes a problem that supports students in being able to generate a strategy by adjusting the various problems that have been described in the problem. 4) Re-checking, re-checking all the important information that has been identified in the problem.

Table 1. The Table of Characteristics of HOTS-Question

Type of Test/Grade	Characteristics			
	Frequency of HOTS-question	Critical Thinking Skills	Creative Thinking Skills	Problem-Solving Skills
Mid-term 10	6	1 question with inference aspect 2 questions with assumptions aspect 3 questions with deduction aspect		
Mid-term 11	14	5 questions with inference aspect 6 questions with deduction aspect	3 questions with fluency aspect	
Final exam 10	5	1 question with inference aspect 3 questions with deduction aspect		1 question with cross-check aspect
Final exam 11	13	3 question with inference aspect 8 questions with deduction aspect 1 question with interpretation aspect	1 questions with fluency aspect	

Discussion

This study's thinking ability is based on Anderson and Krathwohl's updated Bloom's Taxonomy of Cognitive Domains, known as Anderson's Taxonomy. Thinking skills are divided into lower-order (LOTS) and higher-order (HOTS). Based on the research findings, the questions made by the teacher were then analyzed into the HOTS category, at the cognitive levels C4 (Analyzing), C5 (Evaluating), and C6 (Creating), but not all including HOTS. There is also a LOTS question category (lower-level thinking skills).

Explanation the results of the HOTS analysis of the objective questions on the mid-term and final exams in the second semester for classes X and XI at MAN 1 Lampung Tengah in the 2021–2022 school year are as follows. For data condensation, the researcher used a checklist to categorize questions based on LOTS and HOTS. The HOTS analysis of objective questions for the mid-term and final exam tests for class X and XI in the second semester at MAN 1 Lampung Tengah for the academic year 2021-2022 is provided with descriptions and tables to help identify test questions.

The results suggest that the composition of HOTS is less than that of LOTS. The data analysis of the second semester of class X, the midterm grades for HOTS are 20% and LOTS are 80%, both of which are considered "very low" of the HOTS questions. In the meantime, the percentage composition results for the class XI midterm in the second semester are different from the prior test, in that HOTS-based questions with LOTS-based questions. Achieving 53.33% of LOTS and achieving 46.67% of HOTS. This can be classified as "enough." Change to the outcomes or percentage of HOTS-based questions on the final examination. The ratio of HOTS to LOTS in the final test for class X in the second semester is thus 12.50% to 87.50%. This situation qualifies as "very low." Then, for the composition of HOTS and LOTS on the class XI final test in the second semester, HOTS reached 32.5% and LOTS reached 67.5%, which is HOTS questions in this test is belongs to "low" category.

Related to the characteristics of the HOTS questions in the mid-term and final exam test items, the use of HOTS questions with the characteristics of the deduction aspect is more dominant with supporting critical thinking skills, namely from the overall test items, namely the mid-term and final exams, the deduction aspect reached 20 items of HOTS questions. As for the inference aspect, which supports critical thinking skills, there are 10 HOTS items. As for the fluency aspect, which

support creative thinking skills, there are 4 HOTS items. As for the interpretation aspect, which supports critical thinking skills, there are only 1 HOTS item. As for the aspect of assumptions that support critical thinking skills, there are 2 HOTS items. As for the crosscheck aspect, which supports problem solving abilities, there is only 1 item on the HOTS question. From the explanation above, it can be concluded that the characteristics of HOTS type questions with a percentage of 86.84% support critical thinking skills, 10.52% support creative thinking skills and 2.63% support problem solving abilities.

The differences between this study and previous research are that in this study, the researcher focused on analyzing the test items in the HOTS-based exam and found the proportion and characteristics of HOTS-type questions, considering that the HOTS-based questions that are tested on students are important. The implications of the research's findings are that teachers and educational institutions can use them as a basis for improving the way they create questions that require higher-order thinking abilities in order to meet the objectives of the 2013 curriculum and catch up with Indonesian students' rankings on the global stage.

D. CONCLUSION AND SUGGESTION

Conclusion

As a result of the justification and description in the preceding chapter, this study would like to get to the conclusion that the proportion of HOTS questions is described as follows:

- The quality of English mid-term for X class with a percentage of 20% which consists of 6 items of HOTS-question out of 30 questions. This can be categorized as “very low” for HOTS-based questions.

- The quality of English mid-term for grade XI with a percentage of 46.67% of the HOTS type questions consisting of 14 item questions out of 30 questions. This is included in the category of "enough".
- The quality of English final exam for X grade with a percentage of 12.50% which consists of 5 items out of 40 questions of HOTS-based questions so that it can be categorized as "very low".
- The quality of English final exam for grade XI with a percentage of 32.5% of the HOTS type questions consisting of 13 item questions out of 40 questions. This is included in the "low" category.

From the results of the analysis it can be concluded that the characteristics of HOTS-type questions with a percentage of 86.84% supporting critical thinking skills, 10.52% supporting creative thinking skills, and 2.63% supporting problem solving abilities. It can be concluded that the HOTS-based questions in the mid-term and final exams in this study were dominated by HOTS questions with characteristics belonging to questions that include critical thinking skills.

Suggestion

In light of the conclusions, the researcher advises to the teachers. It is necessary to develop mid-term and final exam questions based on HOTS English subjects at the high school level so that they can be applied to learning activities. This study can be used to improve the evaluation process in the following year at school to further improve the quality of HOTS-based questions on exam items. Besides that, it is recommended to the next researcher conduct a study that looks at how the influence of HOTS content in exam questions used in schools on students' higher order thinking skills.

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