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Cognitive Complexity in Junior High School English Textbooks: A Comprehensive Analysis of Tasks and Instructional Questions

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Abstract. This study uses content analysis to examine how well the activities and instructional questions in the Maestro English textbook for Eighth Grade Junior High School match with the cognitive stages of Bloom's Taxonomy. It is a descriptive qualitative study. The textbook consists of six chapters and includes a total of 55 activities and 441 questions. The results indicate that tasks are distributed over several levels of Bloom's Taxonomy, with a primary emphasis on the understanding category. The questions mostly correspond to the areas of remembering, comprehending, and applying. The study seeks to uncover patterns and trends in the cognitive difficulty of exercises and questions, offering insights for the instructional design of the textbook. The findings enhance our comprehension of the cognitive requirements imposed on learners within the realm of junior high school English instruction, providing significant insights for educators and curriculum designers.

Keywords: *Cognitive Complexity, Textbook, Questions, Task*

1. Introduction

The level of cognitive complexity plays a crucial role in educational materials, impacting both the consequences of learning and the cognitive processes involved. The cognitive complexity included in instructional materials has the potential to influence cognitive load, engagement, and comprehension. Merriënboer & Sweller, 2005 marked the importance of cognitive load theory in comprehending the intricacy of learning activities and its influence on students' academic achievement. The authors stress that the cognitive burden produced by instructional materials has a direct impact on the difficulty of learning activities. In addition, Sweller et al. (2019) explore the utilization of cognitive architecture in instructional design, highlighting the significance of minimizing cognitive load to improve learning outcomes (Sweller et al., 2019). These findings indicate that instructional materials should be created in a way that reduces mental effort and increases mental sophistication in order to maximize learning results.

Examining activities and instructional questions in junior high school English textbooks is essential for molding the educational encounters of pupils. Considering the depiction of 21st-century abilities in reading activities is crucial, as it directly influences the cultivation of vital skills in learners (Wulandari & Hidayat, 2020). Moreover, the use of various activities, particularly writing tasks, in these textbooks significantly contributes to the enhancement of language competence and cognitive development (Yu & Reynolds, 2018). Moreover, the inclusion of well-constructed instructional questions, such as wh-questions, in English textbooks plays a crucial role in facilitating successful language learning and understanding among students (Lyddon & Okamura, 2020).

The impact of cognitive complexity in instructional materials has been thoroughly investigated. The study conducted by Ritchie et al. (2015) investigated the correlation between education and enhancements in overall cognitive capacity or particular talents, providing insights into the impact of education on cognitive growth (Ritchie et al., 2015).

(2023) examined the reciprocal connection between education level and cognitive complexity, highlighting the capacity of education to improve cognitive complexity and vice versa (Mikušková, 2023; Sabur et al., 2018). Sabur et al. (2018) compared written assessment instruments grounded in Bloom's Taxonomy, offering valuable information on the real-world implementation of cognitive complexity in educational evaluation. In their study, Agustina et al. (2022) examined how critical thinking is included into English textbooks for junior high school students. They emphasised the significance of cognitive complexity in educational resources for enhancing critical thinking abilities (Agustina et al., 2022).

The research conducted by Stevani and Tarigan (2022) presents a systematic approach for assessing English textbooks by employing Bloom's Taxonomy to examine reading comprehension questions. The study emphasises the significance of ensuring that instructional activities are in line with cognitive processes and learning objectives. In their study, Erdiana and Panjaitan (2023) examine the incorporation of higher-order thinking skills (HOTS) in English textbooks used in Indonesian high schools. They highlight the importance of instructional tasks that promote students' cognitive engagement and critical thinking abilities. In addition, Deng et al. (2020) conducted a study that examines the relationship between learner characteristics, teaching environment, and engagement patterns in MOOC learning outcomes. The study emphasises the importance of instructional activities in fostering cognitive and behavioural engagement.

Furthermore, the examination of the implementation of higher-order thinking skill (HOTS) in reading comprehension questions, as explored by Aryani and Wahyuni (2020), illuminates the significance of instructional tasks in promoting critical thinking and cognitive complexity (Aryani & Wahyuni, 2020). In addition, Febriyani et al. (2020) conducted a research that underscores the significance of engaging in high-order thinking skills (HOTS) activities in enhancing students' critical thinking abilities. The study emphasises the direct correlation between instructional tasks and the resulting learning outcomes (Febriyani et al., 2020).

In addition, the study conducted by (2015) presents a structure for examining the level of mental effort required and the integration of content and practices, highlighting the importance of instructional tasks in facilitating students' involvement in critical thinking and logical analysis of disciplinary concepts and practices (Tekkumru-Kisa et al., 2015). The study conducted by Litman & Greenleaf (2017) examines argumentation tasks in secondary English language arts, history, and science. It emphasises the differences in instructional focus and enquiry space, highlighting the various instructional methods that impact student engagement and learning outcomes (Litman & Greenleaf, 2017).

The decision to use Bloom's Taxonomy as the analytical framework for the study is based on its extensive recognition and usefulness in educational research, specifically in the examination of instructional activities and questions in English language teaching (ELT) curriculum. Bloom's Taxonomy offers a systematic and all-encompassing structure for classifying cognitive processes and learning goals, consisting of six tiers of cognitive intricacy: knowledge, understanding, application, analysis, synthesis, and assessment.

The references (Stevani & Tarigan, 2022; Ulum, 2016; Dewayani et al., 2020; Aryani & Wahyuni, 2020; Erdiana & Panjaitan, 2023; Igbaria, 2013; Anasy, 2016; Baggali & Kuhi, 2014; Rosi & Ningrum, 2019; Zainil et al., 2020; Sidek & Ja'afar, 2017), and Febriyani et al. (2020) collectively emphasise the widespread utilisation of Bloom's Taxonomy in the analysis of reading comprehension questions, higher-order thinking skills (HOTS), and cognitive demand in educational materials. The taxonomy provides a methodical technique to assessing the cognitive complexity and alignment of instructional activities with learning objectives, therefore offering significant insights on the depth and rigour of instructional materials.

In addition, the following references (Stevani & Tarigan, 2022; Ulum, 2016; Dewayani et al., 2020; Aryani & Wahyuni, 2020; Erdiana & Panjaitan, 2023; Igarria, 2013; Anasy, 2016; Baggali & Kuhi, 2014; Rosi & Ningrum, 2019; Zainil et al., 2020; Sidek & Ja'afar, 2017), along with Febriyani et al. (2020), emphasise the usefulness of Bloom's Taxonomy in analysing the cognitive levels represented by instructional tasks and questions, as well as its role in identifying the distribution of higher-order thinking skills in educational materials. Researchers can use Bloom's Taxonomy to methodically evaluate the cognitive requirements and elements of critical thinking present in instructional activities. This information can then be used to guide the creation and assessment of educational resources.

Conclusively, doing a thorough examination of instructional activities and questions in English textbooks is crucial to guarantee that educational materials are in line with learning goals, possess a high level of cognitive complexity, and foster the development of critical thinking abilities. Through analysing the many aspects of instructional activities, educators may improve the quality and efficacy of instructional materials, eventually leading to enhanced student learning outcomes. The research is attempted to answer the following questions:

1. How do tasks in junior high school English textbooks align with the cognitive levels of Bloom's Taxonomy, and what patterns or trends emerge in their distribution across different levels?"
2. How are instructional questions categorized within Bloom's Taxonomy in junior high school English textbooks?

2. Method

The study employed a qualitative methodology using content analysis to examine the cognitive complexity of tasks and instructional questions of English textbooks using revised Bloom's taxonomy. The content analysis primarily examined specific words or concepts, as well as the meanings and linkages within the formal components of communication. Additionally, it analysed the fundamental structures of meaning that were the subject of investigation (Ulum, 2016). Moreover, content analysis is a methodical approach used to examine the definitions and concepts presented in textbooks or the topics discussed within them, with the aim of constructing a comprehensive understanding of the subjects taught in a certain field of study (Karama, 2022).

This study included set of tasks and instructional questions that were designed to assess cognitive domains of revised Bloom's taxonomy (Anderson et al., 2001), including remembering, understanding, applying, analyzing, evaluating, and creating. The data gathering involved the use of an English textbooks published by Maestro CV Hasan Pratama for Grade VIII Junior High School. The book consisted of six chapters with 112 pages in total.

The researcher obtained the data by employing a checklist table, which was derived from Pratiwi's work in 2014. The checklist table will serve as the tool to address the research question and achieve the research aim. Multiple categories were listed. The rows of the checklist table consist of tasks, instructional questions and the six levels of updated Bloom's taxonomy. In order to obtain valid and reliable data, the researchers conducted a data trustworthiness using four criteria, namely credibility, transferability, dependability and confirmability (Elo et al., 2014).

3. Findings

The analysis begun with the allocation of assignments and the different types of questions in the Maestro English textbook over six chapters. Every chapter has a distinct collection of activities, combining both individual and group projects. Chapter 1 has the most number of

tasks (12), while Chapter 5 has the lowest (2). Tasks encompass a range of levels in Bloom's Taxonomy, incorporating both Lower Order Thinking Skills (LOTS) and Higher Order Thinking Skills (HOTS). The incorporation of both individual and collective tasks inside each chapter enhances intricacy, providing valuable perspectives on both collaborative and independent learning. Regarding instructional questions, Chapters 1, 2, and 6 have a total of 50 multiple-choice questions each. In addition, Chapter 3 has 50 questions for a mid-term test and 10 questions for completing dialogues. Chapter 4 has 10 questions that help students differentiate between requests and permissions. In Chapter 5, there are 50 multiple-choice questions and a special assignment to create a greeting card. There were 55 tasks and 441 questions consisted in the six chapters of the textbook.

3.1. Cognitive Alignment and Distribution Patterns of Assignments in Junior High School English Textbooks

All cognitive domain were covered by the classification of assignments based on Bloom Taxonomy presented in the textbook. They were the levels of *remembering*, *understanding*, *applying*, *analyzing*, *evaluating*, and *creating*. Below was the table presenting the result of the analysis of tasks found in the textbook.

Table 1. Cognitive Domain of Tasks in Maestro English Textbook

Cognitive Domain of Bloom Taxonomy	Task	LOTS & HOTS
C1	20	LOTS
C2	12	
C3	6	
C4	2	HOTS
C5	4	
C6	11	

The defining feature of C1 Remember is the ability to retrieve information from memory by identifying and recalling facts, terminology, fundamental concepts, and replies (Anderson & Krathwohl, 2001). Creating and responding to these sort of queries is rather straightforward. The user's text is incomplete. Students may readily locate the solution within the text without the need for them to analyze, identify, infer, or engage in other activities that require critical thinking. For example in the task "*Read the dialogue and answer the following questions*" could be answered directly by finding the answer that obviously stated in the text. As expected, all the 6 chapters of the textbook being examined have this type of task. This Remembering domain had the highest frequency of task with 20 tasks across the six chapters.

As for C2 domain, the textbook had 12 tasks performed the cognitive domain of Understanding. The definition of Understanding is by building a meaning from instructional messages, including oral, written, and graphic communication (Anderson & Krathwohl, 2001). This type of task is one level higher than C1 Remember and still included in LOTS. Basically, this domain require the students to interpret, exemplify, classify, summarize, infer, compare, or explain. For example, as for the task "*Complete the dialogue using the suitable expression*" could be answered by giving the the right expression to the given sentence. The task did not provide list of expression for students to choose, otherwise they needed to choose the right expression based on the previous explanation in the book. All the chapters had the same model of task which enhance the students thinking skill not just by providing the answers right in the text, but by inferring the answer by the given sentence and situation in the text.

The third cognitive domain of Bloom taxonomy is Apply. According to Anderson and Krathwohl (2001) applying is performing or a procedure through executing, or implementing. Applying connects to or points to circumstances where learned material is used through products like models, presentations, interviews or simulations, and other activities. This type of task involve the students capability to apply learned material in new and concrete conditions. For example, as for the task "Do the interview with your friends to fill in the table using Can you...?". This type of activity could be done by applying learned material in that situation about asking for capability. Not like the previous level, there are only 6 type of this task found in the textbook.

However, for the domain of Analyzing (C4) which represent the first stage of Higher order thinking, the textbook only provided two tasks. Analyzing leads to separating materials or concepts into sections, deciding how the sections connect to one another or how they interconnect, or how the sections connect on the whole form or objective (Anderson & Krathwohl, 2001). The point of this question is the competence of the students to differentiate the sections or material into its components so that its arrangement might be better. The task was about arranging unjumbled dialogue, and analyzing the song lyrics. In this cognitive area, learners must analyze information into its fundamental elements, see the connections between these elements, and subsequently arrange them in a coherent fashion. The assignment requires students to analyze the sequence and structure of phrases, determining the logical order needed to create a meaningful dialogue. By engaging in this assignment, students not only demonstrate their comprehension of grammar and syntax but also refine their analytical abilities in evaluating the syntactic connections and contextual significance of each phrase. This exercise promotes critical thinking by requiring a careful analysis and synthesis process, which enhances the development of analytical skills essential for successful communication and understanding in the field of English language instruction.

Moreover, the activity in chapters 1 and 6, where the group is tasked with selecting and expressing emotions such as happiness, compassion, condolence, prayer, and wish through appropriate quotes, corresponds to the "Evaluate" (C5) level in Anderson and Krathwohl's (2001) updated Bloom's Taxonomy. At this cognitive level, evaluation entails the act of forming judgments by using specified criteria and standards, accomplished through the process of verifying and critiquing. The work necessitates students to evaluate and choose suitable quotes for particular circumstances, showcasing their proficiency in utilizing predetermined criteria to make evaluative assessments. By selecting quotations that correspond to the provided scenarios, students demonstrate their comprehension of suitable language and actively evaluate the emotional and contextual suitability of each quotation. In the revised taxonomy, the act of assessing takes place before producing, highlighting the significance of careful assessment prior to engaging in creative endeavors. Thus, this activity efficiently focuses on the evaluation level, enhancing students' capacity to develop well-informed assessments and criticisms using predetermined criteria within the framework of expressing opinions.

In the last level of the taxonomy was creating (C6). Creating is placing elements simultaneously to construct a coherent or functional whole; reorganizing elements into a new system or format through generating, planning, or producing. Create asks the students to place sections at the same time in a different way, or synthesize sections into something new (Anderson & Krathwohl, 2001). Since this level is the last level and occupies the highest position in the newest taxonomy, it could be concluded that this level is the most difficult to construct or even to answer for both the teacher and the student (Daeik & Anter, 2004). There were 11 activities found in the textbook applying this thinking skill. For example the task of writing sentences using simple present tense, writing invitation card, translating several

sentences from English into Indonesian, making phone call on the given situation, and writing dialogue about prohibition.

3.2. Cognitive Domain of Instructional Questions

Applying the theory of revised Bloom's taxonomy, the current research discovers 441 instructional questions from 6 chapters presented in the Maestro English Textbook for the second grade of Junior High School Students. The questions were presented at the end of every chapter of the book and served as the evaluation. 400 questions were in the form of multiple choice while the other 30 were comprehension questions, 10 last questions were to be translated into English and Indonesian, and 1 last questions was to write a greeting card for the loved one. Below is the presented data found in the textbook.

Table 2. Cognitive Domain of Questions in Maestro English Textbook

Cognitive Domain of Bloom Taxonomy	Questions	LOTS & HOTS
C1	197	LOTS
C2	221	
C3	22	
C4	-	HOTS
C5	-	
C6	1	

Table 2 shows distribution of instructional questions in each domain. There were 191 questions in C1 of Remembering level, 221 questions in C2 of Understanding, 22 questions in C3 of Applying, and 1 question in C6 of Creating. As stated before that mostly the questions were in the form of multiple choices. The multiple-choice questions pertain to completing short dialogues and encompass a range of language functions, including seeking attention, expressing appreciation, stating abilities and willingness, conveying obligations, prohibitions, and suggestions, as well as asking for and granting permission and extending invitations. The comprehension questions are designed to assess the comprehension of conversations. All these questions primarily align with the "Applying C3", "Understanding C2" and "Remembering C1" levels of Bloom's Taxonomy.

Additionally, the finding reveals that the categories of cognitive level are not equally distributed in the questions. The lower thinking skill address the questions with less intensity compared to the higher thinking. Despite the absence of an analyzing and evaluating category, it is important to recall High proportions of Remembering and Understanding in the distributed questions. The predominant category seen is remembering, which accounts for almost three quarters of the total questions. When it comes to this area, students mostly handle clear information that is presented in the text. E.g. *what does Thoriq expresses? What are Frans and Agus discussing about? What does Frans say to get respond from Nara?* To answer the questions, students only need to read the text and quickly search for the relevant information. The answers are clearly stated. Over 75% of the questions fall into this category, indicating that students primarily encounter topics that pertain to the lower level of thinking skill.

Moreover, The task of translating sentences from Indonesian to English and vice versa is classified under the "Applying" level of Bloom's Taxonomy. Students were asked to

translate 10 sentences in the form of conversation. Though this assignment, students were required to utilize their language proficiency and abilities to effectively convey information between different languages. The process of translating from one language to another according to certain standards will help to master the language materials and speech. As a result, the growth of students' thinking leads to the development of oral and written skills. Using this translation will help to increase student memory. One type is conversation translation. This translation can be used to translate a foreign language into the native language and vice versa Normatova, 2020.

However, the higher level of question serve as C6 of Creating was found only 1 question in chapter 6. Through the type of question, students were encouraged to deal with the skill to analyze information on the text by differentiating the elements found there, such as *read the greeting card, find elements in writing a greeting card, and write your own greeting card to someone you love*. This question demanded students to break the text and analyze the elements to find out the most important section in a greeting card, later on they were asked to produce or write a greeting card.

4. Discussion

The primary objective of revised Bloom's taxonomy (2001) is to aid instructors in developing assignments that align with the cognitive abilities of students. The intended degree of achievement (Anderson & Krathwohl, 2001). The categories on the cognitive level function hand in hand. It is necessary to prioritize the lower categories in order to enhance the proficiency in the higher categories. The upper categories encompass the abilities to analyze, evaluate, and create.

Regarding this finding, the textbook for grade VIII of Junior High School only includes reading comprehension problems that sufficiently meet the criteria for Lower Order Thinking Skills (LOTS) and it is mainly in Remembering, Understanding and Applying category. This is stated as imbalance since the realization of LOTS is found in more than 60% of the inquiries. The frequent occurrence of C1 to C3 which serve as Ligher Order Thinking Skills (LOTS) load students with incapacity to maximize their problem-solving abilities that need a higher level of cognitive thinking.

The assignments and questions in grade VIII textbooks mostly emphasize the lower categories, particularly Remembering, understanding and applying. This category is effective for reviewing previously acquired knowledge, however an excessive number of tasks and questions from this category alone is insufficient to stimulate higher-order thinking skills (HOTS). Less than 20% of the questions in this textbook contain HOTS-based questions and exercises, which is inadequate for stimulating and growing HOTS abilities. This presents evidence that the development of HOTS (Higher Order Thinking Skills) is necessary. This growth can be achieved by acquainting students with the necessary abilities. A textbook should serve as a platform for familiarizing and developing higher-order thinking skills (HOTS) (Pratama & Retnawati, 2018). Therefore, in promoting higher-order thinking skills (HOTS) to develop critical thinking, it is beneficial to implement HOTS-based questions more frequently (Wu & Pei, 2018).

These findings align with the results reported by Ulum (2016), Brasahid (2019), and Tangsakul (2017). Within those Current study indicates that there is still a deficiency in the inclusion of Higher Order Thinking Skills (HOTS)-based items in exercises and questions in English textbook. Comparatively, there is a commencement of including Higher Order Thinking Skills (HOTS) in a sufficient quantity of reading comprehension problems. This is seen in the findings of the analyzed textbook. The finding is supported by the research conducted by Setiyawati, who discovered that Higher Order Thinking Skills (HOTS) are

prevalent in the textbook she examined. It is asserted that the textbook marginally incorporate Higher Order Thinking Skills (HOTS), but their quantity is insufficient.

As for the task designed in the textbook, when completing the exercise, students are not required to engage in critical thinking as the answer is already provided in the text. Supported by Aryani & Wahyuni 2020 indicated in their study that these exercises necessitate students to concentrate on the material presented in the book, while also expecting them to comprehend the content at a more profound level. They do not depend on the exact assertions, but rather they must examine the significance underneath the literal data. However, in these analyzed assignments, students were still primarily focused on the text and have not yet transitioned to thinking beyond the text.

Regarding the task type of Numrich's sequence, it is elucidated that critical thinking is cultivated by exposure to diverse experiences. Progressive actions that present escalating difficulties. The process begins with an examination of the students' immediate environment, with a specific emphasis on the written material. This analysis then extends to encompass a broader context, as described by Beaumont (2010). According to Beaumont (2010), critical thinking involves the activation of emotional or instinctive reactions in order to arrive at a rational judgment. However, it is disclosed that the reading comprehension questions only concentrate on the text. The practice of examining pupils' individual emotions and subsequently linking them to encourage deeper thinking about the text is relatively overlooked. Therefore, it can be concluded that the three textbooks are unlikely to enhance critical thinking skills because the tasks assigned to students do not require them to think critically or engage with the real world beyond the literal information provided in the text or the problems they solve.

Conversely, the researcher argues that there could be some contributions from the Higher Order Thinking Skill (HOTS) problem since they appear significantly more intricate than the Lower Order Thinking Skill (LOTS) difficulties. In addition, the researcher contends that the textbook's author takes into account the amount of time required to complete higher-order thinking skill (HOTS) activities. Engaging in higher-order thinking skill (HOTS) tasks requires much more time compared to lower-order thinking skill (LOTS) tasks, especially considering the restricted duration of classroom activities. A remark from Airasian & Russel (2008) supports the notion that teachers often have to wait a significant amount of time for pupils to answer problems related to higher-order thinking abilities.

5. Conclusion

The findings indicate that the English language textbook for eight grade students, published by the Maestro CV Hasan Pratama, inadequately addresses and promotes higher order thinking skills in both tasks and instructional questions. Specifically, the assignments and questions in these exercises only evaluate half of the comprehensive reading skill indicators and language function. The textbook lacks emphasis on higher order thinking skills and markers of reading proficiency in the reading comprehension activities. It is also concluded that the cognitive dimension in each task and questions presented in an imbalance portion. It is dominated to remember (C1), followed by understanding (C2), and Apply (3).

Hence, it is recommended that the author incorporate and finalize more advanced cognitive questions in order to establish a more equitable distribution between lower-level and higher-level questions. This is necessary because the current reading comprehension exercises in the textbook are predominantly comprised of lower-order thinking skill questions, with a dearth of higher-order thinking skill questions. It was important for English teachers to consider all levels of Bloom's Taxonomy, such as knowledge, comprehension, application, analysis, synthesis, evaluation, and creation. Subsequent research should assess the

incorporation of Bloom's taxonomy in English language teaching resources, namely in the areas of speaking, listening, and writing, in order to showcase the significance of including revision techniques in English textbooks on a broader scale. Furthermore, the viewpoints of the students might be obtained and examined in order to modify the current English language resources.

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