Reconstructing cognitive levels of test items in Indonesian textbook for vocational school

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ABSTRACT

Although there have been a lot of studies on Bloom's taxonomy's use in the evaluation of language learning in Indonesia, there has never been any research on Bloom's taxonomy's use in the training and evaluation content of Indonesian language textbooks in vocational schools. The objectives of this study are to describe the reading material, cognitive level, and relationship between the material and other aspects in forty items of reading material from Indonesian language textbooks for vocational schools. To achieve this goal, this research uses descriptive qualitative research methods with content analysis design using primary data sources from textbooks. The results of this qualitative study using a content analysis design revealed that the choice of reading material topics is very diverse and represents textual genres. The level of cognition is not evenly distributed and is dominated by Lower Order Thinking Skills (LOTS) with a total of 24 questions (60%), and there are even 2 levels of cognition that are not accommodated at all. The findings of this study defined the distribution of the level of understanding of the items in the textbook, which is very useful for Indonesian language teachers and textbook writers to complete the items evenly according to the level of cognition dispersal, ensuring that students' mastery of the subject matter is broad.

INTRODUCTION

Textbooks continue to receive intense attention from education stakeholders as one of the critical components in achieving the success of the teaching and learning process of the various subjects (Stylianides, 2014; Nupponen et al., 2019). The importance of this textbook cannot be separated from its very important function for the Ministry of Education as the executive of education, schools as educational institutions, teachers as educators, and students who use these textbooks. Considering the significance of this textbook in the school learning process, the content of the textbook, including subject matter, student and teacher activities, exercises, level of material difficulty, and other pedagogical aspects, should be given special consideration (Rørbech & Skyggebjerg, 2020; Stoller, 2015). The above-mentioned factors also influence the evaluation of a subject textbook's quality.

The exercise element, which is typically found in each part of the textbook, is one of the components that must be textbook (Luck & Swartz, 2020). The textbook's exercise component is typically used to assess students' understanding of the topics displayed in a specific chapter (Nugroho., et. al, 2019). Although its feature is critical in evaluating students' understanding of the subject matter, book writers frequently overlook content exercises, causing this section to fail to operate effectively as it should, namely exploring, measuring, and assessing students' understanding of the material contained in each chapter of the book (Fan et al., 2013). Even though many educators have studied textbook content, only a few studies have specifically investigated the existence and function of exercise in numerous

textbooks, so textbook writers, who are typically overtaken by novice writers, pay little attention to whether the exercises they provide in each chapter truly portray and can evaluate the accuracy' level of comprehension (Kembhavi et al., 2017; Allen & McNamara, 2020).

Cognitive skills refer to the ways that a student remembers, reasons, holds attention, solves problems, thinks, reads, and learns (Anderson, 2013). A student's cognitive abilities help him process new information by taking that information and distributing it into the appropriate areas in his brain (Sala, & Gobet, 2016). The measurement of this cognitive level is well defined by Bloom's taxonomy, which is a set of hierarchical models that classify educational learning objectives (Taatgen, 2013). It divides the cognitive abilities into levels that differ in their specificity and complexity. Students use it for better learning and understanding of a subject, while tutors incorporate it into teaching.

The process of cognition is characterized as empirical research of mental understanding involved in recognizing objects, names, concepts, comprehending words, and solving problems based on this understanding (Preckel., et.al, 2018). While this cognitive process is an empirical inquiry involving mental processes and behaviors used to perceive, remember, and think, all parts in this cognitive process are involved.
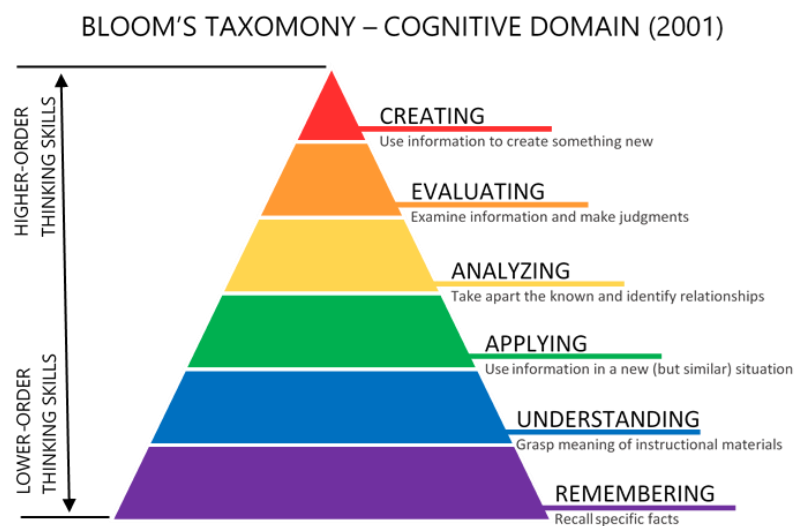

Figure 1. Cognitive level of Bloom Taxonomy

The exercise in the textbook materials, as one component of the textbook, must contribute equally attention to the process of cognition (Kuhn et al., 2000). Remembering, comprehending, applying, analyzing, evaluating, and creating are all processes at this level of analysis.

In this level of knowledge, students are asked to answer questions and describe terms, facts, and basic concepts by memorizing previously learned information (Bietenbeck, 2014). At this stage, students do not need to understand the meaning and the material in its entirety. The verbs commonly used in this level include retrieve, state, know, match, reproduce, select, omit, choose, find, show, relate, tell, locate, point out, highlight, bookmark, and search. Some examples of practice questions in this level are as follows. "Choose a word from this list that describes the main character of the short story!" and "State the level of cognition based on Bloom taxonomy".

Comprehension is the second degree of cognition. At this level, students are expected to be able to articulate their grasp of a fact, concept, or opinion in greater depth (Finn et al., 2014). As a result, questions in this category require students to respond to questions or instructions that begin with the verb comprehend, convert, distinguish, estimate, extend, generalize, translate, compare, contrast, demonstrate, illustrate, outline, re-show, classify, infer, exemplify, comment, and annotate. The following two questions are examples of questions at this level. "Compare the personalities of the two main characters in this short narrative." "Give instances of religious principles from the above reading material!"

In Bloom's taxonomic hierarchy, the application is the third degree of cognition. Problem-solving and dealing with challenges related to learning materials are described as part of this implementation activity's description (Mumford et al., 2017). At this level, students apply the principles, facts, and procedures they've learned to new situations and scenarios. In general, verbs like apply, change, count, construct, demonstrate, manipulate, modify, operate, predict, prepare, produce, show, solve, build, choose, develop, interview, make use of, organize, experiment, plan, utilize, and identify are used to probe students' understanding at this level of cognition. Two instances of items that use this degree of intellect are listed below. "Provide proof that this paragraph employs the deductive process!" "Insert passive voice into the following sentences!"

An analysis is the fourth level of Bloom's taxonomy. At this level, students should be able to analyze information, classify and group information into numerous categories, explain the relationship between several pieces in a single unit, and arrange components into a cohesive whole and meaningful at this level (Li et al., 2016). In general, test designers utilize verbs like breakdown, contrast, demonstrate, infer, outline, choose, classify, categorize, organize, divide, scrutinize, distinguish, integrate, explain, match, and analyze to assess students' ability to evaluate the subject matter. The following are some samples of questions from this cognitive level. "Use the parts of speech categories to classify the words in the phrases below!" "Make a meaningful statement out of the words below!".

Synthesis as the fifth level of cognition refers to the act of integrating the constituent elements of different material or abstract things into a single or unified entity (as contrasted to analysis, which is the act of breaking down any material or abstract object into its constituent components) (Cocchi et al., 2017). Texts provide students with new information and ideas regularly. They must combine fresh information from the text with what they already comprehend and know. Readers may think deeper, understand more viewpoints, and attain enlightenment of experiences they cannot encounter by combining this new information with their previous knowledge.

The ability to evaluate is the sixth level in Bloom's taxonomy. At this level, students defend their point of view on a topic or make a presentation that differs from that of others in exercises (Penner, 2016). Students are required to judge the quality of a product, notion, or idea based on norms and standards at this level as well. Checking a source's consistency, criticizing, distinguishing, recognizing, explaining, defining, reviewing, assessing, evaluating, summarizing, reflecting, and prioritizing are some of the general signs utilized at this level. The following are some examples of questions in this category. "Which reading approach is most appropriate for children to be used by a teacher and explain why!" and "Why is it necessary for a learner to learn and practice soft skills?"

The highest and last degree of the cognitive domain is created. In this project, students should be able to combine existing structures to create a new one. Teachers commonly use the verbs innovate, generate, write, combine, gather, devise, plan, design, develop, compose, produce, create, and actualize, among other verbs, to assess students' talents and understanding based on the indicators established in this area (Le Dantec, 2010). The following are some samples of this level's questions. "Define a descriptive paragraph in your own words!" "Based on the given information, write your argumentative paragraph!".

The content of Indonesian language textbooks in vocational schools is usually tailored to the vocational school's focus, such as economics, computers, engineering, art, and so on. Listening, reading, speaking, and writing are all components of Indonesian language skills that are integrated into the field of vocational schools. For each Indonesian language competence, some research has been undertaken on the material in Indonesian language subjects in vocational high schools. However, there has not been any previous research conducted on the level of cognition of practice questions in the form of examinations found in textbooks used by vocational school students.

Book authors and teachers must consider the distribution of these cognitive components when constructing questions in textbook exercises. Several scholars have looked into using Bloom's taxonomy in the design of items for Indonesian high school topics (Hardianti & Kuswanto, 2017; Hadi et al., 2018;

Ramadhani et al., 2019). Almost all previous study has concentrated solely on examination materials used in public schools. Only a few studies have investigated the products used in vocational schools. Furthermore, although some studies have chosen test items from vocational schools as the subject of their research, their findings do not address the content of student textbooks.

Previous research in Indonesia looked at the level of cognition in various items in a variety of examinations covering a variety of subjects at various levels of schooling (Hermita & Thamrin, 2015). Other studies have investigated different aspects of textbook assessment as well. The content analysis from textbooks and the assessment of cognitive levels from practice tests in Indonesian language textbooks are combined in this study (Hambali, et., al, 2021). The findings of this study can fill in gaps in the literature about the description of the level of cognition of questions found in Indonesian language textbooks in vocational schools.

Besides adding to the body of knowledge on textbook studies and Bloom's taxonomy applications, this research is urgently needed since the findings can be utilized as a foundation for teachers to examine when generating inquiries in each content. Furthermore, policymakers might use the findings of this study to select Indonesian language textbooks that prioritize fairness in areas of cognition in the exam items. The aim is to answer the following research questions:
1. What are the topics of reading materials contained in the Indonesian textbook for vocational schools?
2. How is the cognitive level of questions in reading materials?
3. How is the relationship between reading materials and questions?

METHODS

The research investigated the level of cognition of the questions in the textbook on Indonesian language subjects at the Vocational school level, the connection between indicators and questions, and the relationship between the material and the questions are the subject of this research. The research team employed a qualitative research method and a content analysis design to answer this research question. The qualitative data in the study includes information on cognition levels, the relationship between indicators and questions, and the interaction between material and questions. The purpose of this content analysis research design is to gain a thorough understanding of the research variables, which include the proportion of cognition levels, the connection between indicators and questions in textbook reading exercises, and the relationship between reading material and questions.

The data sources of this research were 40 questions contained in the book entitled *Bahasa dan Sastra Indonesia kelas X*, for Vocational High school written by Dra. Yustisah, M.Pd, by Erlangga Publisher in 2018. For two key reasons, this book was chosen as a study data source employing inclusion criteria. First, based on preliminary findings, this book is used by 60% of North Sumatra's vocational schools. Second, each chapter of this book includes practice items that can be used to assess students' comprehension of previously studied information.

The research team employed Bloom's taxonomy to categorize the cognitive level of each item in the textbook, which includes knowledge, comprehension, application, synthesis, assessment, and creativity. Furthermore, the following stages were used to collect the primary research data. The research team began by gathering reading materials from textbooks to identify patterns and themes in reading texts, and then collected questions from each reading material. The research team then observed and analyzed the message content of each piece of reading material before categorizing each item of practice questions according to Bloom's taxonomy cognitive level. The next stage was to assess how closely the questions corresponded to the reading's topic. While the qualitative research procedures followed the following steps: data collection, data reduction, data category, data tabulation, data analysis, data interpretation, and conclusion.

This content analysis research approach was thought to be capable of exploring and answering concerns concerning the essence, meaning, and interpretation of the degree of cognition contained in student textbook questions. Although the subjects of this study were still confined to forty questions

from textbooks, the subjects of this study at least represent the cognitive level of the questions represented in this study.

RESULT AND DISCUSSION
Reading Material and Question in the textbook
The findings of the analysis of reading topics, reading genres, number of questions, and question form from reading material in Indonesian language textbooks in vocational high schools are detailed in Table 1 below, by the study questions specified previously.

Table I
Description of Reading Material and Questions

No	Themes/Title	Genre	Number of Questions	Form of Questions
1	Laporan observasi 'sampah'	Report	5	Essay test
2	Minyak Esensial yang Serbaguna	Exposition	5	Essay test
3	Teks Anekdot "Kisah Pemulung"	Anecdote	5	Essay test
4	Teks Cerita Rakyat "Hikayat Putri Kuning"	Narration	5	Essay test
5	Bahasa, Sastra, dan Budi Darma dan Buku Pintar Etiket untuk Remaja	Description	5	Essay test
6	Negosiasi Membeli Buku	Persuasion	5	Essay test
7	Tuntutan Perbaikan Kesejahteraan	Argumentation	3	Essay test
8	Chairul Tanjung"	Biography	3	Essay test
9	Penumpang	Recount	3	Essay test
10	Si Bolang di Papua" dan Memperjuangkan Kedaulatan Publik	Exposition	2	Essay test

In vocational school Indonesian language textbooks, there are ten themes or reading titles, as shown in Table 1. The genres of the texts of the reading materials include a report, exposition, anecdote, narrative, description, persuasion, argumentation, biography, recount, and exposition. While the number of questions in each text is roughly similarly distributed throughout each theme. However, the questions in the textbook are only written in one format, namely an essay test, and no other types of tests are included.

The choice of themes from reading materials according to those contained in textbooks is very relevant to indicators and general learning objectives in the syllabus and curriculum. However, from the choice of themes in the table above, there were not any topics or themes that were directly related to fields in vocational schools such as economics, engineering, culinary arts, computers, and other fields.

Level of Cognition
Based on the principle of cognition level discussed earlier, this study used Bloom's taxonomy's cognitive level to investigate the cognition level contained in each question item in 40 questions of reading material. Bloom's taxonomy category was chosen because of its clarity, popularity among educators and teachers, and the versatility of the vocabulary employed, all of which are familiar to teachers, educators, curriculum designers, and other education stakeholders. Table 2 shows the description of the theme of reading material and cognition level.

Table 2
Cognition Level

No	Themes/Title	Lower Order Thinking Skills (LOTS)			Level of Cognition Middle Order Thinking skills (MOTS)		High order thinking skills (HOTS)	
		CI	C2	C3	C4	C5	C6	C7
I	Laporan observasi 'sampah'	I	0	2	2	0	0	0
2	Minyak Esensial yang Serbaguna	0	I	2	2	0	0	0
3	Teks Anekdot "Kisah Pemulung"	I	2	2	0	0	0	0
4	Teks Cerita Rakyat "Hikayat Putri Kuning"	0	I	I	2	0	I	0
5	Bahasa, Sastra, dan Budi Darma dan Buku Pintar Etiket untuk Remaja	I	0	0	3	0	I	0
6	Negosiasi Membeli Buku	I	4	0	0	0	0	0
7	Tuntutan Perbaikan Kesejahteraan	I	0	0	2	0	0	0
8	Chairul Tanjung"	I	2	0	0	0	0	0
9	Penumpang	0	0	I	I	0	0	0
10	Si Bolang di Papua" dan Memperjuangkan Kedaulatan Publik	0	0	0	0	0	2	0
Total of cognition level		6 (15%)	I0 (25%)	8 (20%)	12 (30%)	0 (0%)	4 (10%)	0 (0%)
Thinking skills		24 (60%)			12 (30%)		4 (10%)	

Table 2 above describes the levels of cognition of the questions in the reading material. Based on Bloom's taxonomy theory, there are seven categories of cognition levels, namely Knowledge (C1), Comprehension (C2), Application (C3), Analysis (C4), Synthesis (C5), Evaluation (C6), and Creation (C7). The seven classifications of cognition are classified into three major parts. First, Lower Order Thinking Skills (LOTS) which consists of C1, C2, and C3 occupies the largest category in the distribution of cognition, with a total of 24 questions (60%). Of the three cognitions in the LOTS category, the order of cognition with the highest to lowest frequency is Comprehension (25%) followed by application (20%) and knowledge (15%). The second is the Middle Order Thinking Skills (MOTS) cognition level, which consists of Analysis (C4) and Synthesis (C5) which occupies the second position with a frequency of 12 questions (30%). At this level category, all items are in the Analysis category, not a single question is in the synthesis category (C5). The third is Higher Order Thinking Skills, which consist of the ability to evaluate and create. In this cognitive category, there are only 2 questions in the evaluation category.

Reading Materials, Questions, Cognitive Level

The subjects in the reading materials are particularly relevant to the themes suggested in the Indonesian language curriculum in vocational schools, based on observations, material analysis, and interviews with various Indonesian language teachers in vocational schools. Due to the low number of questions offered, the supplied questions did not properly explore students' grasp of the reading material. Furthermore, the degree of cognition distribution in each reading theme is not evenly spread, and the levels of cognition analysis (C5) and creativity (C7) are not well addressed in the 40 questions presented. Lower-order thinking skills (LOTS), followed by middle-order thinking skills (MOTS), and higher-order thinking skills (HOTS) are the most common question domains in the field of thinking skills (HOTS).

The three examples of questions above are described in the following 3 question domains taken from questions from textbooks:
1. *Apa yang menjadi objek tawar menawar pada teks tersebut?* (Source: Question No. 4, Theme: Negotiation, Thinking Level: LOTS, Cognition Level: Knowledge)
2. *Bagaimana konflik/pertentangan pada teks negosiasi tersebut?* (Source: Question No. 3, Theme: Negosiasi dan kewirausahaan, Thinking Level: MOTS, Cognition Level C2: Comprehension)

3.   *Analisislah puisi tersebut mencakupi makna yang tersirat dan tersurat!* (Source: Question No. 1, Theme: Rima dan Irama, Thinking Level: HOTS, Cognition Level C5: Analysis)

The three questions above are direct quotes from the textbook being studied, which contains a total of 40 questions. The questions from the text represent the indicators included in the curriculum, according to the results of the content analysis, which are associated with indicators in the Indonesian language curriculum, even though they have not been able to explore in-depth students' understanding of the reading content.

Discussion

The outcomes of this study reveal several things that are in line with the problems and objectives of this investigation. Firstly, the themes, genres, and degrees of cognition in the reading material from the textbook differ from the material and questions in the reading material from the textbook. One similarity that can be drawn from the foregoing data is the form of questions that are only of one type, namely the essay test, which necessitates subjective responses. Second, the reading material contains a variety of questions with varying degrees of thinking and cognition (Pammu, et., al, 2014). Lower order thinking skills, followed by middle-order thinking skills, and high-level thinking skills, dominate the questions in terms of cognitive levels. To put it another way, the tasks intended to test pupils' ability fall within the "easy" group. Furthermore, the questions were not evenly distributed in terms of difficulty based on this metric.

Thirdly, the elements in the reading material are dominated by the cognitive level of knowledge, comprehension, and application, followed by the cognitive level of cognitive analysis and synthesis, according to Bloom's taxonomy. The level of cognition evolution and creation, on the other hand, was not discovered in any of the reading materials. Fourth, the reading material is highly relevant to the learning indicators found in the Indonesian curriculum and syllabus, as well as the correlation between reading items that are highly relevant to the reading material offered (Zulaeha, 2013). However, there are some intriguing aspects to this reading material, such as the fact that the items created have not been able to examine and represent vocational school students' grasp of the reading's contents (Cirocki, & Farrell, 2019). Furthermore, each question's level of cognition is not fairly dispersed, as required by the curriculum to increase students' thinking through reading questions.

Several advantageous features were found in the reading material in this textbook in terms of the diversity of topics and themes, genre of the material text, and level of cognition as other research findings on the same topic (Goldman et al., 2016; Kunze et al., 2013; Zhu, 2020). However, there are also some differences found in this study when compared to the findings of other studies in terms of even distribution of cognitive levels (Parodi, 2015; Wigfield et al., 2016). When the level of cognition of the questions found in other studies is evenly distributed, this study finds that there are several levels of cognition based on Bloom's taxonomy that have not been accommodated in the questions. This is certainly not expected to be related to the principle of equal distribution of cognitive levels (Mumford et al., 2017), to improve students' thinking sharpness. The second interesting thing relates to the number of questions provided in each reading material. The available questions have not been able to explore students' understanding of the reading material so teachers must add questions based on the need of understanding the reading material.

Aside from the originality and advantages found in the explanation of this study's findings, the conclusions of this study have several limitations connected to the number of texts and questions used as research objects. Even though the textbook under investigation is extensively utilized in Indonesian vocational schools, more research objects that serve as comparison objects are required for the research results to be more trustworthy (Karbalaei & Rahmanzade, 2015). The findings of this study, at the very least, provide an overview of the theme, material, cognitive level, and interrelationships between components found in Indonesian language textbooks at vocational schools (Weng, et., al, 2018). Future

research, particularly on the number of textbook objects, is likely to be able to supplement the conclusions of this study.

The findings of this study offer a detailed account of the content of Indonesian language textbooks used in vocational schools, particularly those connected to the degree of cognition in the questions (Finn et al., 2014). This finding is particularly valuable for teachers, schools, textbook writers, and curriculum designers because it provides a full description of the items in the textbook as well as their associations (Stracke, 2016). Additionally, the findings of this study contribute to the body of knowledge in the field of textbook research in vocational schools.

CONCLUSION

The study discusses the theme, level of cognition, and the association between many components of Indonesian language textbooks in vocational schools. The results of this study confirm that the themes in the textbook reading materials are broad and reflect a variety of writing genres. The number of questions, on the other hand, has not been able to reflect a comprehensive knowledge of the reading content. In the same way, the item questions the level of cognition. The objects' level of cognition hasn't been evenly distributed, and there are even two levels of cognition that aren't represented. The advantages of this textbook's content include a good relationship between indicators, materials, questions, and degrees of cognition, ensuring that the synchronization between parts in the book is maintained.

Teachers, schools, book authors, and curriculum designers should always pay attention to the elements that will be included in the textbook, particularly those related to the reading theme, the content of reading materials, and the level of cognition in questions to explore students' understanding, according to the findings of this study. Even though the breadth of this study is still limited due to the number of books, reading materials, and items examined, it can serve as a useful reference for developing, selecting, and adjusting textbooks to curriculum content. Teachers, schools, book authors, and designers of Indonesian language curricula in vocational schools could use the findings of this study as a guide and consideration. The study's findings are also expected to contribute to the literature for textbook research in both public and vocational schools. Future researchers are also expected to conduct studies with a bigger number of research items and the use of a variety of methodologies in textbook research.

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