

Higher Order Thinking Skills (HOTS) Questions in Indonesian and United States Mathematics Textbooks

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ARTICLE INFO	ABSTRACT
Article History: Received: 05-01-2026 Revised: 09-03-2026 Accepted: 06-04-2026 Keywords: <i>High order thinking skills, mathematics textbooks, Indonesian textbooks, United States textbooks.</i>	This study aims to compare the differences in Higher Order Thinking Skills content in questions found in Indonesian mathematics textbooks and United States mathematics textbooks. This study uses a qualitative descriptive method with a literature study research design. The subjects of this study are two textbooks used in Indonesia and the United States at the high school level in accordance with the applicable curriculum. The instrument used was a table designed to categorize questions based on Higher Order Thinking Skills sub-indicators. The results of the research and data analysis showed that the percentage of Higher Order Thinking Skills questions differed significantly. with the United States mathematics textbook at 92.31% (288 Higher Order Thinking Skills questions out of a total of 312 questions) and the Indonesian textbook at 74.83% (107 questions out of a total of 143 questions). Several differences were found in the structure of the questions related to the integration of digital media.

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INTRODUCTION

Mathematics textbooks in the 21st century are required to improve higher-order thinking skills. The strategy to achieve this goal is through the application of Higher Order Thinking Skills in learning tools, especially in textbooks and question instruments used. Higher Order Thinking Skills-based questions are questions that require analytical skills, critical thinking, and creativity (Nurjanah, 2021). In fact, higher-order thinking skills have become a crucial component in global education. This is reflected in the 2022 PISA test scores, which show that Indonesia ranks low in mathematical literacy (70th out of 81 participants). This condition is in contrast to the United States, which ranked at the top (36th out of 81 participants) (OECD, 2023a). PISA itself is a test to measure the abilities of 15-year-old students, covering reading literacy, science, and mathematics (OECD, 2022).

The OECD (2022) explains that the PISA test includes components of communication, modeling, representation, reasoning, argumentation, problem solving, and the use of mathematical symbols and tools. All of these components require higher-order thinking skills. In line with this, students are required to use creative thinking skills to practice divergent thinking. Higher Order Thinking Skills questions can be represented through PISA questions that involve analysis, evaluation, and creation processes. This shows the close relationship between the PISA test and Higher Order Thinking Skills, supported by Amalia (2021), who argues that the Higher Order Thinking Skills content in PISA questions has a potential effect on students.

The United States ranks third among countries with high-quality education systems that focus on developing human resources for the world of work. PISA results show that around 69% of US students are able to solve problems without direct instruction and can interpret mathematical situations well. In addition, 7% of students reached level 5 or 6, which indicates the ability to think complexly in evaluating problem-solving strategies. In contrast, the average Indonesian student is only able to reach levels 1 and 2. Although the results are different, both countries have integrated higher-order thinking skills into their curricula. Indonesia implements the Merdeka Curriculum, which emphasizes the importance of Higher Order Thinking Skills in the learning process (Permendikbudristek, 2022). Meanwhile, the United States uses the Focal Point curriculum, which discusses mathematics in detail at each grade level, covering concepts, skills, and procedures that form basic understanding (Juneau, 2018). NCTM (2000) also sets learning process standards in the United States, which include: 1) problem solving, 2) reasoning and proof, 3) communication, 4) connections, and 5) representation. Both curricula require actualization through learning media, one of which is textbooks.

Textbooks play a vital role in supporting the mathematics learning process. As a collection of information in print or digital form, textbooks present material chronologically and procedurally in accordance with competency standards. In mathematics learning, textbooks serve to provide practice questions because mathematical understanding requires intensive practice (Romyati & Tjahjono, 2021). In Indonesia, the government provides free main textbooks in accordance with Permendikbudristek Number 25 of 2022 concerning the Assessment of Indonesian Textbooks (Permendikbudristek, 2022). The implementation of the Merdeka Curriculum has implications for the content of textbooks, which must now be based on Higher Order Thinking Skills.

Higher Order Thinking Skills are thinking abilities that exceed general standards, requiring individuals to apply knowledge to create solutions. These skills include advanced cognitive processes such as critical thinking and creativity (Hwang et al., 2018). Based on revised Bloom's Taxonomy, HOTS indicators include:

1. C4 (Analyzing): distinguishing, organizing, attributing.
2. C5 (Evaluating): examining, critiquing.
3. C6 (Creating): formulating, planning, producing.

Although very useful, many students find it difficult to complete Higher Order Thinking Skills questions due to a lack of understanding of the concepts (Kusaeri, et.al., 2019). Therefore, teachers need to use varied Higher Order Thinking Skills-based learning materials, including referring to textbooks from other countries. Teachers play an important role in fostering student motivation and abilities through the application of Higher Order Thinking Skills questions (Wu, 2019). Although students are responsible for their own learning, positive external factors are essential to support the acquisition of knowledge (Rasheed, 2020).

Mathematical literacy is included in scientific literacy because it uses knowledge to solve problems with higher-order thinking skills (Amaringga, 2021). Higher Order Thinking Skills questions significantly affect students' critical thinking skills (Syarifah et al., 2019). Teachers can improve students' Higher Order Thinking Skills by asking Higher Order Thinking Skills-based questions (Widana et al., 2018). Teachers can help improve these skills by asking provocative questions, using appropriate learning strategies, and encouraging the exploration of learning resources (Purnomo et al., 2021). Saputri et al. (2019) also emphasized that Higher Order Thinking Skills questions improve thinking skills at every level of education. To increase awareness of Higher Order Thinking Skills, the development of problem-solving skills must be encouraged through learning media, such as the use of textbooks in mathematics learning.

Based on the background and the fact that although both countries have curricula that include Higher Order Thinking Skills, the 2022 PISA test scores show significant differences. Therefore, the researcher is interested in investigating the factors related to the learning media used. The researcher will focus on analyzing Higher Order Thinking Skills questions in mathematics textbooks used in Indonesia and the United States. Thus the research question for the study presented in the article is: How do the

Higher Order Thinking Skills (HOTS) questions in Indonesian high school mathematics textbooks compare to those in United States high school mathematics textbooks in terms of content, cognitive levels, presentation, and integration of digital media? Understanding these differences is critical to improving mathematics learning tools and student outcomes in both countries. Given the low mathematics literacy ranking of Indonesian students compared to the U.S., this study aims to provide insights into how textbook design and question quality may influence higher-order thinking abilities. Such insights can guide curriculum developers and educators in enhancing instructional materials. The following sections detail the research methodology, present the comparative analysis results, discuss implications for mathematics education, and conclude with recommendations for future research and practice.

METHODS

The type of research used in this study is descriptive qualitative with a literature study method. The researcher chose this method because the research subject is textbook literature that will be studied theoretically and in depth, particularly in terms of Higher Order Thinking Skills. This research was conducted for approximately two months at a flexible location. The subjects of this study included the 2021 edition of the Merdeka Curriculum Grade X mathematics textbook published by the Ministry of Education, Culture, Research, and Technology (Indonesia) and the 2020 edition of the Carnegie Learning High School Math Solution Integrated mathematics textbook published by Carnegie Inc. (United States) based on the Curriculum Focal Point. This research focuses exclusively on question items within two selected high school mathematics textbooks aligned with each country's curriculum. Other textbook contents, such as explanatory text or learning activities, and classroom teaching methods, are outside this study's scope.

The research design applied was content analysis, which focused on the content in the reference sources (Krippendorff, 2004). This study aims to analyze and categorize the questions in both textbooks based on the Higher Order Thinking Skills sub-indicators. The research instruments used consist of a Higher Order Thinking Skills indicator classification table and a data tabulation table to display the results in percentage form. The format of these instruments is presented in table 1.

Tabel 1. Categorization Table

Title of Chapter / Module			
Title of Main Topic			
Section	Question Number	Category	Description
Chapter/Module			

The validity and reliability of the instrument were confirmed through expert judgment by two lecturers from the Mathematics Education Department, which showed the instrument to be valid and suitable for use. Data analysis was performed using content analysis (Krippendorff, 2004), where questions were coded according to HOTS sub-indicators, and the results were converted into percentages and described qualitatively to provide a comprehensive overview of HOTS question distribution and characteristics.

RESULT

Based on the results of the analysis, the researchers grouped the questions found in the Indonesian and US textbooks as follows.

Comparison of Studied Loads

Table 2. Comparison of Studied Loads

Grade 10 Mathematics Textbook, Mardeka Curriculum	Carnegie Learning High School Math Solution Integrated
CHAPTER 1	Module 1
Exponents and Logarithms (Subchapter Exponential Functions)	Searching for Patterns Topic 1: Function
CHAPTER 2	Module 1
Sequences and Series (Subchapter Sequences)	Searching for Patterns Topic 2: Sequences
CHAPTER 5	Module 2
Systems of Linear Equations and Inequalities	Exploring Constant Change Topic 3: System of equation and inequalities

Table 2 shows the results of the differences in material structure between the two textbooks studied. In the Indonesian textbook, the material is divided into chapters and subchapters, while the US textbook uses the terms modules and topics. The researchers did not examine the entire subject matter, but only selected sub-topics that were comparable for comparison. This was done based on preliminary observations that showed differences in the scope of material in the two textbooks. In the material on exponents and logarithms, Chapter I of the Indonesian textbook covers exponents and logarithms, while Module 1 of the American textbook only discusses functions in general. The researcher decided to focus the comparison on the material on Exponential Functions. Furthermore, in the material on sequences and series, chapter II of the Indonesian textbook covers sequences and series, while the American textbook only discusses sequences in Module 1 Topic 2. Thus, the part being compared is limited to the material on Sequences. As for the material on linear equation and inequality systems, this material is found in Chapter V of the Indonesian textbook and Module 2 Topic 3 of the American textbook. The researcher directly referred to Topic 3 because the material in the previous topics was not included in the Indonesian textbook.

Percentage of Higher Order Thinking Skills Content

Table 3. Summary of Higher Order Thinking Skills Content Acquisition

Text Book	Section	C 4.1	C 4.2	C 4.3	C 5.1	C 5.2	C6.1	C6.2	C6.3
Indonesia	Chapter 1	1	1	3	0	0	17	1	10
	Chapter 2	5	1	2	1	0	3	6	7
	Chapter 5	2	0	3	12	3	22	0	7
	Jumlah	8	2	8	13	3	42	7	24
Percentage		7,48%	1,87%	7,48%	12,15%	2,80%	39,25%	6,54%	22,43%
			16,83%		14,95%			68,22%	

Total = 143, with 107 (74,83%) HOTS level and 36 (25,17) non-HOTS level.

Amerika Serikat	Module								
	1 –	1	8	3	0	1	2	2	4
	Topic 1								
	Module								
	1 –	4	11	29	12	5	24	7	40
	Topic 2								
	Module								
	2 –	0	12	15	24	4	25	14	41
	Topic 3								
	Jumlah	5	31	47	36	10	51	23	85
Percentage		1,74%	10,76%	16,32%	12,5%	3,47%	17,71%	7,99%	29,51%
			28,82%		15,97%			55,21%	

Total 312 with 288 (92,31%) HOTS level and 24 (7,69%) non-HOTS level.

Table 3 shows a significant percentage difference between Indonesian and US textbooks. Questions in Indonesian textbooks are dominated by sub-indicator C6.1 (Formulating) at 39.25%, with the total percentage of indicator C6 (Creating) reaching 68.22%. Meanwhile, the US textbook is dominated by sub-indicator C6.3 (Producing) at 29.51%, with a total content of indicator C6 (Creating) at 55.21%. The data shows that the majority of questions in both textbooks contain Higher Order Thinking Skills (HOTS), namely 74.83% for Indonesian textbooks and 92.31% for American textbooks. Although the Indonesian textbook excels in indicator C6 (Creating) with 68.22%, the American textbook shows superiority in indicator C4 (Analyzing) at 28.82% compared to Indonesia's 16.83% and indicator C5 (Evaluating) at 15.97% compared to Indonesia's 14.95%.

Higher Order Thinking Skills Content in Indonesian Mathematics Textbooks

The Indonesian mathematics textbook used in this study is the Grade X SMA/SMK Merdeka Curriculum mathematics textbook published by the Ministry of Education, Culture, Research, and Technology in 2021. This book consists of 270 pages. There were 143 questions studied, and 107 of them were Higher Order Thinking Skills questions, as shown in the following table.

Tabel 4. Percentage of Higher Order Thinking Skills Content

No.	HOTS	Non-HOTS
1.	74,83%	25,17%

Table 4 shows that Higher Order Thinking Skills questions dominate with a percentage of 74.83%, while the remaining 25.17% are non-Higher Order Thinking Skills questions. This data indicates that more than half of the total questions studied have met the Higher Order Thinking Skills criteria.

Tabel 5. Number of Higher Order Thinking Skills and non-Higher Order Thinking Skills

No.	Chapter I		Chapter II		Chapter V	
	HOTS	Non-HOTS	HOTS	Non-HOTS	HOTS	Non-HOTS
	33	6	25	23	49	7

Table 5 shows the distribution of Higher Order Thinking Skills and non-Higher Order Thinking Skills questions in each chapter. Based on this data, there is a significant difference between Higher Order

Thinking Skills and non-Higher Order Thinking Skills questions in Chapters I and V, with Higher Order Thinking Skills questions accounting for more than half of the total questions. A different situation is seen in Chapter II, where the difference between Higher Order Thinking Skills and non-Higher Order Thinking Skills questions is not very significant, with only a difference of two questions. The distribution of questions based on the Higher Order Thinking Skills sub-indicators can be seen in detail in the following figure.

Tabel 6. Distribution of Higher Order Thinking Skills Based on Sub-Indicators

No	Main Indicator	Chapter		
		I	II	V
1.	C 4.1	1	5	2
2.	C 4.2	1	1	0
3.	C 4.3	3	2	3
4.	C 5.1	0	1	12
5.	C 5.2	0	0	3
6.	C 6.1	17	3	22
7.	C 6.2	1	6	0
8.	C 6.3	10	7	7

Table 6 shows the distribution of Higher Order Thinking Skills sub-indicators in each chapter studied. Based on this table, at the analyzing level, sub-indicator C4.1 (distinguishing) dominates in Chapter II, while C4.2 (organizing) does not dominate in any chapter and is not even found in Chapter V, whereas C4.3 (attributing) is evenly distributed across all chapters. At the evaluating level, sub-indicator C5.1 (examining) dominates significantly in Chapter V, while C5.2 (criticizing) is only found exclusively in that chapter. Furthermore, at the creating level, sub-indicator C6.1 (formulating) dominates in Chapter V, C6.2 (planning) dominates in Chapter II, and C6.3 (producing) dominates in Chapter I and has an equivalent number in Chapters II and V.

Representation of Higher Order Thinking Skills Questions

- a. Question C4.1 (Discriminate)

Ayo Berpikir Kreatif

Perhatikan ketiga fungsi berikut ini.

$f(x) = 2x$
 $f(x) = 2^x$
 $f(x) = x^2$

1. Gambarkanlah ketiga grafik fungsi tersebut.
2. Apa yang membedakan ketiga grafik fungsi tersebut?

Figure 1. Discrimination Sub-Indicator Question (In Indonesian Language).

Question number 2 in Chapter I, page 11, in the “Let’s Think Creatively” section instructs students to analyze the available information and process it. Students are directed to identify and select the most relevant information to solve the problem according to the question instructions. Therefore, this question is categorized at the C4.1 (distinguishing) cognitive level because it involves the process of sorting out the relevant parts of the material provided.

b. Question C4.2 (Organizing)

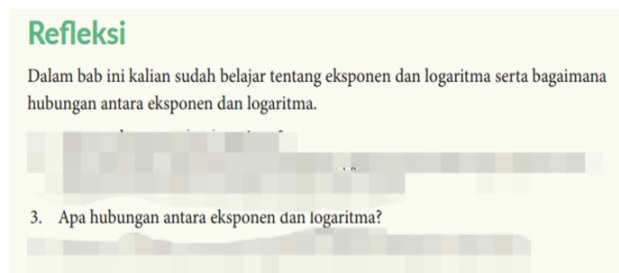


Figure 2. Organizing Sub-Indicator Question (In Indonesian Language).

The question in Figure 2 is located on page 31 of Chapter I in the “Reflection” section. This question asks students to relate the information obtained from previous lessons to the problem presented, namely grouping based on the information in the question. Thus, this question can be categorized into cognitive level C4.2 (organizing) because it requires students to determine how elements function or are arranged in a structure.

c. Question C4.3 (Attributing)

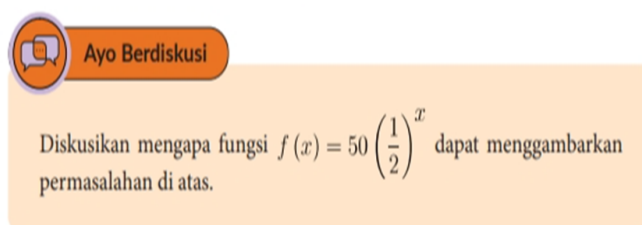


Figure 3. Attributing Sub-Indicator Question (In Indonesian Language).

This question is located in the “Let's Discuss” section on page 17 of Chapter I. This instrument directs students to analyze an exponential function model, then perform in-depth interpretation to provide reasons or arguments in answering the question. Therefore, this question is categorized as cognitive level C4.3 (attributing) because it requires students to determine the perspective or implied meaning behind the mathematical model presented.

d. Question C5.1 (Checking)

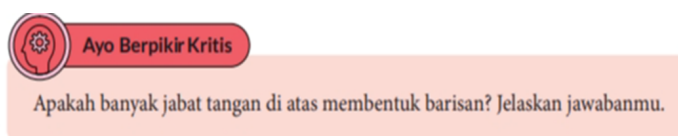


Figure 4. Question on the Checking Sub-Indikator (In Indonesian Language).

The question in the “Let's Think Critically” section is located on page 46 of Chapter II. This question is categorized as cognitive level C5.1 (checking) because students are instructed to test and determine the validity or truth of a statement based on predetermined criteria.

e. Question C5.2 (Critical Thinking)

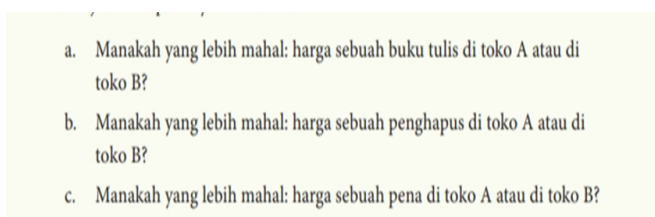


Figure 5. Critical Thinking Sub-Indicator Question (In Indonesian Language).

This question is part of the competency test in Chapter V, page 142. This instrument is categorized as cognitive level C5.2 (critical thinking). In points a to c, students are asked to evaluate and determine the most effective and efficient solution to solve the system of linear equations and inequalities. The activity of assessing the quality or effectiveness of a procedure is a characteristic of the critiquing indicator.

f. Question C6.1 (Formulating)

2. Tuliskan strategi lain yang kalian coba.

Figure 6. Formulating Sub-Indicator Question (In Indonesian Language).

The question in Figure 6 is part of the “Let's Discuss” activity in Chapter V, page 138. This question explicitly instructs students to determine and create alternative strategies that are different from the solutions provided previously. Students' ability to construct hypotheses or new ways to solve this problem categorizes the question into cognitive level C6.1 (formulating).

g. Question C6.2 (Planning)

Eksplorasi 2.4 Pembelahan Bakteri

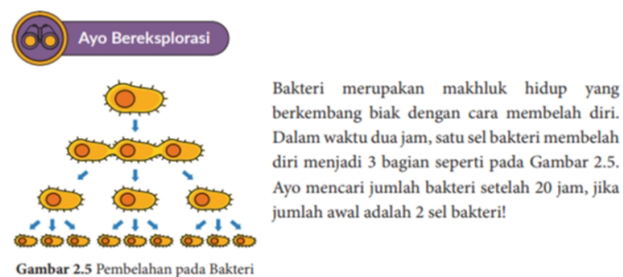


Figure 7. Planning Sub-Indicator Question (In Indonesian Language).

The question in Figure 7 is located on page 42 of Chapter II in the “Exploration” section. This question instructs students to solve problems by developing plans through strategic steps to obtain the right solution. Based on these requirements, this question is categorized into cognitive level C6.2 (planning) because it involves the process of designing procedures to complete a task.

h. Question C6.3 (Producing)

Latihan 5.2

1. Bonar memiliki dua pekerjaan paruh waktu. Untuk mengantar barang, Bonar dibayar Rp15.000,00 per jam. Untuk pekerjaan mencuci piring di restoran, Bonar dibayar Rp9.000,00 per jam. Dia tidak dapat bekerja lebih dari 10 jam. Bonar membutuhkan uang sebesar Rp120.000,00. Berapa jam dia harus bekerja untuk masing-masing pekerjaan?
 - a. Tuliskan model matematikannya.
 - b. Gambarkan grafiknya.

Figure 8. Producing Sub-Indicator Question (In Indonesian Language).

This question is found in Exercise 5.2 on page 140 of Chapter V. This question explicitly instructs students to create mathematical models and graphs that meet the specific criteria in the question. Therefore, this question is categorized as cognitive level C6.3 (producing) because it requires students to construct a tangible product based on a predetermined design.

Higher Order Thinking Skills Content in American Mathematics Textbooks

For comparison, this study used a US mathematics textbook entitled Carnegie Learning High School Math Solution Integrated. Published by Carnegie Inc, this technology-based book is 500 pages long. Based on the analysis results, 288 questions were found to be Higher Order Thinking Skills questions out of a total of 312 questions studied. The distribution of the data can be seen in more detail in the following table.

Table 7. Percentage of Higher Order Thinking Skills and Non-Higher Order Thinking Skills in American Mathematics Textbooks

No.	HOTS	Non-HOTS
1.	92,31%	7,61%

Table 7 shows a very significant percentage difference between Higher Order Thinking Skills and non-Higher Order Thinking Skills questions. This book contains Higher Order Thinking Skills questions with a percentage of 92,31%, indicating that the material in it has adapted Higher Order Thinking Skills-based questions almost entirely. The distribution of the number of Higher Order Thinking Skills and non-Higher Order Thinking Skills questions in each chapter is presented in more detail as follows.

Table 8. Number of Higher Order Thinking Skills and Non-Higher Order Thinking Skills Questions in Each Module

No.	Chapter I		Chapter II		Chapter V	
	HOTS	Non-HOTS	HOTS	Non-HOTS	HOTS	Non-HOTS
1.	21	1	132	10	135	13

Table 8 shows the distribution of Higher Order Thinking Skills and non-Higher Order Thinking Skills questions in each module. All units, both Module 1 Topics 1 and 2 and Module 2 Topic 3, show a significant difference in the number of Higher Order Thinking Skills and non-Higher Order Thinking Skills questions. The distribution of each Higher Order Thinking Skills sub-indicator in each module can be observed in the following table.

Table 9. Distribution of Higher Order Thinking Skills Based on Sub-Indicators

No	Main Indicator	Chapter		
		I	II	V
1.	C 4.1	1	4	0
2.	C 4.2	8	11	12
3.	C 4.3	3	29	15
4.	C 5.1	1	5	4
5.	C 5.2	2	24	25
6.	C 6.1	2	7	14
7.	C 6.2	2	7	14
8.	C 6.3	4	40	41

Table 9 shows the distribution of the number of Higher Order Thinking Skills questions based on sub-indicators in each module. At the analyzing level, sub-indicator C4.1 (distinguishing) dominates Module 1 Topic 2 but is not found in Module 2 Topic 3, while C4.2 (organizing) dominates Module 2 Topic 3, and C4.3 (attributing) appears to dominate significantly in Module 1 Topic 2. At the evaluating level, sub-indicator C5.1 (examining) dominates significantly in Module 2 Topic 3 even though it is not found in Module 1 Topic 1, while C5.2 (criticizing) is most commonly found in Module 1 Topic 2. Furthermore, at the creating level, sub-indicators C6.1 (formulating), C6.2 (planning), and C6.3 (producing) overall dominate Module 2 Topic 3. Specifically for sub-indicators C6.1 and C6.3, there was a significant difference in number compared to Module 1 Topic 1, but both were only one question apart when compared to Module 1 Topic 2.

Representation of Higher Order Thinking Skills Questions

a. Question C4.1 (Distinguishing)

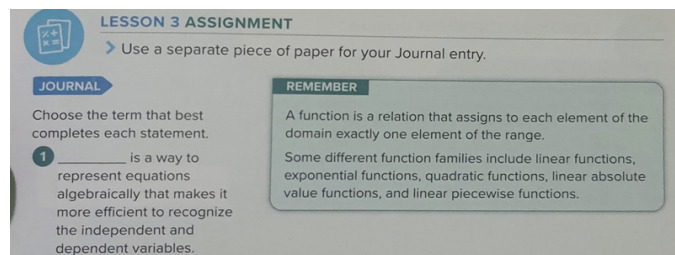


Figure 9. Distinguishing Sub-Indicator Question (In Indonesian Language).

The question in Figure 9 is located on page 51 of Module 1 Topic 1 in the Assignment-Journal section. The question instruction, "Choose the term that best completes each statement," indicates that students must analyze the information they have obtained previously, then select the most relevant part to answer the given problem. Therefore, this question is categorized at the C4.1 (distinguishing) cognitive level because it requires students to sort important and relevant information from other information.

b. Question C4.2 (Organizing)

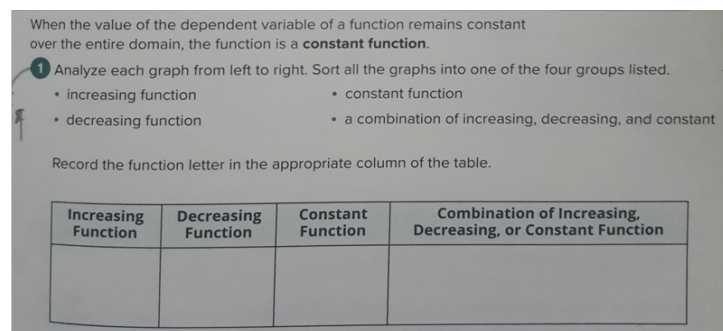


Figure 10. Organizing Sub-Indicator Question (In Indonesian Language).

The question in Figure 10 is located on page 39 of Module 1 Topic 1, Activity 2. The question instructions, which read, "Analyze each graph from left to right. Sort all the graphs into one of the four groups listed," indicates that students must analyze the available information and relate it to the problem given. Next, students are directed to organize or group these elements into a structure that corresponds to the question's instructions. Therefore, this question is categorized at the C4.2 cognitive level (organizing).

c. Question C4.3 (Attributing)

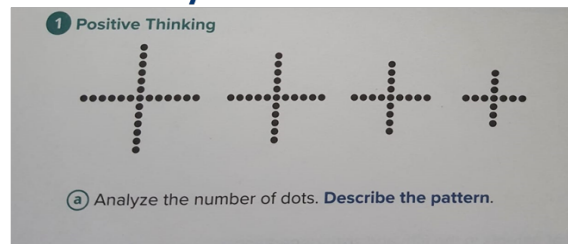


Figure 11. Attributing Sub-Indicator Question (In Indonesian Language).

The question in Figure 11 is located on page 67 of Module 1 Topic 2 Activity 1. This question is categorized as cognitive level C4.3 (attributing) because it explicitly instructs students to interpret a pattern image. Students are directed to describe the available patterns according to mathematical concepts in order to find the implied meaning or structure of the problem.

d. Question C5.1 (Checking)

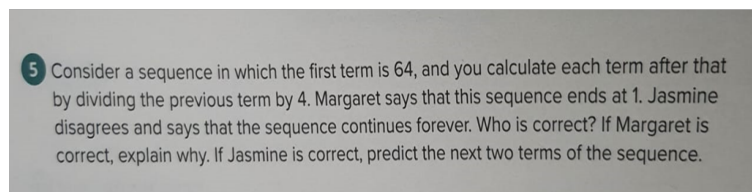


Figure 12. Checking Sub-Indicator Question (In Indonesian Language),

Question 12 is found in Module 1 Topic 2 on page 75, section Activity 2. This instrument explicitly instructs students to test the validity of a condition by determining whether the statement is true or false in order to solve further problems. Based on this evaluation activity, this question is categorized as cognitive level C5.1 (checking).

e. Question C5.2 (Critical Thinking)

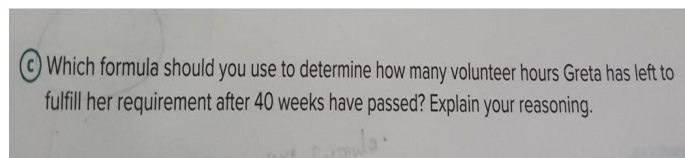


Figure 13. Critical Thinking Sub-Indicator Question (In Indonesian Language).

Based on Figure 13, this question is part of Assignment-Practice Module 1 Topic 2 on page 119. This question instructs students to evaluate various available information to determine the most effective and efficient solution. Students' ability to assess the quality of a method based on specific criteria categorizes this question into cognitive level C5.2 (criticizing).

f. Question C6.1 (Formulating)

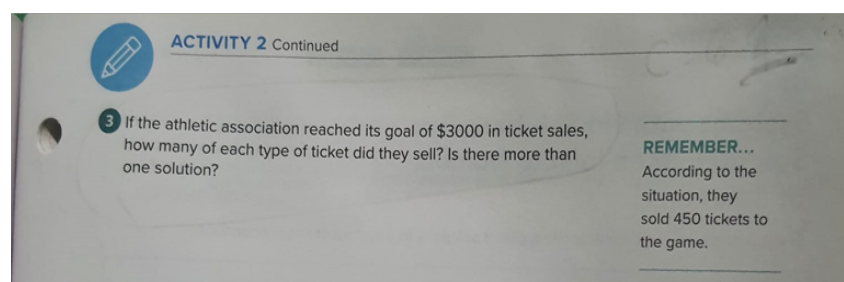


Figure 14. Formulating Sub-Indicator Question (In Indonesian Language).

Figure 14 shows a question found in Module 2 Topic 3 on page 307. The question instructs students to determine and create alternative solutions beyond the options provided. Students' ability to generate new hypotheses or solutions categorizes this question as cognitive level C6.1 (formulating).

g. Question C6.2 (Planning)

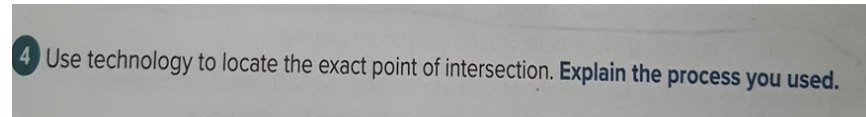


Figure 15. Planning Sub-Indicator Question (In Indonesian Language).

The question in Figure 15 is located on page 307 in Activity 2, Module 2, Topic 3. This question instructs students to develop systematic steps or procedures to solve the given problem. In addition, this question integrates the use of technology or digital media in the process of completing it. Therefore, this question is categorized at cognitive level C6.2 (planning) because it requires students' ability to design procedures to achieve specific goals.

h. Question C6.3 (Producing)

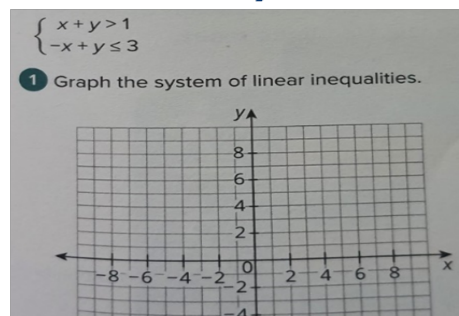


Figure 16. Producing Sub-Indicator Question (In Indonesian Language).

The question in Figure 16 is an instrument found in Activity 2 on page 351 of Module 2 Topic 3. This question explicitly instructs students to construct or create a tangible product in the form of a graph of an inequality system. Based on this activity, this question is categorized into cognitive level C6.3 (producing) because it requires students to produce a work as an application of the design or concept they have learned.

Comparison of Presentation

a. Indonesian Mathematics Textbook

4. Kalian dapat melihat perubahan dari suku-suku pada barisan geometri serta tampilan grafiknya pada aplikasi **Geogebra** melalui link berikut:
<https://www.geogebra.org/m/k8b2b2kn>
(sumber: Geogebra.org, penulis: Firmansyah)

Ayo Menggunakan Teknologi

Bentuk grafik pada barisan dapat dilihat menggunakan aplikasi **Geogebra**.

Figure 17. Integration with the Geogebra Application (In Indonesian Language).

Figure 17 shows integration with an external application called GeoGebra. However, this integration is still limited to checking results using templates provided in the GeoGebra application itself.

b. United States Mathematics Textbook

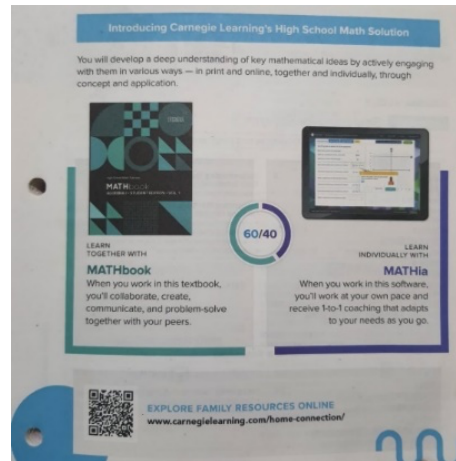


Figure 18. Integration with the MATHia Application (In Indonesian Language).

Figure 18 shows the ratio between the use of textbooks and the integration of a special application called MATHia. This application was developed and launched by the publisher of Carnegie Learning High School Math Solution Integrated, which is the subject of this study. This technological integration is applied in the problem-solving process, as shown in Figure 21, which instructs students to use the relevant technology to find and present solutions through accurate steps.

DISCUSSION

The results of the study show that there is a significant difference between the Higher Order Thinking Skills content in Indonesian and American mathematics textbooks. Based on the analysis of indicators and sub-indicators, Indonesian mathematics textbooks for grade X of the Merdeka Curriculum only excel at one cognitive level, namely C6 (creating) with a percentage of 68.22%. This is slightly higher than American textbooks, which score 55.21%. Conversely, American textbooks excel at two other cognitive levels. At the C4 (analyzing) level, the textbook scored 28.82%, higher than Indonesia's 18.83%. Similarly, at the C5 (evaluating) level, the American textbook scored 15.97% while the Indonesian textbook scored only 14.95%. These findings are in line with the PISA test results on mathematical literacy, which show that the average American student is superior and able to reach levels 5 and 6. This indicates that these students have the ability to recognize problems, distinguish relevant information, and evaluate the available information (OECD, 2022).

Upon closer inspection, the questions in American and Indonesian textbooks have contrasting presentation characteristics. Questions in Indonesian mathematics textbooks tend to be presented indirectly and are sometimes unclear, requiring students to interpret for themselves whether the question requires analytical or creative skills. However, in some sections, there are hints or alternative steps to guide students. In contrast, American mathematics textbooks present instructions more explicitly and systematically. This can be seen in the use of straightforward operational verbs such as "Analyze..." at the beginning of questions, which gives students clear directions for conducting analysis. In addition, the questions in the American textbook are arranged as a series of steps to solve a problem. The structure of the question begins with a description of general or specific conditions, followed by sub-questions that serve as stages of completion, and ends with a conclusion. This structure covers various sub-indicators of Higher Order Thinking Skills in a single question. Researchers consider this structure to be more effective because it provides a direct and focused learning experience for students. This model can be adopted by teachers as an adaptive learning strategy, given that problem solving requires the right strategy, one of which is through the optimization of Higher Order Thinking Skills (Soto et al., 2019).

Problem solving, as a key component of Higher Order Thinking Skills, is highly relevant in education because it involves identifying complex problems, collecting and analyzing data, proposing potential solutions, and selecting the most effective strategies (Hwang & Lai, 2017; Lu et al., 2021a, 2021b). Presenting problems using effective strategies has been proven to have a positive impact on students' Higher Order Thinking Skills, particularly in terms of creative thinking. This is because creative thinking skills have a significant influence on the depth of students' understanding of mathematical concepts (L., 2019). Overall, both textbooks have met the criteria for good presentation strategies, considering the very high percentage of Higher Order Thinking Skills content in both, which is almost 100%.

The results show that American mathematics textbooks are superior in terms of Higher Order Thinking Skills content, with a percentage difference of 17.83% compared to Indonesian mathematics textbooks. This finding is in contrast to the research (Pratama, 2019), which states that Indonesian mathematics textbooks have superior Higher Order Thinking Skills content, namely 16%, while the comparative textbooks from Malaysia only reached 13%. This difference in results indicates the dynamics of curriculum changes or differences in the characteristics of the instruments used in each research period.

Researchers have previously revealed that comparative studies of Indonesian textbooks are generally limited to comparisons with countries in Asia, such as Singapore, Malaysia, and Japan (Manopo, 2020). Unlike previous studies, this study takes a novel approach by using textbooks from the United States as a comparison. In addition, this study focuses on the senior high school level, while similar studies usually focus more on the junior high school level (Ananda, 2023). The selection of the senior high school level is considered relevant to the PISA data reference, which uses Higher Order Thinking Skills questions. The PISA test is intended for students aged approximately 15 years old. In Indonesia, this age range correlates with senior high school students in Phase E or F of the Merdeka Curriculum (Nurasri, 2018). This is reinforced by OECD (2023b) data, which states that the average student aged 15–19 years is at the senior high school level. The PISA instrument, which is integrated with Higher Order Thinking Skills, contains a number of instructions designed to encourage students' cognitive development (Lo, 2020). In addition to student factors, PISA results are also influenced by the role of teachers. Appropriate teacher guidance creates a positive correlation with students' Higher Order Thinking Skills abilities so that the results achieved can be maximized. Optimizing guidance through the use of Higher Order Thinking Skills questions is expected to improve students' critical thinking skills (Muhibbuddin, et.al., 2023).

This study also found fundamental differences in the presentation of questions integrated with external digital media. In US textbooks, the integration of digital media is done extensively and comprehensively. A number of problems that require Higher Order Thinking Skills are solved through a special application called MATHia. This application guides students in the problem-solving process interactively. In contrast, the integration of technology in Indonesian mathematics textbooks is still limited, with digital media generally only used as an instrument for checking final answers or simple validation. These findings are in line with the characteristics of the US curriculum, which strongly emphasizes the strengthening of Higher Order Thinking Skills in every component of learning media. Deep integration in US textbooks is considered effective in building student learning strategies. Structured and adaptive learning strategies such as this have been proven to have a direct impact on improving students' Higher Order Thinking Skills in solving complex problems (Lu, 2021). Therefore, mathematics education should be viewed as a strategic opportunity to foster Higher Order Thinking Skills (V. Svecov, 2019). This can be achieved through the teacher's ability to collaborate the main supporting factors, such as teaching materials, with additional supporting factors in the form of targeted learning technology.

CONCLUSION

Based on the research findings and discussion, it can be concluded that the percentage of Higher Order Thinking Skills (HOTS) content in United States mathematics textbooks is higher than in Indonesian mathematics textbooks, with a difference of 17.83%. The U.S. textbooks contain 92.31% HOTS content (288 out of 312 questions), while the Indonesian textbooks reach 74.83% (107 out of 143 questions). Beyond quantitative aspects, a significant difference was found in digital media integration; U.S. textbooks implement technology extensively and comprehensively to support HOTS processes, whereas Indonesian textbooks remain limited to simple validation functions. Given that the HOTS content in both textbooks is relatively high, both are considered suitable instruments for training students' Higher Order Thinking Skills through a collaborative approach, using the Indonesian textbook as the primary source and the U.S. textbook as a supplementary reference. This study is limited by its exclusive focus on question instruments. Therefore, future research is encouraged to expand the analytical scope of HOTS content beyond questions, such as in material explanations or learning activities. Furthermore, it is expected that future studies will provide a deeper examination of the challenges regarding specific mathematical English terminology encountered in this research. These findings also highlight important implications for educational practice. Indonesian curriculum developers and educators can enhance the effectiveness of HOTS integration by adopting clearer, more explicit question structures and expanding the use of digital technology in learning materials, similar to the comprehensive approach seen in U.S. textbooks. Teachers are encouraged to leverage a blend of both textbooks' strengths to better support students' critical thinking and problem-solving skills. Strengthening HOTS in mathematics education is essential for preparing students to meet the demands of the 21st-century skills landscape, enabling them to tackle complex real-world problems with creativity and analytical rigor.

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