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Evaluation of 6th and 7th Grade Mathematics Course Common Written Exam Questions According to Item Types and Revised Bloom's Taxonomy Prepared by Kocaeli Provincial Directorate of National Education Measurement and Evaluation Center

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Abstract

This study aims to evaluate the 6th and 7th grades mathematics lesson common written exam questions prepared by Kocaeli Provincial Directorate of National Education Measurement and Evaluation Center according to item types and the Revised Bloom Taxonomy. In this research, descriptive scanning method was used. In the research, as a data collection tool, the first and second semesters of 2018-2019 academic year and the first semester of 2019-2020 academic year's exam questions of mathematics lesson were put to use by Kocaeli Provincial Directorate of National Education's Measurement and Evaluation. The common written 195 exam questions, were examined in agreement with the item types and Revised Bloom Taxonomy. Obtained data show %2,88 of 6th- grathe questions were prepared for memorization, % 33,65 for comprehension, % 44,2 for exercise, % 8,65 for analysis, %3,85 for evaluation. It was determined that %37,5 of questions written in mathematics exam are true-false, are short-answer, % 59.62 are multiple-choice, and it is confirmed that there are also no questions from matched and open-ended question types.. According to the Revised Bloom Taxonomy, % 9,62 of e were no questions which test the creativity of the students. Besides, % 45,05 of 7th- grade mathematics written questions consisted of short answers, and % 54,95 consisted of multiple-choice items. It was observed that there were no open-ended, matched and true-false questions. As stated in Revised Bloom Taxonomy, % 2,20 of the questions were prepared for memorization, % 43,95 for comprehension, % 51,65 for exercise, %2,20 for analysis.

It was resolved none of the questions was to test the creativity and evaluation of the students.

Keywords: Revised Bloom Taxonomy, Mathematic, Item Types

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INTRODUCTION

Education is the process of intentionally bringing about desired changes in an individual's behavior through personal experiences (Ertürk, 1979). The term "desired changes" in this definition refers to the objectives of the course. Hence, objectives are the qualities intended to be instilled in students through education. Behavior is a more tangible form of these objectives. In other words, behavior represents the observable part of learning. In the literature, the term "cognitive process" is also used by scholars (Güven & Aydın, 2004; Korkmaz & Ünsal, 2016; Tekindal, 2017) instead of behavior.

When examining studies on classifications related to cognitive process dimensions, it is noted that according to Sönmez's study (2012), 19 different classifications of cognitive domains have been proposed, including those by Bloom, Anderson, Krathwohl and colleagues, Tuckman, Williams, Hannah and Michaels, Stahl and Murphy, and Romizowski. A literature review reveals that the most commonly used taxonomy is the Revised Bloom's Taxonomy (Ardahanlı, 2018; Kuzu, Çil & Şimşek, 2019; Yakalı, 2016). An examination of the Revised Bloom's Taxonomy indicates that the principle of progression is given less importance and is secondary. However, it is assumed that as one moves from lower to higher categories, the process becomes cumulative and increasingly complex, progressing from simple to complex (Tekindal, 2017).

The Revised Bloom's Taxonomy is examined in two dimensions: the knowledge dimension and the cognitive process dimension. The knowledge dimension consists of four categories: factual knowledge, conceptual knowledge, procedural knowledge, and metacognitive knowledge.

The cognitive process dimension consists of six main categories: remembering, understanding, applying, analyzing, evaluating, and creating (synthesis). This study focuses on the cognitive process dimensions. According to the Revised Bloom's Taxonomy, the cognitive process dimensions are explained as follows (Tekindal, 2017; Yakalı, 2016):

Remembering: This is the cognitive process of increasing the retention time of taught information in memory in its original form. Remembering involves the retrieval of desired information from long-term memory. Cognitive processes at the remembering level include recognition and recall.

Understanding: This category involves restructuring given information in relation to prior knowledge, either verbally, in writing, or graphically. Cognitive processes at the understanding level include interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining.

Applying: This involves using procedures to perform tasks or solve problems, whether known or unknown. Cognitive processes at the applying level include executing and implementing.

Analyzing: Materials, events, or situations are presented as a whole, composed of structures organized by certain principles. To learn and measure these structures, it is necessary to break them down using specific principles (criteria). The analyzing level involves breaking materials into their constituent parts and determining how these parts relate to each other and the whole structure. Cognitive processes at the analyzing level include differentiating, organizing, and attributing.

Evaluating: This is the process of making judgments and decisions based on specific criteria and standards. Cognitive processes at the evaluating level include checking and critiquing.

Creating (Synthesis): Creating involves selecting appropriate elements or parts, combining them into an integrated and functional whole. Cognitive processes at the creating level include generating, planning,

and producing.

Analyzing the questions asked in exams provides insights into understanding students' cognitive development processes and assessing meaningful learning levels.

Furthermore, examining not only the quality of exam questions but also the item types is considered significant.

In Turkey, Article 22(b) of Chapter 4 of the Primary Education Institutions Regulation, published in the Official Gazette on July 26, 2014 (No. 29072), states that different types of questions must be included in exams prepared by teachers. The item types commonly used in teacher-made exams include true-false items, multiple-choice items, matching items, short-answer items, and written responses (long-answer items). These item types are described as follows (Tekindal, 2017; Yakalı, 2016):

True-False Items: These are items where students are asked to indicate whether a given statement is true or false.

Short-Answer Items: These require responses in the form of a calculation, a word, a phrase, a figure, a sentence, or at most two sentences. Fill-in-the-blank statements are also considered short-answer items.

Multiple-Choice Items: These test items ask the respondent to choose the best or correct answer from several options provided to complete a sentence or answer the item.

Matching Items: These items present one group of expressions alongside another group of expressions to be matched correctly.

Essay-Type Tests (Long-Answer Items): These require the respondent to organize and articulate their answer(s) that they believe are correct.

The goal of teaching in schools is to enhance the retention and transfer of learned knowledge (Tekindal, 2017). Retention refers to a student's ability to recall learned information, while transfer involves making sense of, interpreting, and applying the learned knowledge in appropriate situations (Tekindal, 2017). In measuring retention, recall is utilized, whereas understanding, analysis, evaluation, and creation are cognitive processes used to assess transfer (Anderson & Krathwohl, 2001; trans. Özçelik, 2018). The teacher's role is to support the retention and transfer of knowledge. In other words, teachers aim to develop students' abilities in recalling, interpreting, understanding, applying, analyzing, criticizing, evaluating, and creative thinking regarding a topic being taught.

If knowledge retention and transfer have been achieved, meaningful learning has taken place. The degree to which students can learn meaningfully and the extent of their acquisition of knowledge are directly related to the level of the questions posed to them. Considering that questions at various cognitive levels affect students' achievements, creative thinking skills, and meaningful learning, it becomes important to examine the questions prepared by teachers in schools (Akpınar & Ergin, 2006). For this reason, this study aims to analyze the mathematics exam questions prepared for middle school students by the Kocaeli Provincial Directorate of National Education Measurement and Evaluation Center according to the Revised Bloom's Taxonomy.

In Turkey, various studies have been conducted analyzing mathematics questions according to the Revised Bloom's Taxonomy. Upon reviewing these studies, it is observed that they focus on topics such as the Revised Bloom's Taxonomy, item types, the analysis of mathematics textbook questions based on taxonomy, and the comparison of questions from centralized exams with teacher-made exam questions (Baki & Köğce, 2009; Biber & Tuna, 2017; Büyükalan & Delal, 2018; Güler, Özdemir & Dikici, 2012).

This research also examines the common mathematics exams administered by the Kocaeli Provincial Directorate of National Education Measurement and Evaluation Center. It was decided that the first

exams conducted in schools by teachers throughout the province would be centrally administered by this center, starting in the 2018-2019 academic year. Specifically, the 1st Term 1st mathematics exams and 2nd Term 1st mathematics exams for grades 6 and 7 were prepared by mathematics teachers working at the Kocaeli Provincial Directorate of National Education Measurement and Evaluation Center.

A review of the literature revealed no studies analyzing exams prepared by Provincial Measurement and Evaluation Centers affiliated with the Ministry of National Education according to the Revised Bloom's Taxonomy and item types. This study aims to fill that gap and, in doing so, contribute to the field.

Purpose of the study

The primary purpose of this study is to evaluate the common mathematics exams for grades 6 and 7, prepared by the Kocaeli Provincial Directorate of National Education Measurement and Evaluation Center, based on item types and the Revised Bloom's Taxonomy. To achieve this main objective, the following sub-goals have been set:

1. To determine the types of items in the exams.
2. To identify which cognitive domain level of the Revised Bloom's Taxonomy each item belongs to.

Scope and Limitaions

The study is limited to the mathematics exams prepared and administered by the Kocaeli Provincial Directorate of National Education Measurement and Evaluation Center during the first and second terms of the 2018-2019 academic year and the first term of the 2019- 2020 academic year.

METHOD

This section includes the Research Model, Study Document, Data Collection, and Data Analysis.

Research Model

In this study, the descriptive survey model was used.

Survey models are research approaches aimed at describing a situation that existed in the past or is currently present (Karasar, 2007). The goal of survey research is typically to provide a descriptive "snapshot" of the existing situation related to the research topic (Fraenkel & Wallen, 2006; cited in Büyüköztürk, 2017). Due to the nature of the data collected, survey-type research generally does not test hypotheses or develop theories as an outcome (Gorard, 2006; cited in Büyüköztürk, 2017).

Therefore, this study, which aims to examine common mathematics exams in terms of item types and the Revised Bloom's Taxonomy, was conducted using the descriptive survey model.

Study Document

The study document consists of the common exams prepared by the Kocaeli Provincial Directorate of National Education Measurement and Evaluation Center for mathematics during the first and second terms of the 2018-2019 academic year and the first term of the 2019-2020 academic year.

The common mathematics exams were administered in the Kocaeli province during the 2018-2019 academic year to 28,702 sixth-grade students and 38,128 seventh-grade students. In the first term of the 2019-2020 academic year, the exams were administered to 1,650 sixth-grade students and 1,660 seventh-grade students (Kocaeli Provincial Directorate of National Education, 2019).

Data Collection

According to Article 22(a) of Chapter 4 in the Primary Education Institutions Regulation published in the Official Gazette dated 26.07.2014 and numbered 29072, two exams must be conducted per semester for each subject in grades 4, 5, 6, 7, and 8. For the 2018-2019 academic year, it was decided that one of the two exams to be held in a semester would be administered by the Kocaeli Provincial Directorate of

National Education Measurement and Evaluation Center.

The data for this study comprise the mathematics exams prepared by the Kocaeli Provincial Directorate of National Education Measurement and Evaluation Center during the first and second terms of the 2018-2019 academic year and the first term of the 2019-2020 academic year. The exams analyzed in this study were obtained from Kocaeli Kartepe Halise Türkkan Middle School.

The distribution of the mathematics exam questions analyzed by the researchers according to academic years and grades is presented in **Table 1**.

Table 1: Distribution of Grade 6 and Grade 7 Mathematics Exam Questions by Academic Years and Terms

Academic Years and Terms	Grade 6	Grade 7	Total
2018-2019 1st Terms	35	29	64
2018-2019 2nd term	34	34	68
2019-2020 1st term	35	28	63
Total	104	91	195
When examining Table 1:			

In the 1st term of the 2018-2019 academic year, 35 questions were for Grade 6, and 29 questions were for Grade 7, totaling 64 questions in the mathematics common exams.

In the 2nd term of the 2018-2019 academic year, 34 questions were for both Grade 6 and Grade 7, totaling 68 questions.

In the 1st term of the 2019-2020 academic year, 35 questions were for Grade 6, and 28 questions were for Grade 7, totaling 63 questions.

Additionally, a total of 195 questions were included in the mathematics common exams, with 104 questions for Grade 6 and 91 questions for Grade 7.

Data Analysis

In this study, the document analysis method from the qualitative research approach was used. Document analysis involves analyzing written materials that contain information about the phenomenon or phenomena being investigated (Yıldırım & Şimşek, 2018). Documents that can serve as data sources in educational research include textbooks, curriculum guidelines, internal and external school correspondence, student records, meeting minutes, student guidance files and records, teacher handbooks, student assignments and exams, lesson and unit plans, teacher files, official documents related to education, and so on (Bogdan & Biklen, 1992; Goetz & LeCompte, 1984; cited in Yıldırım & Şimşek, 2018).

The mathematics exam questions prepared and administered by the Kocaeli Provincial Directorate of National Education Measurement and Evaluation Center were analyzed by three mathematics subject experts based on a criteria list. The collected mathematics common exams were first analyzed according to item types, and their frequency and percentage distributions were determined.

The subject experts analyzed the exam items based on the following criteria:

1. If a question asks the respondent to judge the correctness or incorrectness of a given statement, it is classified as a True-False Item**.**
2. If the question requires the respondent to select the correct answer from the provided answer categories, it is classified as a Multiple-Choice Item.

3. If the question requires matching expressions, figures, or terms based on their relationships, it is classified as a Matching Item.
4. If the response to the given question consists of short answers such as a word or a calculation, it is classified as a Short-Answer Item.
5. If the question requires the respondent to plan their answer and express it in their own words, it is classified as an Open-Ended Item.

Subsequently, the questions were analyzed and classified according to the cognitive process dimension of the Revised Bloom's Taxonomy, and their frequency and percentage distributions were determined.

The criteria used by the subject experts to analyze the questions based on the Revised Bloom's Taxonomy are as follows:

1. If the question asks the student to recall learned information as it is, it belongs to the remembering level.
2. If the question expects the student to interpret, rephrase, explain, give examples, categorize, summarize, infer, extrapolate, compare similarities or differences, match, or explain, it belongs to the understanding level.
3. If the question requires the student to perform a known procedure or derive an answer in a new situation based on a known process, it belongs to the applying level.
4. If the question asks the student to analyze, organize, identify main structures, or scrutinize, it belongs to the analyzing level.
5. If the question expects the student to identify inconsistencies, evaluate the effectiveness of a process, or critique, it belongs to the evaluating level.
6. If the question asks the student to create hypotheses, design a new process, or invent a product, it belongs to the creating (synthesis) level.

Questions analyzed according to the cognitive process dimension of the Revised Bloom's Taxonomy are placed in the higher-order dimension in cases where they are related to two dimensions simultaneously, following the views of Altun (2002).

In this study, the aim is to determine which category—remembering, understanding, applying, analyzing, evaluating, or creating—of the cognitive process dimension in the Revised Bloom's Taxonomy is most appropriate for the analyzed mathematics common exam questions.

To enhance the reliability of the study, the classification of the questions according to the Revised Bloom's Taxonomy was conducted independently by three subject experts. The evaluations were categorized as agreement or disagreement, and a reliability coefficient was calculated using the formula:

[Reliability = Agreement / (Agreement+Disagreement)]

The reliability coefficient was found to be 0.88, which is greater than the acceptable threshold of 0.70. A coefficient above 0.70 indicates the reliability of the study (Miles & Huberman, 1994; cited in Biber & Tuna, 2017).

FINDINGS

In this section, the common mathematics exams for grades 6 and 7 are analyzed based on item types and the cognitive process dimension of the Revised Bloom's Taxonomy. The results of the analyses, including frequencies and percentage distributions for item types and cognitive process dimensions, are presented in tables.

Finding Based on Item Types

Findings from the Analysis of Grade 6 Mathematics Common Exams

The table below provides the frequency (f) and percentage (%) distributions of the item types in the grade 6 mathematics common exams.

Table 2: Frequency and Percentage Distributions of Item Types in Grade 6 Mathematics Common Exams

Item Types	Question Frequency (f)	Percentage (%)	
True-False Items Matching Items	3 -	2,88 -	
Short-Answer Items	39	37,5	
Multiple-Choice Items	62	59,62	
Open-Ended Items	-	-	
Total	104	100	
When Table 2 is examined:			

It is seen that 2.88% of the questions are true-false items, 37.5% are short-answer items, and 59.62% are multiple-choice items.

Additionally, it is observed that multiple-choice items are the most frequently used, while true-false items are the least used.

It is noteworthy that matching and open-ended item types are not included in the exams.

1. Findings from the Analysis of Grade Mathematics Common Exams

The table below provides the frequency (f) and percentage (%) distributions of the item types in the grade 7 mathematics common exams.

Table 3: Frequency and Percentage Distributions of Item Types in Grade 7 Mathematics Common Exams

Item Types	Question Frequency (f)	Percentage (%)
True-False Items	-	-
Matching Items	-	-
Short-Answer Items	41	45,05
Multiple-Choice Items	50	54,95
Open-Ended Items	-	-
Total	91	100

When Table 3 is examined:

It is seen that 45.05% of the questions are short-answer items and 54.95% are multiple- choice items.

Multiple-choice items are more frequently used than short-answer items.

Additionally, it is noteworthy that open-ended, matching, and true-false item types are not included in

the exams.

Findings Based on the Revised Bloom's Taxonomy

6 Findings from the Analysis of Grade 6 Mathematics Common Exams

The table below shows the distribution of grade 6 mathematics common exam questions according to the cognitive process dimensions of the Revised Bloom's Taxonomy.

Table 4: Frequency and Percentage Distributions of Grade 6 Mathematics Common Exam Questions by Cognitive Process Dimensions of the Revised Bloom's Taxonomy

Cognitive Process Dimensions	Question Frequency (f)	Percentage (%)
Remembering	10	9,62
Understanding	35	33,65
Applying	46	44,23
Analyzing	9	8,65
Evaluating	4	3,85
Creating	-	-
Total	104	100
When Table 4 is examined:		

9.62% of the grade 6 mathematics common exam questions are prepared at the remembering level. 33.65% are at the understanding level. 44.23% are at the applying level.8.65% are at the analyzing level. 3.85% are at the evaluating level. No questions are prepared at the creating level.

It is also observed that most of the questions are at the applying level, while the fewest are at the evaluating level.

Below are sample questions from the cognitive process dimensions of the Revised Bloom's Taxonomy at the grade 6 level.

Example of a Question at the Remembering Level:

Only natural numbers greater than 1 that are divisible by 1 and themselves are called prime numbers.

Based on this, which of the following is **not** a prime number?

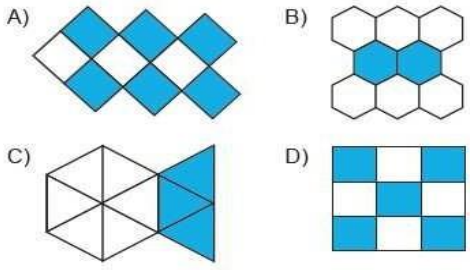
A) 13 B) 43 C) 61 D) 91

The reason this question falls under the remembering level is that it requires students to recall the definition of prime numbers exactly as they learned it, without interpretation.

Example of a Question at the Understanding Level:

The following shapes are composed of equal parts:

Based on this, in which figure is the ratio of the shaded area to the total area **1/4**?



The reason this question is categorized under the understanding level is that it requires students to interpret their existing knowledge. In other words, they are expected to represent a numerical statement using a visual figure.

Example of a Question at the Applying Level:

Information: The perimeter of a rectangle is calculated by adding all its sides. The area of a rectangle is calculated by multiplying its length by its width.

(2a + 5)

(b – 2)

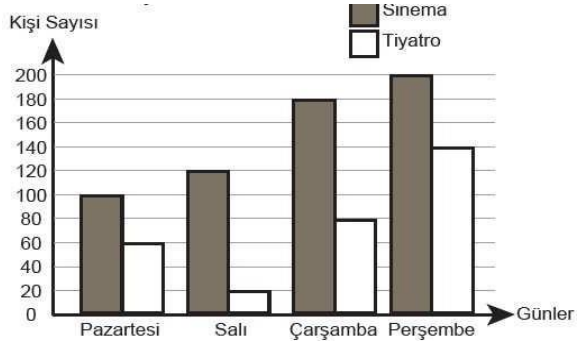
Given a=2a = 2a=2 and b=4b = 4b=4, what are the perimeter and area of the rectangle above?

	Perimeter(cm)		*Area(cm²)*
A)	*18*	*22*	
B)	*11*	*18*	
C)	*22*	*18*	
D)	*22*	*11*	

The reason this question is categorized under the applying level is that it requires students to use a known process to find the solution. While the problem itself is new to the students, the method and knowledge required to solve it are familiar to them..

Analyzing Level Example Question:

Graph: Number of People Attending Cinema and Theater During the First Four Days of the Week



Based on the data in the graph, which of the following statements is incorrect?

(5 points)

A) The number of people going to the cinema increased steadily.

B) Thursday saw the highest number of theater attendees.

C) More people went to the cinema than the theater each day.

D) Monday had the lowest attendance for all activities.

The reason this question is categorized under the analyzing level is that it requires students to identify the number of attendees for cinema and theater based on the days presented in the graph. Then, they must compare the data for cinema, theater, or specific days. In other words, the students are expected to break the problem into parts, analyze these parts, and examine them critically.

Evaluating Level Example Question:

In the physical education class, the students of our 6/B class played a basketball game. The basketball

game was played over 4 periods.
The number of points scored by the students in each period is shown in the table below.

Öğrenciler	1. Periyot	2. Periyot	3. Periyot	4. Periyot
Ataberk	10	12	6	12
Aykut	10	8	12	10
Keremcan	14	6	8	12
Emre	10	6	14	10

One of these students will be selected for the school team. The selection criteria include their average points and consistency.

Based on this, which student should be selected for the school team?
A) Ataberk *B) Keremcan* *C) Aykut* *D) Emre*
The reason this question is categorized under the evaluating level is that it requires the student to use the given information to make a judgment based on specified criteria and standards. This involves analyzing the data and reaching a value-based conclusion.

2. Findings from the Analysis of Grade Mathematics Common Exam Questions

The table below shows the distribution of grade 7 mathematics common exam questions according to the cognitive process dimensions of the Revised Bloom's Taxonomy.

Table 5: Frequency and Percentage Distributions of Grade 7 Mathematics Common Exam Questions by Cognitive Process Dimensions of the Revised Bloom's Taxonomy.

Cognitive Process Dimensions	Question Frequency (f)	Percentage (%)
Remembering	2	2,20
Understanding	40	43,95
Applying	47	51,65
Analyzing	2	2,20
Evaluating	-	-
Creating	-	-
Total	91	100

When Table 5 is examined: 2.20% of the questions are prepared at the remembering level. 43.95% are at the understanding level. 51.65% are at the applying level. 2.20% are at the analyzing level. No questions are prepared at the evaluating and creating levels.
It is observed that most of the questions are at the applying level, while the fewest questions are at the remembering and analyzing levels.
Below are some sample questions from the cognitive process dimensions of the Revised Bloom's Taxonomy at the grade 7 level..
Example of a Question at the Remembering Level;

- *Which of the following state ments about rational numbers is incorrect?*

A) $\frac{2}{-6} = \frac{-2}{6} = \frac{2}{-6}$

B) *4 is both a rational and an integer.*

C) $\frac{3}{-4}$ *is a negative rational number.*

D) $\frac{3}{0}$ *is a rational number*

This question is categorized under the remembering level because students are expected to recall what they learned about rational numbers without interpretation.

Example of a Question at the Understanding Level;

- *Which of the following equalities is correct?*

A) $-8^2 = 64$ B) $(-2)^4 = +8$

C) $(-10)^3 = 1000$ D) $-7^0 = -1$

This question is categorized under the understanding level because it requires students to interpret their existing knowledge and express the relationship between numbers and exponents. Students are expected to convert an exponent to a number or vice versa. Thus, this question fits within the understanding dimension.

Example of a Question at the Applying Level;

Aslı buys a carton of eggs (30 in total) from the market. On her way home, she breaks 12 of them. Based on this, what percentage of the total eggs are intact??

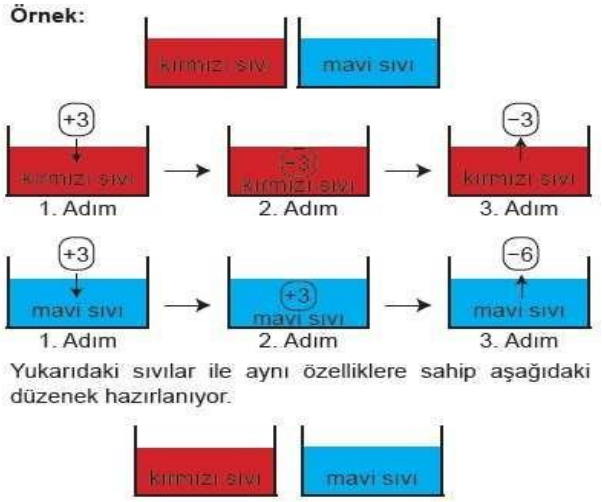
A) %40 B) %50 C) %60 D) %70

This question falls under the applying level because students are required to use previously learned knowledge to solve the problem. While the problem is new, the method and the information needed for the solution are already known to the students.

Example of a Question at the Analyzing Level;

In a mathematics class, a setup is prepared to help students understand multiplication with integers. The setup involves red and blue liquids, where dipping a number into the liquids represents its multiplication by another number.

1. *Numbers are dipped into the liquids.*
2. *Numbers are left in the liquids for a while.*
3. *New numbers emerge from the liquids.*



In the new experimental setup, when the number -5 is first dipped into the red liquid and then the resulting number is dipped into the blue liquid, what is the final number?

This question falls under the analyzing level because students are required to examine the transformations that occur when numbers are dipped into the red and blue liquids. They need to organize the observed changes and apply this understanding to predict the transformation of the given number. In other words, students are expected to analyze the information provided and deduce the correct result.

Findings from the Matching of Item Types to the Cognitive Process Dimensions Findings from the Analysis of Grade 6 Mathematics Common Exam Questions

The table below presents the distributions obtained from matching the preferred item types in the grade 6 mathematics common exams to the cognitive process dimensions.

Table 6: Distribution of Item Types in Grade 6 Mathematics Common Exams by Cognitive Process Dimensions

Item Types		Cognitive Progress Dimensions: Remembering	Understanding	Applying	Analyzing	Evaluating	Creating		Total
True-False Items	f		2	-	-	1	-	-	3
	%		66,67			33,33			100
Short-Answer Items	f		2	19	16	1	1	-	39
	%		5,13	48,72	41,03	2,56	2,56		100
Multiple-Choice Items	f		6	16	30	7	3	-	62
	%		9,68	25,80	48,39	11,29	4,84		100

When Table 6 is examined, it is observed that the exam contains a total of 3 true-false, 39 short-answer,

and 62 multiple-choice items.

For true- false items, 66. 67 % are at the remembering level, and 33. 33 % are at the analyzing level based on cognitive process dimensions.

For short- answer items, 5. 13 % are at the remembering level, 48. 72 % at the understanding level, 41.03% at the applying level, 2.56% at the analyzing level, and 2. 56% at the evaluating level.

For multiple- choice items, 9. 68 % are at the remembering level, 25. 80 % at the understanding level, 48.39% at the applying level, 11.29% at the analyzing level, and 4. 84% at the evaluating level.

It is noted that true- false items are absent in the understanding, applying, and evaluating levels. Additionally, no item type appears at the creating level.

Findings from the Analysis of Grade 7 Mathematics Common Exam Questions

The table below presents the distributions obtained from matching the preferred item types in the grade 7 mathematics common exams to the cognitive process dimensions.

Table 7: Frequency and Percentage Distributions of Item Types in Grade 7 Mathematics Common Exams by Cognitive Process Dimensions

Bilişsel Süreç Boyutu / **Item Types**		**Remembering**	**Understanding**	**Applying**	**Analyzing**	**Evaluating**	**Creating**	**Total**
Short-Answer Items	f	-	17	24	-	-	-	41
	%		41,46	58,54				100
Multiple-Choice Items	f	2	23	23	2	-	-	50
	%	4	46	46	4			100

When Table 7 is examined, it is observed that the exam contains a total of 41 short- answer items and 50 multiple-choice items. Among the short-answer items, 41.46% are at the understanding level, and 58.54% are at the applying level. Among the multiple- choice items, 4% are at the remembering level, 46% are at the understanding level, 46% are at the applying level, and 4% are at the analyzing level.

It can be concluded that Short-answer items are present at the understanding and applying levels but not at the remembering, analyzing, evaluating, or creating levels. Multiple-choice items are present at the remembering, understanding, applying, and analyzing levels but not at the evaluating or creating levels. No item types are used at the evaluating or creating levels.

Conclusion

Within the scope of this study, the common exam questions for grade 6 and grade 7 mathematics, prepared by the Kocaeli Provincial Directorate of National Education Measurement and Evaluation

Center, were analyzed based on item types and the cognitive process dimensions of the Revised Bloom's Taxonomy. In the study, a total of 195 items were analyzed, including 104 items at the grade 6 level and 91 items at the grade 7 level.

It was found that 2.88% of the grade 6 mathematics common exam questions were true- false items, 37.5% were short-answer items, and 59.62% were multiple-choice items. It was observed that open-ended and matching item types were not used. When the common exam questions were analyzed according to the cognitive process dimensions of the Revised Bloom's Taxonomy, it was found that 9.62% of the items were at the remembering level, 33.65% at the understanding level, 44.23% at the applying level, 8.65% at the analyzing level, and 3.85% at the evaluating level. No items were found at the creating level. According to the data obtained, multiple-choice items were the most used item type with a percentage distribution of 59.62%. It was concluded that most of the items analyzed based on the cognitive process dimension aimed to measure the applying level, with a percentage distribution of 44.23%. When item types were matched to cognitive process dimensions, it was observed that 66.67% of true-false items were at the remembering level, and 33.33% were at the analyzing level; 5.13% of short-answer items were at the remembering level, 48.72% at the understanding level, 41.03% at the applying level, 2.56% at the analyzing level, and 2.56% at the evaluating level; 9.68% of multiple- choice items were at the remembering level, 25.80% at the understanding level, 48.39% at the applying level, 11.29% at the analyzing level, and 4.84% at the evaluating level.

It was found that 45.05% of the grade 7 mathematics common exam questions were short-answer items, and 54.95% were multiple-choice items. It was observed that no questions were asked in the form of open-ended, matching, or true-false items. When the questions were analyzed according to the cognitive process dimensions of the Revised Bloom's Taxonomy, it was found that 2.20% of the items were at the remembering level, 43.95% at the understanding level, 51.65% at the applying level, and 2.20% at the analyzing level. Additionally, no items were found at the evaluating or creating levels. According to the data obtained, multiple-choice items were the most used item type with a percentage distribution of 54.95%. It was concluded that most of the items analyzed based on the cognitive process dimension aimed to measure the applying level, with a percentage distribution of 51.65%. When item types were matched to cognitive process dimensions, it was observed that 41.46% of short-answer items were at the understanding level, and 58.54% were at the applying level; 4% of multiple-choice items were at the remembering level, 46% at the understanding level, 46% at the applying level, and 4% at the analyzing level.

According to the analysis conducted based on the cognitive process dimension of the Revised Bloom's Taxonomy, questions that were found to relate to two dimensions simultaneously were placed in the higher-order dimension in line with Altun's (2002) suggestions.

The results of the analysis show that in the mathematics common exams prepared for grade 6 and grade 7, multiple-choice items were predominantly preferred. The preference for multiple-choice items in mathematics common exams can be attributed to several factors: ease and objectivity in scoring, ease of administration as it does not require much time to answer, the ability to ask questions at different levels of the cognitive domain, applicability at all levels of education, high content validity due to the possibility of asking many questions, and the ability to adjust question difficulty by making the options harder or easier. Additionally, the influence of the multiple-choice format used in high school entrance exams administered by the Ministry of National Education could also be a contributing factor.

In this study, the analysis results based on the cognitive process dimension of the Revised Bloom's Taxonomy revealed that questions in the grade 6 and grade 7 common mathematics exams predominantly focused on the understanding and applying levels, while no questions were prepared at the creating level. These findings are consistent with the results of similar studies in the literature.

For instance, in the study by Karaman and Bindak (2017), which examined the exam questions prepared by elementary mathematics teachers, it was reported that the questions were predominantly at the understanding and applying levels, and no questions were prepared at the synthesis level. Similarly, Ardahanlı (2018) found in their analysis of teacher-made exam questions and TEOG (Transition from Elementary to Secondary Education Exam) questions that teacher-made mathematics questions were predominantly at the applying level (83.7%) and no questions were found at the analyzing level. In the same study, it was reported that TEOG exam questions were predominantly at the understanding and applying levels, with no questions at the analyzing level. Yakalı (2016) also found in their study that TEOG exam questions were predominantly at the applying level, with no questions prepared at the evaluating or creating levels.

The preference for questions at the understanding and applying levels in mathematics common exams may stem from several factors: mathematics teachers writing questions without considering the cognitive process dimensions of the Revised Bloom's Taxonomy, the desire to include more questions in the exam, the alignment of the cognitive process levels in the mathematics curriculum outcomes, the inclusion of multiple behaviors in outcomes, or the cognitive levels of the students taking the exam.

Indeed, Kuzu, Çil, and Şimşek (2019) analyzed the mathematics curriculum outcomes based on the cognitive process dimension of the Revised Bloom's Taxonomy and found that the outcomes were predominantly at the understanding and applying levels. It was also reported that some outcomes included multiple behaviors.

It is recommended that mathematics exams include questions not only at the remembering, understanding, and applying levels but also at the analyzing, evaluating, and creating levels. In other words, for meaningful learning to occur, more emphasis should be placed on questions that encourage students to analyze, examine, critique, and create. However, studies show that most questions are focused on the understanding and applying levels. Further research is needed to identify the source of this issue.

Mathematics teachers preparing exam questions should have knowledge of the cognitive process dimensions of the Revised Bloom's Taxonomy. For this purpose, it is recommended to provide teachers with practical in-service training on how to prepare questions based on the Revised Bloom's Taxonomy.

When designing the mathematics curriculum, the number of outcomes targeting the analyzing, evaluating, and creating levels should be increased. Outcomes should also be designed to measure a single behavior at a time.

REFERENCES

1. Akpınar, E., & Ergin, Ö. (2006). Evaluation of science teachers' written exam questions. Milli Eğitim Dergisi, Issue: 172, Fall, 225-231.
2. Altun, M. (2002). Mathematics Teaching (2nd ed.). Bursa: Alfa Publishing.
3. Anderson, L. W., & Krathwohl, D. R. (2001). A classification of learning, teaching, and assessment: An updated version of Bloom's taxonomy of educational objectives (Trans. Özçelik, D. A., 3rd ed., 2018). Ankara: Pegem Academy.

4. Ardahanlı, Ö. (2018). Analysis of TEOG mathematics questions and 8th-grade mathematics exam questions according to the revised Bloom's taxonomy (Unpublished master's thesis). Eskişehir Osmangazi University, Institute of Educational Sciences, Eskişehir.
5. Baki, A., & Köğce, D. (2009). Comparison of questions asked in the mathematics exams of different types of high schools according to Bloom's taxonomy. Kastamonu Eğitim Dergisi, 17(2), 557-574.
6. Biber, A.Ç., & Tuna, A. (2017). Comparative analysis of learning areas in middle school mathematics textbooks according to Bloom's taxonomy. Ondokuz Mayıs Üniversitesi Eğitim Fakültesi Dergisi, 36(1), 161-174. doi:10.7822/omuefd.327396
7. Büyükalan, F., & Delal Turan, S. (2018). Analysis of written exam questions in core subjects asked by 4th-grade teachers in terms of Bloom's taxonomy. Asya'dan Avrupa'ya Sosyal Bilimler Dergisi, 5, 11-20. doi:10.31455/asya.431973
8. Büyüköztürk, Ş. (2017). Scientific research methods (23rd ed.). Ankara: Pegem Publishing.
9. Ertürk, S. (1979). Curriculum Development in Education. Ankara: Yelkentepe Publishing.
10. Güler, G., Özdemir, E., & Dikici, R. (2012). Comparative analysis of primary school mathematics teachers' exam questions and SBS mathematics questions according to Bloom's taxonomy. Erzincan Üniversitesi Eğitim Fakültesi Dergisi, 14(1), 41-60.
11. Güven, Ç., & Aydın, A. (2004). Analysis and evaluation of seventh-grade science and technology curriculum questions in terms of revised Bloom's taxonomy. Atatürk Üniversitesi Kazım Karabekir Eğitim Fakültesi Dergisi, 35, 223-233.
12. Karasar, N. (2007). Scientific research method. Ankara: Nobel Academic Publishing.
13. Karaman, M., & Bindak, R. (2017). Analysis of elementary mathematics teachers' exam questions and TEOG mathematics questions according to the Revised Bloom's Taxonomy. Curr Res Educ, 3(2), 51-65.
14. Kocaeli Provincial Directorate of National Education. (2019). Grade 7 Common Exam Report. Kocaeli: Kocaeli Measurement and Evaluation Center.
15. Kocaeli Provincial Directorate of National Education. (2019). Grade 6 Common Exam Report. Kocaeli: Kocaeli Measurement and Evaluation Center.
16. Kocaeli Provincial Directorate of National Education. (2019). Common Exam Provincial Report. Kocaeli: Kocaeli Measurement and Evaluation Center.
17. Korkmaz, F., & Ünsal, S. (2016). An exam analysis according to the revised Bloom's taxonomy. Turkish Journal of Education, 5(3), 170-183. doi:10.19128/turje.97805
18. Kuzu, O., Çil, O., & Şimşek, A. S. (2019). Analysis of the 2018 mathematics curriculum outcomes according to the revised Bloom's taxonomy. Erzincan Üniversitesi Eğitim Fakültesi Dergisi, 21(3), 129–147.
19. MEB. (2014). Ministry of National Education primary school institutions regulation. Retrieved from
20. https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=19942&MevzuatTur=7&MevzuatTertip=5. Accessed on 03/08/2020.
21. Sönmez, V. (2012). Teacher's Handbook for Curriculum Development (17th ed.). Ankara: Anı Publishing.
22. Tekindal, S. (2017). Measurement and Evaluation Methods in Schools (6th ed.). Ankara: Nobel Academic Publishing.
23. Yakalı, D. (2016). Evaluation of TEOG mathematics questions according to the revised Bloom's

taxonomy and curriculum (Unpublished master's thesis). Adnan Menderes University, Institute of Social Sciences, Aydın.

24. Yıldırım, A., & Şimşek, H. (2018). Qualitative Research Methods in Social Sciences (11th ed.). Ankara: Seçkin Publishing.