USING REVISED BLOOM'S TAXONOMY TO EVALUATE THE COGNITIVE LEVELS OF QUESTIONS IN INDONESIAN HIGH SCHOOL PHYSICS TEXTBOOKS

by Riskan Qadar

Using Revised Bloom's Taxonomy to Evaluate the Cognitive Levels of Questions in Indonesian High School Physics Textbooks

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Abstract

This study aimed to determine the cognitive level and dimensions of knowledge about the types of Lower Order Thinking Skills (LOTS), Middle Order Thinking Skills (MOTS), and Higher Order Thinking Skills (HOTS) in class X high school physics textbooks on impulse & momentum based on bloom taxonomy revision. We used a descriptive approach with a quantitative approach. The subjects of this research were three high school physics textbooks for class X from three different publishers and data collection techniques using analysis sheets. The research results on the LOTS category of the three open books do not contain this question category. In the MOTS category, the analysis results included 1) C2-Conceptual 10% book publishers, 70% C3-Procedural, 2) C2-Conceptual book publishers 23.1%, C3-Procedural 46.2%, 3) book publishers 3 C2-Conceptual 55.7%, C3-Procedural 42.9%. In the HOTS category, the analysis results included 1) 20% for publisher 1 C4-Procedural, 2) 30.7% for publisher 2 C4-Procedural, and 3) 42.9% for publisher 3 C4-Procedural. Category questions C5 and C6 are separate from the three textbooks.

Keywords: Cognitive level, Physics textbook, Revised Bloom's taxonomy

INTRODUCTION

The National Education Association has identified 21st-century skills as "The 4C's" skills, including Critical Thinking, Communication, Collaboration, and Creativity (National, E.A, 2012). One factor that directly intersects with student learning activities and influences Indonesian students' low scientific literacy ability is the existence of student learning resources. In this case, teaching materials in the form of books have been the primary source of learning (Kurnia & Fathurohman, 2014). Textbooks have a significant role in education because they are directly related to teachers and students, so textbooks are widely circulated. Therefore, teachers as educators must be able to sort and choose which textbooks are appropriate for use in learning activities. Selecting suitable textbooks can support students to be more active in learning independently, not wholly depending on the teacher, and be able to develop and apply the knowledge they already have by studying the books they use. Regulations of the Minister of National Education Number 46 of 2007 and Number 12 of 2009 state that the Electronic School Book (BSE) is a type of electronic textbook considered appropriate for use in the learning process in Indonesia (Ministry of National Education, 2007).

Through education, teachers can apply students learning strategies or models and facilitate students with learning media, including the test questions given. This is done so that students can

think in higher-order thinking. The Electronic School Book also contains questions related to learning materials. The function of these questions is as a tool that can measure students' understanding of a subject matter so that the teacher as an educator can measure and find out whether the learning objectives have been achieved (Juhanda, 2015). Anderson & Krathwol (2001) stated that Bloom's taxonomy divides learning objectives into lower-order, middle-, and higher-order thinking levels. Juhanda (2015) explains that one of the things that can hinder the learning process of students is the use of lower-order thinking level questions in the learning evaluation instrument. If the questions given by the teacher still focus on questions at that level, then the participants' thoughts of students will also be stuck at that level. Therefore, it is important to know whether the questions in textbooks have developed students' thinking at various cognitive levels.

Although in research on Higher Order Thinking Skills (HOTS), there have been many, their implementation in learning in schools has yet to be maximized, especially when it is associated with achieving the expected student competencies in the curriculum. The HOTS assessment to measure student abilities and the fields of Mathematics and Science on a large scale internationally has been carried out by the International Mathematics and Science Study Team (TIMSS) and the Program of International Student Assessment (PISA) (Siswoyo & Sunaryo, 2017). Based on the results of the Program for International Student Assessment (PISA) test reported by the OECD (2019) that in 2018, Indonesia's science performance ability was ranked 71st with an average score of 396 out of 79 countries participating in this program. At this level of ability, students can generally only remember facts, terminology, and scientific laws and use general scientific knowledge in drawing and evaluating conclusions. Looking at the results of PISA in 2000, 2003, 2006, 2009, 2012, 2015, and 2018 Indonesia is still in the lower ranks compared to other countries participating in this program (Sandi, Setiawan & Rusnayati, 2013).

Research conducted by (Erniyanti, Junus & Syam, 2020) regarding the analysis of the cognitive domain of practice questions based on Bloom's taxonomy. The categories of questions that develop higher-order thinking skills are still low and need improvement. This article will discuss how to analyze the cognitive level of questions on LOTS, MOTS, and HOTS in three different publishers.

METHOD

The descriptive research used a quantity approach to describe how much LOTS, MOTS, and HOTS there were in impulse and momentum material. The subjects in this study were practice questions on impulse and momentum material in three different class X high school physics textbooks, namely publisher 1, publisher 2, and publisher 3.

This study was to determine the senior high school physics textbook to be used, determine the practice questions to be analyzed, identify practice questions based on the specified chapter, count the number of questions according to the categorization, and calculate the percentage level of cognitive processes. Based on the Revised Bloom's Taxonomy, it was then categorized based on LOTS, MOTS, and HOTS types, making discussions and conclusions (Erniyanti, Junus & Syam, 2020).

Table 1. Classification of Thinking Process Dimensions

Cognitive Level	Levels in the Revised Bloom's Taxonomy
HOTS	Create (C6)
	Evaluate (C5)
	Analyze (C4)
MOTS	Apply (C3)
	Understanding (C2)
LOTS	Remember (C1)

(Himmah, 2019)

Data collection was carried out using a document analysis sheet instrument which contained tables with columns for numbers, questions, answers, keywords, types of levels of the cognitive dimension, and types of levels of the knowledge dimension. Data analysis carried out was descriptive analysis, where the data obtained was then processed into qualitative and quantitative data. The results of data analysis are divided into LOTS, MOTS, and HOTS.

Table 1. Revised Bloom's Taxonomy Cognitive Process Levels

Cognitive levels	Dimensions
Remember (C1)	Recalling, reading, mentioning, writing, choosing, matching, and stating.
Understanding (C2)	Explaining, interpreting, telling, showing, giving examples, summarizing, and concluding.
Apply (C3)	Implement, use, conceptualize, determine, process, calculate, do, adjust, and find.
Analyze (C4)	Examine, relate, solve, organize, describe, and compare.
Evaluate (C5)	Checking, criticizing, proving, supporting, evaluating, and giving suggestions.
Create (C6)	Designing, constructing, creating, creating, designing, and rebuilding.

(Jessen & Mirsky, 2008)

Table 3. Knowledge Dimension Levels

Dimension of Knowledge	Dimension
Pengetahuan faktual Factual knowledge	1. Knowledge of terminology 2. Knowledge of detailed charts and elements
Conceptual knowledge	1. Knowledge of classification and categories 2. Knowledge of principles and generalizations 3. Knowledge of theory, structure, and models
Procedural knowledge	1. Knowledge of specific skills related to a particular field and knowledge of algorithms 2. Knowledge of techniques and methods 3. Knowledge of the criteria for using a procedure
Metacognitive knowledge	1. Knowledge of strategy 2. Knowledge of cognitive operations 3. Knowledge of oneself

(Widodo, 2005)

Quantitative data in the form of numbers processed using the percentage formula (Susanti, 2015)

$$Pi = \frac{Ni}{N} \times 100\% \qquad (1)$$

Notes:

Pi = percentage value of occurrence of questions

Ni = number of occurrences of questions from each level category

N = the total number of questions

RESULTS AND DISCUSSION

The textbooks analyzed consisted of multiple choice and essays with a total of 116 questions from publisher 1 with 20 questions, publisher 2 with 26 questions, and publisher 3 with 70 items.

1. Presentation of the Results of Each Textbook

Kunarto in Zaim (2016) states that the study of the cognitive domain includes categories of knowledge dimensions and categories of cognitive dimensions. The knowledge dimension reflects scientific concepts that students must master through the teaching and learning process. Cognitive assessment or knowledge assessment is an assessment to measure students' ability to factual, conceptual, procedural, and metacognitive knowledge with low to high-level thinking skills (Kemendikbud, 2019).

Publisher 1

Table 4. Results of Publisher Book Analysis 1

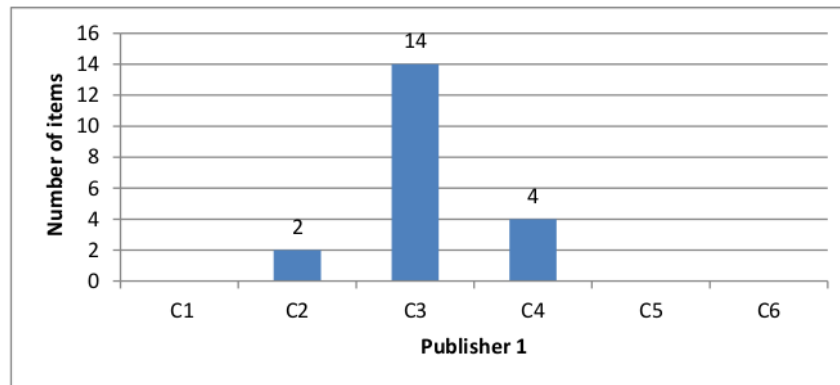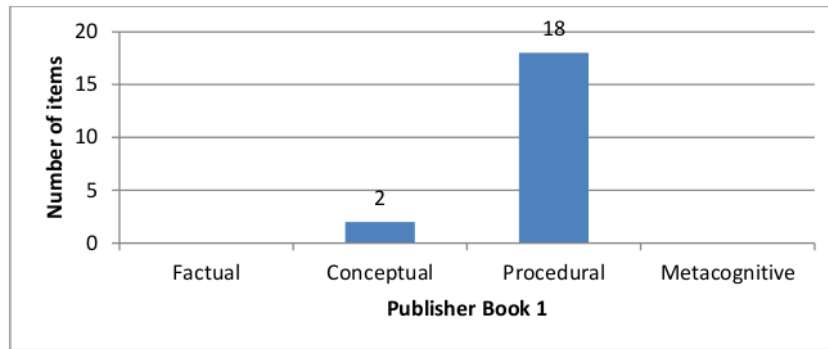| Levels	Factual	Conceptual	Procedural	Metacognitive	Total	Percentage
C1	-	-	-	-	-	-
C2	-	1,2	-	-	2	10%
C3	-	-	2,3,4,5,8,1, 2,3,4,5,6,7, 9,10,	-	14	70%
C4	-	-	6,9,10,8	-	4	20%
C5	-	-	-	-	-	-
C6	-	-	-	-	-	-
Total	-	2	18	-	20	
Percentage	-	10%	90%	-		100%

Figure 1. Cognitive dimension of publisher book 1

Figure 2. Knowledge dimension of publisher book 1

Publisher 2

Table 5. Results of Publisher Book Analysis 2

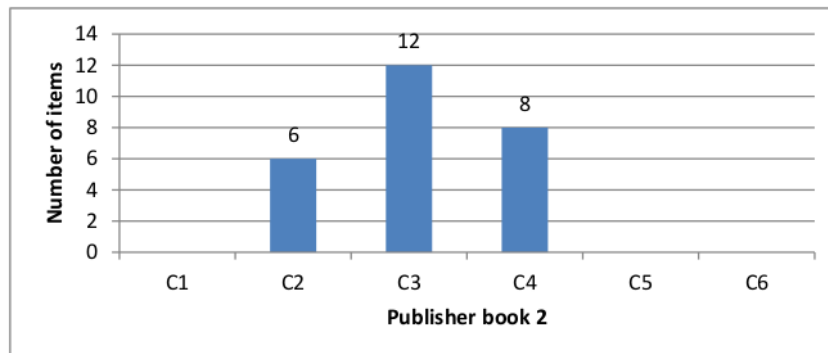| Levels	Factual	Conceptual	Procedural	Metacognitive	Total	Percentage
C1	-	-	-	-	-	-
C2	-	1,5,6,8,11,14	-	-	5	23.1 %
C3	-	-	2,3,4,7,9,10 ,12,15,16, ,17,3,2	-	12	46.2 %
C4	-	-	13,18,19,20 1,4,5,6	-	8	30.7 %
C5	-	-	-	-	-	-
C6	-	-	-	-	-	-
Total	-	6	20	-	26	
Percentage	-	23.1%	76.9%	-		100%

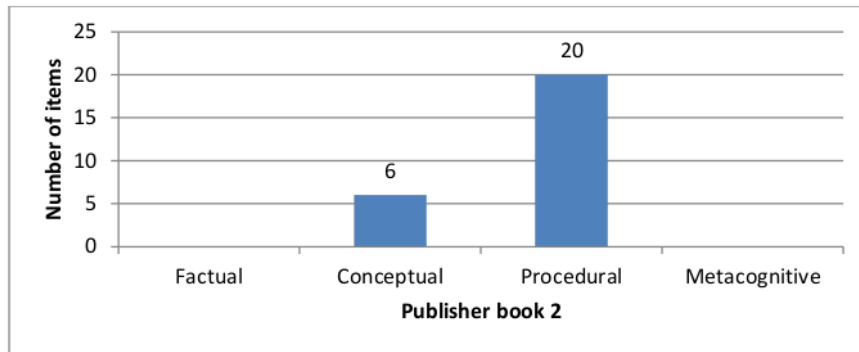Figure 3. Cognitive dimension of publisher book 2

Figure 4. Knowledge dimension of publisher book 2

Publisher 3

Table 6. Results of Publisher Book Analysis 3

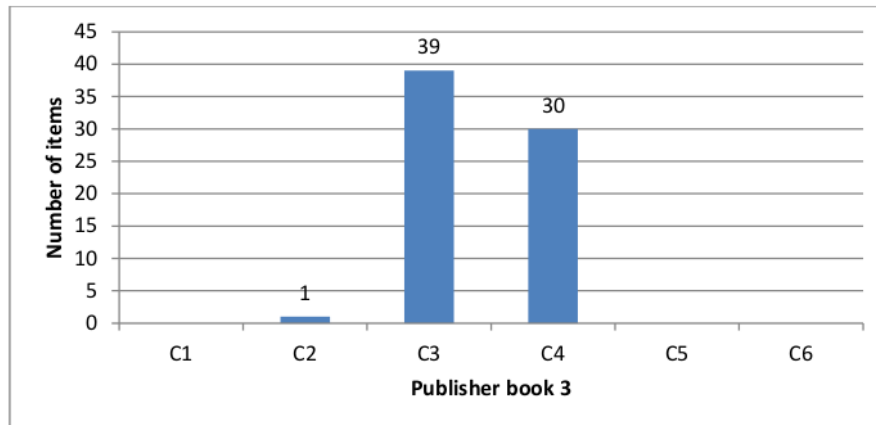| Levels	Factual	Conceptual	Procedural	Metacognitive	Total	Percentage
C1	-	-	-	-	-	-
C2	-	6	-	-	1	1.4 %
C3	-	-	1,2,4,5,8,9, 1011,12,14, 16,18,19,20, 21,2324,27, 32,33,36,37, 38,40,12,4,5, 7,9,13,16 19,20,23,24 25,28,30	-	39	55.7 %
C4	-	-	3,7,13,15,17, 22,25,26,28, 29,30,31,34, 35,39,3,6,8, 10,11,12,14, 15,17,18,21, 22,26,27,29	-	30	42.9 %
C5	-	-	-	-	-	-
C6	-	-	-	-	-	-
Total	-	1	69	-	70	
Percentage	-	1.4 %	98.6%	-		100%

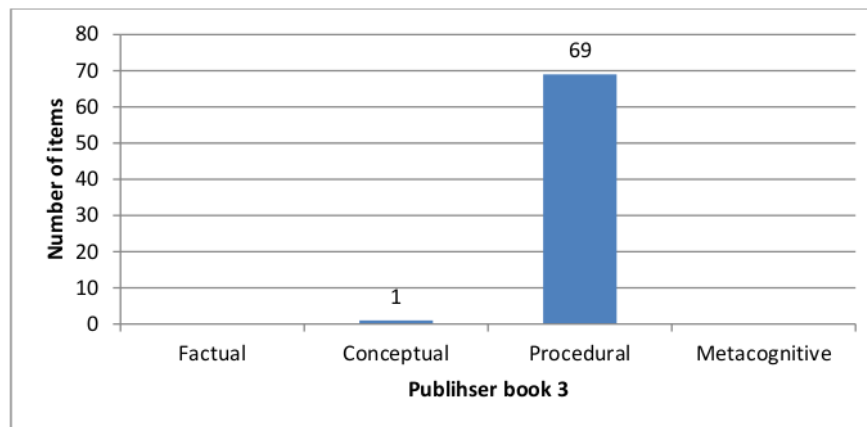Figure 5. Cognitive dimension of publisher book 3

Figure 6. Knowledge dimension of publisher book 3

According to Effendi (2015), Bloom's Taxonomy is a hierarchical structure (level) that identifies thinking skills from low to high levels. Anderson and Krathwohl classify thinking dimensions into three levels, namely: 1) Lower Order Thinking Skills (LOTS), 2) Middle Order Thinking Skills (MOTS), and 3) Higher Order Thinking Skills (HOTS). The revision of Bloom's Taxonomy is proposed to look ahead of time and respond to the demands of the developing educational community, including how children develop and learn and how teachers prepare to teach materials (Rukmini, 2008).

1. **Lower Order Thinking Skills (LOTS)**

Lower-order thinking skills are the ability to know and remember a basic concept (Sutrisno, Koes-h, & Supriana, 2018). The low-level thinking skills (LOTS) observed in this

study include the ability to remember (C1) in Bloom's Taxonomy classification. Remembering is the lowest thought process ability which can be expressed as the ability to retrieve knowledge from long-term memory. The verbs on the dimension of remembering are reading, mentioning, writing, selecting, and restating.

The analysis results on the books of publisher 1, publisher 2 and publisher 3 do not contain the LOTS question criteria. In line with research (Giani, Zulkardi, & Hiltrimartin, 2015), the percentage of questions for each taxonomic bloom cognitive level is 30% for C1 and C2, 40% for C3 and C4, 30% for C5 and C6. The results of the analysis show the percentage of occurrence of questions in category C1 (Remembering); as much as 0% does not fulfill the proportion of questions in textbooks which reaches 30% for C1 and C2. Even though LOTS-type questions need to be in textbooks because they can help teachers to find out the level of ability of students who only have low-level thinking skills, in the rote bloom taxonomy, memorizing is the lowest level of thinking ability. Every student must possess this ability to master higher levels of thinking. In addition, according to (Erniyanti, Junus & Syam, 2020), the cognitive level of the questions is closely related to the quality of these questions. It is hoped that students will be able to solve questions at a level that includes all cognitive levels of questions according to the revised bloom taxonomy, starting from C1-Factual level to C6-Metacognitive. The analysis results on publisher 1, publisher 2, and publisher 3 books do not contain the LOTS question criteria, namely Remembering (C1).

2. Middle Order Thinking Skills (MOTS)

Questions with medium-level thinking skills (Middle Order Thinking Skills) include the cognitive levels of Understanding (C2) and Applying (C3). Understanding is the ability to understand the meaning of learning material, including what is written, spoken, and drawn by the teacher. Operational verbs to understand are explaining, interpreting, telling, giving examples, and concluding. Applying is the ability to use the knowledge one has to solve problems and apply them, the operational verbs to apply are to implement, conceptualize, determine, calculate, process, perform and discover.

The analysis results on publisher 1's book obtained questions with a C2-conceptual cognitive level of 2 questions with a percentage of 10% and a C3-procedural cognitive level of 14 questions with a percentage of 70% of the total 20 questions, as for the example of MOTS questions in publisher book 1 is in Table 7.

Table 7. Example of MOTS questions from publisher 1

No	Item	Operational Verb Indicator	Level Cognitive
1.	The impulse that occurs in the process of kicking a soccer ball is 5 Ns. If the touch between the foot and the ball lasts 0.05 seconds, the force exerted by the foot on the ball is… N a. 50 b. 70 c. 90 d. 100 e. 110 Source: 2016 revised edition of the 2013 curriculum 2013 Senior High School Physics student book, page. 241	Calculating	Applying (C3) – Procedural
2.	The law of conservation of momentum will apply to two interacting identical objects if… a. The masses of the two objects are different b. The masses of the two objects are the same c. The speeds of the two objects are different d. The speed of the two objects is the same e. There is no outside force that influences Source: 2016 revised edition of the 2013 curriculum 2013 Senior High School Physics student book, page. 241	Explaining	Understanding (C2) – Conceptual

In publisher book 1, the analysis results of questions contained six questions with MOTS type of 6 questions C2-Conceptual with a percentage of 23.1% and 12 questions C3-procedural with a percentage of 46.2% of the total 26 questions in this book. The example of MOTS questions in publisher book 2 is in Table 8.

Table 8. Example of MOTS questions from publisher 2

No	Item	Operational Verb Indicator	Level Cognitive
1.	The magnitude of the impulse force of 200 N that touches the target object for 0.1 second is... a. 20 Ns b. 40 Ns c. 50 Ns d. 200 Ns e. 500 Ns Source: revised edition of the 2013 curriculum 2013 Senior High School Physics student book, page. 354	Calculating	Applying (C3) – Procedural

No	Item	Operational Verb Indicator	Level Cognitive
2.	From the following statement which is the correct definition of momentum is... a. The product of the mass and acceleration of an object b. The product of the multiplication between the force and the time interval during which the force acts on the object. c. The energy possessed by a moving object d. The product of the multiplication of the speed and force acting on an object e. The product of the mass and velocity of an object Source: revised edition of the 2013 curriculum 2013 Senior High School Physics student book, page. 354	Interpreting	Understanding (C2) – Conceptual

In publisher book 3, the analysis results of the questions in this book contained one MOTS type question, 1 C2-Conceptual question with a percentage of 1.4%, and 39 C3-Procedural questions with a percentage of 55.7% of the total 70 questions. There are examples of MOTS questions in publisher book 3 is in Table 9.

Table 9. Example of MOTS questions from publisher 3

No	Item	Operational Verb Indicator	Level Cognitive
1.	A ball with a mass of 2 kg hits a vertical wall with a speed of 4 m/s and is bounced back with a speed of 2 m/s. The magnitude of the impulse force generated by the wall is... a. 2 Ns b. 4 Ns c. 6 Ns d. 8 Ns e. 12 Ns Source: revised edition of the 2013 curriculum 2013 Senior High School Physics student book, page. 123	Calculating	Applying (C3) – Procedural
2.	Ball P moving with velocity v hits ball Q which was initially at rest centrally. If the masses of the two objects are the same and the collision is perfectly elastic, after the collision the velocity... a. P = Q ≠ 0 same direction b. P = Q = 0 c. P ≠ 0, Q = 0	Interpreting	Understanding (C2) – Conceptual

No	Item	Operational Verb Indicator	Level Cognitive
	d. P = 0, Q = v		
	e. P = Q = v		
	Source: revised edition of the 2013 curriculum 2013		
	Senior High School Physics student book, page. 124 b.		

Based on the analysis from three textbooks, we found that the problem content on C2-Conceptual was nine from 116 questions with a low percentage of 7.8%, which did not meet the proportion of questions in a good textbook according (Giani, Zulkardi, & Hiltrimartin, 2015) which reached 30% for C1 and C2. The content of the questions in C3-Procedural was 65 from 116, with a high percentage of 56%, exceeding the proportion of questions in textbooks, reaching 40% for C3 and C4. The results of this study were in line with Erniyanti, Junus, & Syam (2020), which shows that the percentage value of the most occurrences of questions is occupied by questions in the Apply category (C3). It is expected at the C3-Procedural level, and students can complete a routine procedure, skill, technique, and method to solve a problem.

3. Higher Order Thinking Skills (HOTS)

Questions with higher-order thinking skills include the cognitive levels of Analyzing (C4), Evaluating (C5), and Creating (C6). Operational verbs in analyzing are examining, associating, organizing, describing, and comparing. The verbs in evaluating are criticizing, checking, supporting, proving, and giving suggestions. The operational verbs to create are to design, construct, create, create and design.

The analysis results on publisher 1's book found questions with a C4-Procedural cognitive level of 4 with a percentage of 20% of the total 20 questions. On multiple choice questions and essays in publisher book 1 needed to have the cognitive level of evaluating (C5) and creating (C6). Still, at the end of the exercise, there is an experiment in the book, an experiment can be categorized as Creating (C6). An example of HOTS questions in publisher book 1 is in Table 10.

Table 10. Example of HOTS questions for publishers 1

| Item	Verb	Cognitive level
Look at the following picture!	Linking	Analyzing (C4) – Procedural
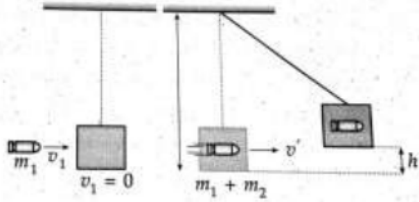
A bullet with a mass of 10 grams is fired at a certain speed hitting the block. The bullets are lodged in the block so that both are lifted 10 cm. if the mass of the block is 2 kg and the acceleration due to gravity is 9.8 m/s2, determine the speed of the bullet!

Source: 2016 revised edition of the 2013 curriculum 2013 Senior High School Physics student book, page. 243

In publisher book 2, there were eight questions with a C4-Procedural cognitive level, with a percentage of 30.7% of the 26 questions. In multiple choice questions and essays in Publisher 2's book, no cognitive levels were Evaluating (C5) and Creating (C6). Still, there is an experiment in the book where an experiment can be categorized as Creating (C6). The example of HOTS questions in publisher book 2 is in Table 11.

Table 11. Example of HOTS questions for publishers 2

Item	Verb	Cognitive level
The figure below shows object B hanging by a long rope at rest. Then, object A with speed vA = 20 m/s hits object B so that the object swings. The maximum height that can be reached by object B, if the collision coefficient of restitution is 1/2 is... ($m_A = m_B = m$ dan $g = 10 \text{ m/s}^2$)	Linking	Analyzing (C4) – Procedural
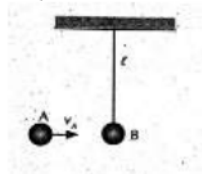
   a. 1,5 m
   b. 3,0 m
   c. 5,0 m
   d. 9,75 m
   e. 11,25 m

Source: revised edition of the 2013 curriculum 2013 Senior High School Physics student book, page. 356

In publisher book 3, there were 30 questions with a C4-Procedural cognitive level, with a percentage of 42.9% of the total 70 questions. In the multiple-choice questions and essays in the publisher's book 3, no cognitive levels are Evaluating (C5) and Creating (C6), but at the end of the exercise, there is an experiment in the book, where an experiment can be categorized as Creating (C6). An example of HOTS questions in publisher book 3 is in Table 12.

Table 12. Example of HOTS questions for publisher book 3

Item	Verb	Cognitive level
A ball with a mass of 0.5 kg falls freely from a height of 20 m and is bounced off the floor 5 m high. If the ball is in contact with the floor for 0.1 s; The magnitude of the impulse force is... a. 250 N b. 200 N c. 150 N d. 100 N e. 50 N Source: revised edition of the 2013 curriculum 2013 Senior High School Physics student book, page. 123	Linking	Analyzing (C4) – Procedural

The average result of the appearance of the HOTS category questions from the three textbooks analyzed was the appearance of C4-Procedural questions in as many as 42 out of a total of 116 questions. The percentage is 36.2% which fulfilled the proportion of questions in the textbook, reaching 40% for C3 and C4. In the three textbooks there are no C5 and C6 cognitive levels. There are only C4 cognitive level categories, meaning they still need to fulfill the 30% proportion of questions for C5 and C6. This shows that students tend to analyze rather than evaluate and create. These results are in line with the results of research by (Erniyanti, Junus, & Syam, 2020), which shows that the questions given to physics textbooks at cognitive levels C5 and C6 are not found in all questions, which means that the percentage of occurrences in that category is 0%. This high-order thinking ability is an activity that requires critical and evaluative thinking, as well as decision-making and problem-solving (Sutrisno et al., 2018). When students can activate both skills, it means they have successfully applied higher-order thinking skills. According to Tajudin & Chinnappan (2016), students need to be given questions at the HOTS level. So, they can be trained to develop their cognitive abilities to compete in Team International Mathematics and Science Study (TIMSS) and the Program of International Student Assessment (PISA).

From the results of the analysis of the three textbooks, most of the questions appear at the MOTS (Middle Order Thinking Skills) level, where the results of the analysis contain C2-Conceptual to C3-Procedural abilities, so it can be said that the three textbooks can measure medium-level thinking skills but does not measure higher order thinking skills. Good questions are questions that are relatively easy and easy. Still, in practice questions for each material, the difficulty level of the questions must vary, which can support the achievement of competition. In addition, varying difficulty levels can also help the teacher know each student's level of ability so that later the teacher can supervise students in every learning activity.

CONCLUSION

We concluded that the Lower Order Thinking Skills (LOTS) type questions based on the revised bloom taxonomy in publisher 1, publisher 2, and publisher 3 do not contain the criteria for LOTS questions. The results of the A analysis show that the percentage of occurrence of questions at level C1 (Remembering) is 0%. Three textbooks did not meet the cognitive dimensions and knowledge of the revised bloom taxonomy. The Middle Order Thinking Skills (MOTS) type questions based on the revised bloom taxonomy in publisher 1's book contain 2 C2-Conceptual questions with a percentage of 10% and 14 C3-Procedural questions with a percentage of 70%. In publisher 2's book, it contained six questions at the C2-Conceptual level with a resulting percentage of 23.1%, and at the C3-Procedural level, there were 12 questions with a resulting percentage of 46.2%. Publisher 3 contains a C2-Conceptual level of 1 item with a resulting percentage of 1.4% and a C3-Procedural level of 39 questions with a resulting percentage of 55.7%. Three textbooks that had been studied fulfilled the cognitive dimensions and knowledge of the revised bloom taxonomy. Higher Order Thinking Skills (HOTS) type questions based on the revised bloom taxonomy in publisher 1's book contain 4 C4-Procedural items with a percentage of 20%, and publisher 2's book contains 8 C4-Procedural items with a percentage of 30.7%, and in publisher 3's book contains C4-Procedural as many as 30 questions with a percentage of 42.9%. The three books do not contain the types of questions C5 and C6. Still, there are student activities in the form of experimental exploratory sheets that can be carried out by students who are categorized into Creating (C6).

This study suggests making questions in textbooks that include and contain all aspects of thinking skills, starting from low-level and medium-level thinking skills to high-level thinking students. Besides that, teachers should better understand and choose textbooks that have

cognitive levels ranging from C1 (remembering) to C6 (creating) as a basis for choosing textbooks used in teaching and learning activities, and more attention should be paid to the use of the right choice of words in the questions in textbooks.

REFERENCES

Anderson, L. W., & Krathwohll, D. R. T. (2001). *A taxonomy for learning and assesing : A revision of bloom's taxonomy of educational objectives*. Addisio Wesley Longman.

Effendi, R. (2015). Konsep Revisi Taksonomi Bloom dan Implementasinya Pada Pelajaran Matematika SMP. *Jurnal Ilmiah Pendidikan Matematika*, *2*.

Erniyanti, Junus, M., & Syam, M. (2020). *Analisis Ranah Kognitif Soal Latihan Berdasarkan Taksonomi Bloom Revisi Pada Buku Fisika Kelas X (Studi Pada Buku Karya Ni Ketut Lasmi). 1*(2), 115–123.

Giani, Zulkardi, & Hiltrimartin, C. (2015). Analisis Tingkat Kognitif Soal-Soal Buku Teks Matematika Kelas VII Berdasasrkan Taksonomi Blooom. *Jurnal Pendidikan Matematika*, *66*, 37–39.

Himmah, W. I. (2019). *Analisis Soal Penilaian Akhir Semester Mata Pelajaran Matematika Berdasarkan Level Berpikir. 3*(1), 55–63.

Jessen, K. R., & Mirsky, R. (2008). KKO Kognitif Revisi. *Glia*, 56(14), 1552-1556

Juhanda, A. (2015). Analisis Soal Jenjang Kognitif Taksonomi Bloom Revisi Pada Buku Sekolah Elektronika (BSE) Biologi SMA. *Jurnal Pengajaran MIPA*, *21*(1), 61–66. https://doi.org/http://dx.doi.org/10.18269/jpmipa.v21i1.657

Kemendikbud. (2019). Buku Penilaian Berorentasi Higher Order Thinking Skills. *Direktorat Jenderal Guru dan Tenaga Kependidikan*. Jakarta

Kurnia, F., & Fathurohman, A. (2014). *Analisis bahan ajar fisika sma kelas xi di kecamatan indralaya utara berdasarkan kategori literasi sains. 1*(1), 43–47.

Ministry of National Education. (2007). *Peraturan Menteri Pendidikan Nasional No. 46 Tahun 2007 Tentang Penetapan Buku Teks Pelajaran yang Memenuhi Syarat Kelayakan untuk Digunakan dalam Proses Pembelajaran*. Ministry of National Education.

National Education Association. (2012). Preparing 21st century students for a global society: An educator's guide to the "Four Cs." *Alexandria, VA: National Education Association*

Rukmini, E. (2008). Deskripsi Singkat Revisi Taksonomi Bloom. *Universitas Negeri Yogyakarta*.

Sandi, M.I., Setiawan, A., & Rusnayati, H. (2013). Analisis buku ajar fisika SMA kelas x di kota Bandung berdasarkan komponen literasi sains. *Universitas Pendidikan Indonesia*, 94–102.

OECD. (2019). *PISA 2018 Results (volume I) : What Students Know and Can DO: Vol. I.* OECD Publishing. https://doi.org/https://doi.org/10.1787/5f07c754-en

Siswoyo, & Sunaryo. (2017). Analisis Soal dan Implementasinya dalam Pembelajaran Fisika di Sekolah Menengah Atas. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *3*(1), 171–175.

Susanti, N. Y., Trapsilasiwi, D., & Kurniati, D. (2015). Analisis Tingkat Kognitif Uji Kompetensi pada Buku Sekolah Elektronik (BSE) Matematika SMP/MTs Kelas VII Kurikulum 2013 Berdasarkan Taksonomi Bloom. *Jurnal Matematika Kreatif- Inovatif*. 6(1), 65-73

Sutrisno, F. H., Koes-h, S., & Supriana, E. (2018). Eksplorasi LOTS dan HOTS Materi Optik Geometri `Siswa SMA. *Physics Education Journal*, *2*(1), 21–28.

Tajudin, N. M., & Chinnappan, M. (2016). The link between higher order thinking skills, representation and concepts in enhancing TIMSS tasks. *International Journal of Instruction*, *9*(2), 199–214. https://doi.org/10.12973/iji.2016.9214a

Widana, I. W. (2017). Modul Penyusunan Soal Higher Order Thinking Skills (HOTS). *Direktorat Pembinaan SMA, Direktorat Jenderal Pendidikan Dasar Dan Menengah Serta Departemen Pendidikan Dan Kebudayaan*.

Widodo, A. (2005). Taksonomi Tujuan Pembelajaran. *Universitas Pendidikan Indonesia*, *4*, 61–69.

Zaim, M. 2016. *Evaluasi Pembelajaran Bahasa Inggris*. Jakarta : Kencana

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