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| Research Article / Araştırma Makalesi |

Analysis of Sample Science Questions for Secondary School Exam in terms of Revised Bloom Taxonomy

Ortaöğretime Geçiş Merkezi Sınava İlişkin Fen Bilgisi Örnek Sorularının Yenilenmiş Bloom Taksonomisine Göre İncelenmesi

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Keywords

1. Revised Bloom Taxonomy
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Anahtar Kelimeler

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Abstract

Purpose: In this research, it is aimed to examine the sample questions for the exam in high school transition system published between 2018-2022 according to the revised bloom taxonomy.

Design/Methodology/Approach: The document analysis model was used and The data source of this research is the science questions in the sample questions for the central examination for secondary education institutions to admit students by examination published on the website of the General Directorate of Measurement, Evaluation and Examination by the Ministry of National Education since October 2018. Between October 2018 and December 2022, a total of 355 science questions were published and in this study all of these questions examined according to the revised bloom taxonomy.

Findings: Most of the sample questions examined are within the scope of conceptual questions. 74% of the questions published in 2018, 75% of the questions in 2019, 66% of the questions in 2020 and 2021, and 70% of the questions in 2022 are at the level of conceptual knowledge.

Highlights: Almost all of the questions are in the conceptual knowledge class and are preferred from low-level questions, and high-level questions are the last ones. Another important finding is that all of the high-level questions (58 questions) are preferred from the category “Analyze”, but not at all from the categories “Evaluate” and “Create”.

Öz

Amaç: Bu araştırmada 2018-2022 yılları arasında yayınlanan lise geçiş sistemindeki sınava yönelik örnek soruların yenilenmiş Bloom taksonomisine göre incelenmesi amaçlanmıştır.

Tasarım/Yöntem/Yaklaşım: Bu araştırmada doküman incelemesi modeli kullanılmış ve bu araştırmanın veri kaynağı olarak Ölçme, Değerlendirme ve Sınav Hizmetleri Genel Müdürlüğü’nün internet sitesinde yayınlanan Millî Eğitim Bakanlığınca Liselere Geçiş Sistemi (LGS) kapsamındaki merkezi sınava yönelik hazırlanan örnek fen bilimleri sorularıdır. Ekim 2018 ile Aralık 2022 arasında toplam 355 örnek fen bilimleri sorusu yayınlanmıştır ve bu çalışmada bu soruların tamamı yenilenmiş Bloom taksonomisine göre incelenmiştir.

Bulgular: İncelenen örnek soruların çoğu kavramsal sorular kapsamındadır. 2018'de yayınlanan soruların %74'ü, 2019'daki soruların %75'i, 2020 ve 2021'deki soruların %66'sı ve 2022'deki soruların %70'i kavramsal bilgi düzeyindedir.

Öne Çıkanlar: Soruların tamamına yakını kavramsal bilgi dersinde olup alt düzey düşünme sorulardan tercih edilmekte, üst düzey düşünme soruları ise son sırada yer almaktadır. Bir diğer önemli bulgu da üst düzey soruların tamamı (58 soru) çözümleme kategorisinden tercih edilirken, “Değerlendirme” ve “Oluşturma” kategorilerinden hiç soru tercih edilmemesidir.

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INTRODUCTION

Education is a system with input, process, output and feedback mechanisms. Exams are one of the most effective ways to provide results and feedback to students, parents and the school. In order to evaluate the results of the teaching in education, both national and international exams are applied and their results are emphasized with sensitivity (İncikabı, Pektaş, & Süle, 2016). In Türkiye, central measurement and evaluation is carried out by the Ministry of National Education (MoNE) and the Student Selection and Placement Center (SSPC) to select students for secondary and higher education institutions. The Ministry of National Education has implemented five different systems in the transition to secondary education since 1997, with the claim of improving the quality of the exam, which is the transition to secondary education, eliminating the differences in education between regions, and implementing a system in line with the requirements of the age (Demir & Yılmaz, 2019). More recently a new system of transition to secondary education, called High School Transition System (HSTS), was put into practice on February 14, 2018 because the latter one was abolished on October 3, 2017, on the grounds that it is not possible to enter high schools without score and all students have to take the exam and experience exam stress. (MoNE, 2018). The exam in high school transition system was occurred on June 2018 for the first time. There are 90 questions consisting of 50 verbal and 40 numerical questions.

Since October 2018, the Ministry of National Education has published some sample questions for the exam in high school transition system. These sample questions are similar to the main exam to be held at the end of 8th grade. In this way, the students who will take the exam have an idea about which subjects and what kind of questions they will encounter. Therefore, considering that the students will be placed in secondary education with the scores they will get from this exam, it will be useful to determine the acquisitions necessary to solve these questions and to determine the cognitive process steps. Classification is made according to various taxonomies in order to determine at which cognitive process and knowledge level the exam questions are and at what level the students have acquired (Demir, 2011). Among these taxonomies, Bloom's Taxonomy is preferred (Thompson, 2008).

Taxonomy enables students to classify the goals they want to gain (Bümen, 2006). Another benefit of taxonomies is that they rank the targets from simple to complex, from concrete to abstract, as prerequisites for each other (Sönmez, 2015). Although there are more than one taxonomy in the literature, the most preferred is Bloom Taxonomy or Revised Bloom Taxonomy. Among the reasons why Bloom's taxonomy is preferred more is its effect on providing consistency by giving importance to the classification of the cognitive domain and the measurement process (Gündüz, 2009). Thinking skills in this taxonomy are of two types, lower and higher thinking skills. The titles of knowledge, comprehension and application are at the lower level, while the titles of analysis, synthesis and evaluation are at the upper level. The Bloom Taxonomy was reviewed in 2000 by Anderson and his colleagues and brought to the literature as the Revised Bloom Taxonomy (Anderson et al., 2014).

Revised Bloom Taxonomy

The original Bloom's Taxonomy was widely accepted, but it was criticized by some researchers in the following years, and as a result, a need for renewal arose (Yüksel, 2007). The first classification made was renewed in line with the criticisms and the fact that the student-centered approach did not fully measure the high-level thinking skills (Anderson et al., 2001). The expert team formed under the leadership of Anderson, a student of Krathwohl and Bloom, who also took part in the preparation of the original taxonomy, claimed that the taxonomy process was not completed (Anderson, 1999; Krathwohl, 2002). From this point of view, this team, consisting of curriculum development, assessment and learning psychologists, rearranged the original taxonomy after five years of work and published it under the editorship of Anderson and Krathwohl (Anderson, 2002). The most important difference that distinguishes the revised Bloom Taxonomy from the original is the two-dimensionalization of the cognitive domain (Krathwohl, 2002). With YBT, the classification process has changed from one-dimensional to two-dimensional. With YBT, noun and verb forms are separated from each other and become easy to understand. In the dimension of knowledge, noun cases consist of 4 categories, in the cognitive process dimension, verb cases consist of 6 steps (Arı, 2011).

Level of Knowledge

Today's education system is based on constructive, active and cognitive learning, which includes meaningful learning. It is accepted that students choose the necessary information for their own learning, away from passivity, at the center of learning. Students have become a permanent learning tool by making sense of the given information rather than being a recording device that takes the information from their teachers, parents and textbooks. In the current understanding of learning, in which the student is centered and constructivist learning predominates, what students learn and how they learn shows the importance of meaningful learning. It is accepted that students create their own meaningful learning by using the positive and negative aspects of the environment depending on their previous knowledge, cognitive and metacognitive activities and all the activities they can benefit from in the teaching environment. Students try to make sense of the information they have acquired in the new environments they enter by making use of their previous knowledge. In this context, there are cognitive processes in which students can actively use their previous knowledge in constructivist learning. Information dimension; It consists of four main groups as factual knowledge, conceptual knowledge, procedural knowledge and metacognitive knowledge and eleven subgroups (Anderson & Krathwohl, 2001).

Cognitive Process

Increasing the permanence and transfer of learned knowledge is also among the two most important aims of education. While the ability to remember a previously learned material close to the way it was learned after a certain period of time expresses the permanence of learning, the ability to search for answers to new questions, find solutions to new problems and facilitate new learning refers to the transfer of what has been learned. In the updated taxonomy, cognitive processes focus in detail on the "Comprehension, Application, Analysis, Evaluation and Creation" steps, which enable the transfer of what has been learned, rather than the "Remembering" step that provides permanence (Anderson & Krathwohl, 2001).

The Revised Bloom Taxonomy is formed as in the following Table 1.

Table 1. The Revised Blook Taxonomy

	Cognitive Processes					
Level of Knowledge	Remember	Understand	Apply	Analyze	Evaluate	Create
Factual						
Conceptual						
Procedural						
Metacognitive						

When the relevant literature is examined, it is seen that there are studies that examine the objectives included in the curriculum for different courses according to the Revised Bloom Taxonomy (RBT). Examining the achievements of science curriculum (Aktan & Sevinç, 2018; Avcı, Öz, Cangüven & Binzet, 2017; Gökler & Arı, 2012; Güven & Aydın, 2017; Kurnaz & Yaz, 2017); analysis of science and technology course exam questions (Arı & İnci, 2015; Ayvacı & Türkdoğan, 2010); examination of secondary school chemistry curriculum outcomes (Zorluoğlu, Kızılaslan, & Sözbilir, 2016); examination of secondary school mathematics curriculum (6-8th grades) achievements (Kablan, Baran & Hazer, 2013), analysis of mathematics course exam questions (Baki & Köğce, 2009; Dursun & Parim-Aydin, 2014; Karaman & Bindak, 2017), analysis of national level exam questions (Aypay, Gökler & Arı, 2012; Baş & Beyhan, 2012; Çevik, 2010; Dursun & Parim-Aydin, 2014, Çifçi, Sönmez & Koç, 2013) studies have been carried out.

Among these studies, Köğce and Baki (2009) examined the exam questions prepared by mathematics teachers and concluded that the questions generally measure low-level thinking skills. In the study of Gündüz (2009), Science and Technology questions were examined and it was concluded that 64.65% of these questions were at the knowledge level, while 92.19% of them were low-level questions. In addition, Ayvacı and Türkdoğan (2010) examined the written questions prepared by the teachers in the Science and Technology lesson according to the new taxonomy in their study and concluded that the questions were at the level of remembering and knowing at a rate of 55%. In another study, the achievements in the 2013 Science curriculum were examined according to the renewed Bloom taxonomy and it was concluded that 69% of the gains were in the sub-cognitive level steps of the taxonomy, but when it was examined in terms of knowledge, 63% of them were in the conceptual knowledge dimension (Yaz & Kurnaz, 2013). In the study of Karaman and Bindak (2017), 72.5% of the TEOG exam questions were low-level and 27.5% were high-level; They determined that 41.3% of the exam questions prepared by the teachers were at the level of understanding and application. In the studies of Güven and Aydın (2017), when he examined the questions in the 8th grade science curriculum, it was concluded that 48.72% of the questions were at the comprehension level. In a study in which the achievements in the 2017 Science draft program were examined according to the renewed Bloom taxonomy, 8.65% of the achievements were recall, 40.79% comprehension, 16.35% application, 11.65% analysis, It has been determined that 3.95 of them are at the evaluation stage and 16.92% at the creation stage (Cangüven, Öz, Binzet, & Avcı, 2017). When Yolcu (2019) evaluated the achievements in the 3rd and 4th grade Science curriculum according to the revised taxonomy, he concluded that he addressed the comprehension level at a rate of 43%.

In general studies, instead of questions that measure low-level mental skills, question information only and are based on memorization; They emphasized the need to prepare questions that can interpret information, adapt existing information to new situations, and provide the opportunity to establish relationships with different disciplines. As can be seen, the reconstructed Bloom taxonomy is a frequent topic in the literature. In addition, when the studies examined were examined, it was determined that as the years progressed, with the development of science and technology, the steps of the questions asked to the students were generally parallel to each other, that is, they appealed to low-level mental skills. Today, sample questions of the entrance exam to high schools have been published by the Ministry of National Education in order to close this gap, and warnings have been made that these questions must be solved by the students. From this point of view, this study has been put forward to reveal which mental process the sample questions, which have been discussed for a long time and taken into account by all stakeholders, address. In addition, this study has been put forward to raise awareness about the importance of higher-order thinking skills and the need to highlight them. To summarize, in this research, it is aimed to examine the sample questions for the exam in high school transition system published between 2018-2022 according to the revised bloom taxonomy.

METHOD

Research Design

In this research, which aims to examine sample science questions for the high school entrance exam published by the Ministry of National Education, according to the cognitive steps of the revised bloom taxonomy, the document analysis model was used. Document analysis is the examination of the existing written or unwritten source of the researched subject (Büyüköztürk et al., 2018).

Research Data Source

The data source of this research is the science questions in the sample questions for the central examination for secondary education institutions to admit students by examination published on the website of the General Directorate of Measurement, Evaluation and Examination Services (URL1, 2022) by the Ministry of National Education since October 2018. Between October 2018 and December 2022, a total of 355 science questions were published and in this study all of these questions examined according to the revised bloom taxonomy.

Data Analysis

While analyzing the questions, cognitive process and knowledge dimensions of the restructured Bloom Taxonomy were taken into consideration. In order to find out which level the questions belong to in the taxonomy, firstly, the sentence structures, which are the main expressions of the questions, were focused on. A sentence is formed by combining the words noun and verb. In the question analysis, the questions were divided into two parts as noun and verb, and then the noun part of the question provided the information dimension, while the verb part provided the cognitive process dimension. In this analysis, while placing the questions in the taxonomy table consisting of horizontal and vertical dimensions, the verbs and nouns in the taxonomy table were taken into consideration. In order to explain how the questions are classified in order to establish the theoretical validity in the study, the following examples of questions regarding the determination of the cognitive levels and types of knowledge of the analyzed questions are shared.

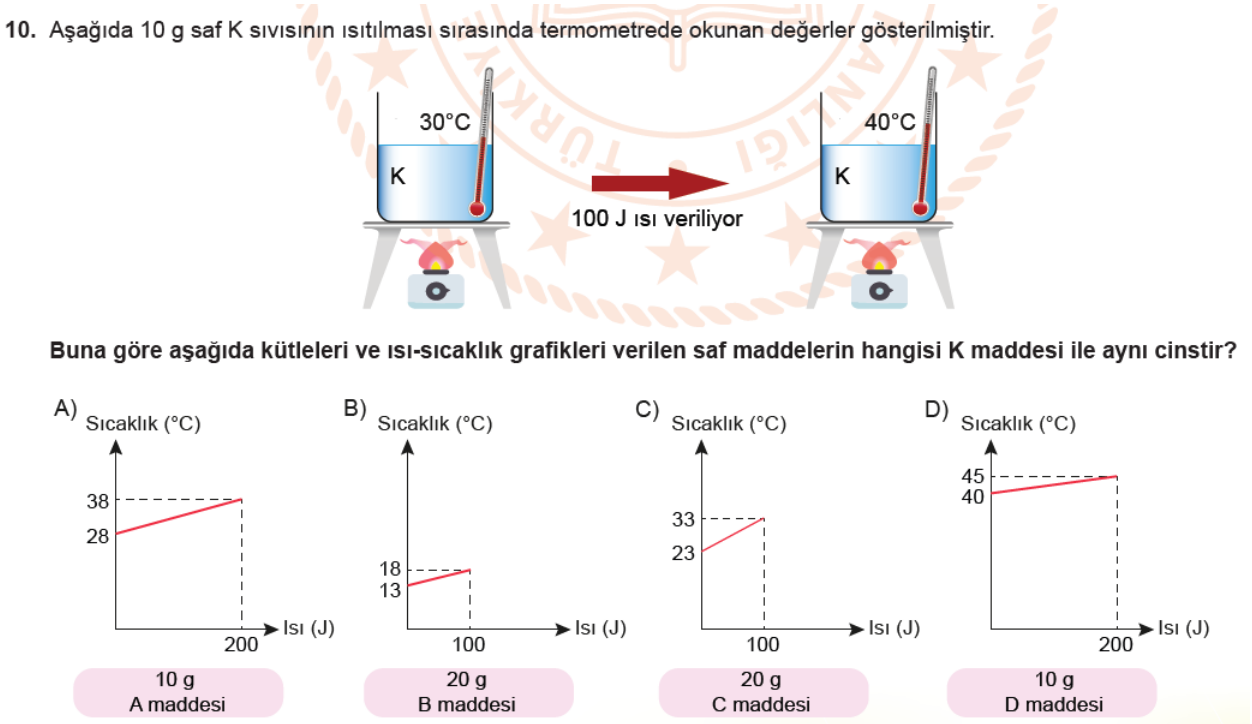


Figure 1. Sample Coding 1 – 2022 February 10th question

As this question is about the calculation of specific heat of some materials, it is classified into “procedural” as the level of knowledge and “apply” as the cognitive process.

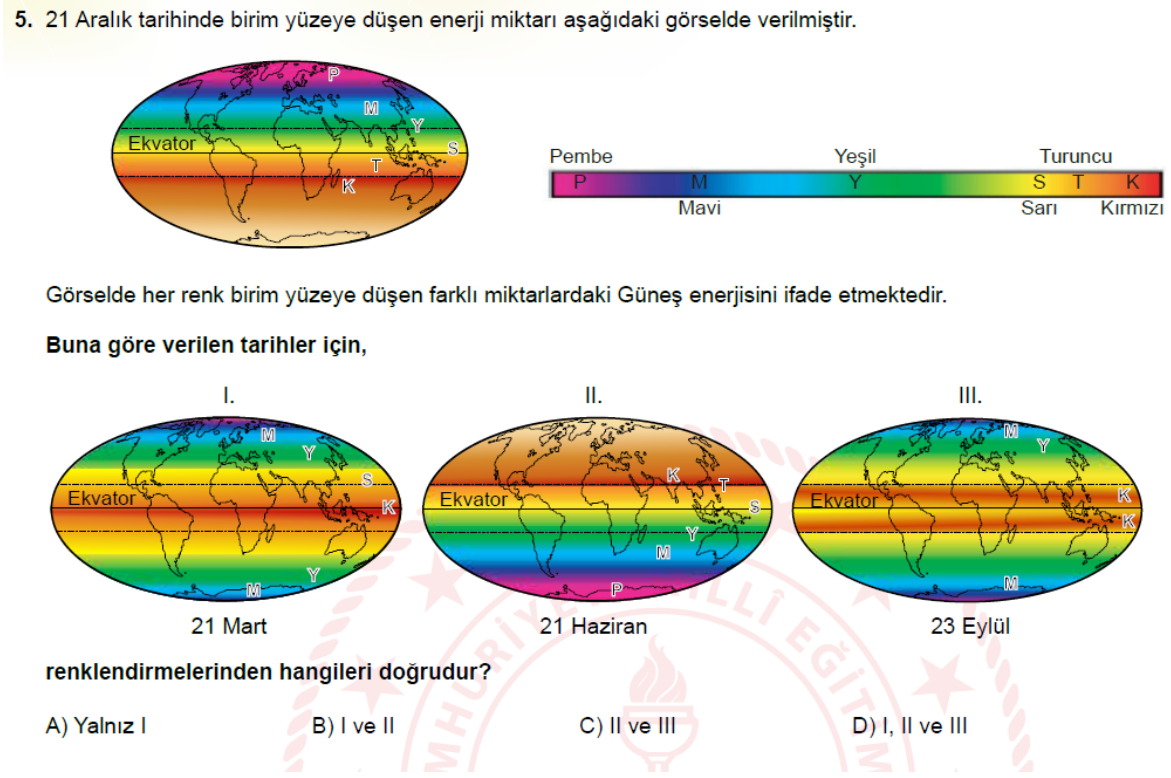


Figure 2. Sample Coding 2 – 2021 October 5th question

As this question is about the determination of one simple phenomena "amount of energy per unit surface" for different days of year, it is classified into "factual" as the level of knowledge and "remember" as the cognitive process

The researchers performed the analyzes separately from each other. Then, the two researchers came together and the results were compared. Disputes were reviewed and a common conclusion was reached. After these procedures were repeated several times by all questions, the researcher analyzed the questions. The answers with the same evaluation of the two researchers were accepted as consensus, and the answers with different evaluations were accepted as differences of opinion. The reliability of the research; Reliability=Consensus/(Consensus + Disagreement)*100 is calculated using the mathematical expression. Accordingly, the reliability of the research was found to be 83.33%. Finding the result above 0.70 ensures the reliability of the research (Miles & Huberman, 1994). Therefore, the classification can be expressed as reliable.

FINDINGS

In this section, the findings after the analysis of questions will firstly be given according to the year, to the level of knowledge and the cognitive process and finally according to the learning areas. In this study, 355 sample questions are published between 2018 and 2022. For each of 4 years, the following table 2 shows the distribution of questions in terms of revised bloom taxonomy categories.

As seen in table 2, most of the sample questions examined are within the scope of conceptual questions. 74% of the questions published in 2018, 75% of the questions in 2019, 66% of the questions in 2020 and 2021, and 70% of the questions in 2022 are at the level of conceptual knowledge. While no questions from the metacognitive knowledge dimension were encountered among the questions examined, the factual knowledge dimension was the least included information dimension for each year.

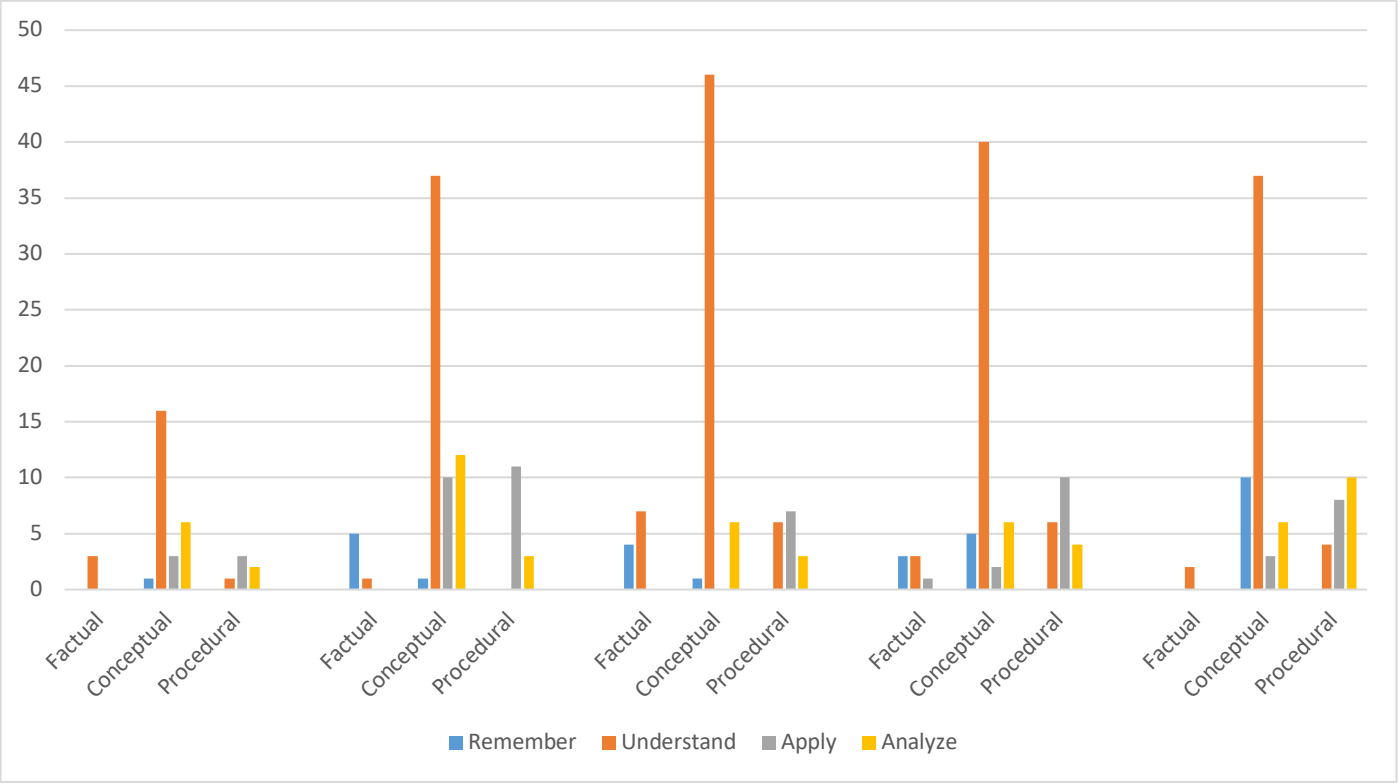
When the cognitive processes in Table 2 are examined, it is seen that there are no questions in the evaluation and creation dimensions. On the other hand, it is seen that the most used cognitive dimension among the remaining 4 dimensions is the understand dimension. It consists of questions in the dimension of understanding values between 48% and 74% of all questions in 4 years. At least, questions were included in the remember dimension.

Table 2. Distribution of sample questions according to the years

Year	Level of Knowledge	Cognitive Processes				
		Remember	Understand	Apply	Analyze	Total
2018	Factual	0	3	0	0	3
	Conceptual	1	16	3	6	26
	Procedural	0	1	3	2	6
	Total	1	20	6	8	35
2019	Factual	5	1	0	0	6
	Conceptual	1	37	10	12	60
	Procedural	0	0	11	3	14
	Total	6	38	21	15	80
2020	Factual	4	7	0	0	11
	Conceptual	1	46	0	6	53
	Procedural	0	6	7	3	16
	Total	5	59	7	9	80
2021	Factual	3	3	1	0	7
	Conceptual	5	40	2	6	53
	Procedural	0	6	10	4	20
	Total	8	49	13	10	80
2022	Factual	0	2	0	0	2
	Conceptual	10	37	3	6	56
	Procedural	0	4	8	10	22
	Total	10	43	11	16	80

The graph of these findings is as below.

Graph 1. Distribution of sample questions according to the years



For each of 4 years, the following table 3 shows the distribution of questions in terms of learning areas.

Table 3. Distribution of sample questions in terms of learning areas according to the years

Learning Areas	Level of Knowledge	Cognitive Processes				
		Remember	Understand	Apply	Analyze	Total
Earth and Universe	Factual	5	5	0	0	10
	Conceptual	5	39	8	6	58
	Procedural	0	0	4	0	4
	Total	10	44	12	6	72
Creatures and Life	Factual	3	3	1	0	7
	Conceptual	6	57	3	13	79
	Procedural	0	6	12	8	26
	Total	9	66	16	21	112
Physical Events	Factual	3	6	0	0	9
	Conceptual	1	43	6	9	59
	Procedural	0	8	19	12	39
	Total	4	57	25	21	107
Matter and Nature	Factual	1	2	0	0	3
	Conceptual	6	37	1	8	52
	Procedural	0	3	4	2	9
	Total	7	42	5	10	64

When Table 3 is examined, it is seen that the 355 questions analyzed are almost equally distributed according to science learning areas. 112 of the sample questions examined are in the "Creatures and Life" learning area, 107 in the "Physical Events", 72 in the "Earth and the Universe" and 64 in the "Matter and Nature" learning area. Similar to the table 2, most of the questions belong to the conceptual level of knowledge and to the understand level as the cognitive process. As seen in Table 3, 57 questions in the "Creatures and Life" learning area have the highest frequency in the "Conceptual - Understanding" category.

DISCUSSION

When looking at the results obtained from this study conducted for the purpose of analyzing sample questions for the exam in high school transition system published between 2018-2022 according to the revised bloom taxonomy, almost all of the questions are in the conceptual knowledge class and are preferred from low-level questions, and high-level questions are the last ones (58 question – Analyze). Another important finding is that all of the high-level questions (58 questions) are preferred from the category "Analyze", but not at all from the categories "Evaluate" and "Create". It should be known that the possibility of applying the "Create" category in multiple choice exams is almost impossible. For this reason, it is not something to be criticized for not asking questions suitable for this category. Despite this, not asking enough questions in accordance with the "Apply" and "Evaluate" categories should be considered as an important deficiency. When many studies on this subject are examined, it is seen that similar results have been reached (Arı & İnci, 2015; Ayvacı & Türkdoğan, 2010;Baş & Beyhan, 2012; Çevik, 2010; Dursun & Parim-Aydin, 2014, Gökler, Aypay & Arı, 2012; Sönmez, Koç & Çifçi, 2013). The results of these cited studies also revealed the fact that the questions in the national exams and science course exams were from low-level questions.

In the current study, it has been observed that science questions mostly measure low-level thinking skills and concentrate especially on the comprehension level. The fact that the questions are mostly at the comprehension level may not be sufficient to develop high-level thinking skills, while making a contribution to the students' understanding of the subject (Güven & Aydın, 2017). In the study, while the questions measuring high-level thinking skills were at a low rate in the analysis and evaluation step, no questions were found in the creation step. Although the distribution of science questions in high school entrance exams is not balanced, the increase in the number of questions prepared for high-level thinking skills draws attention in recent years. The reason for this is that it is an exam that requires students to relate their existing knowledge to daily life and interpret it from different perspectives. It is thought that this situation will contribute to the permanence of knowledge in students and that each student gains these skills in order to solve the situations they encounter in their daily lives by using their problem-solving skills (Sönmez, Koç & Çifçi, 2013). It is clear that it is a highly selective exam, as the science questions in the high school entrance exams do not only include reading comprehension questions, but require interpretation of many information. These results are similar to other studies in the literature (Ayvacı & Türkdoğan, 2010;Baş & Beyhan, 2012). It has been determined that the taxonomic distribution of the examined questions is not homogeneous, and there is a discordance in terms of proportion. In the literature, similar studies were found in which science questions in central exams were examined according to the revised Bloom's taxonomy.

Central exams are made with multiple choice questions. Since these questions are generally used in the measurement of behaviors at the level of remembering, understanding and application and do not allow students to create the answers personally, they lead them to rote thinking (Gökler, Aypay & Arı, 2012). For this reason, it is necessary to use open-ended questions in order to measure individuals' high-level thinking skills (problem solving, critical thinking, etc.). These types of questions provide an opportunity for individuals to reflect and also to personally create answers. It is unlikely that the test questions in the central exams administered in Turkey, in which many students participate, will be distributed conveniently and to a similar extent across all levels of the revised Bloom's taxonomy.

RECOMMENDATIONS

Suggestions developed within the framework of the results obtained from the findings of the research can be listed as follows;

- The questions in the transition exams from basic education to secondary education should not be stacked on the renewed Bloom taxonomy table, but should be distributed homogeneously in the cells. It should not be aimed at certain knowledge and cognitive process dimensions, but should be in a quality that will enable all knowledge and cognitive process dimensions to be used.
- The questions and achievements are located in the lower level cognitive steps. High-level thinking skills of students should be increased by increasing the number of questions and achievements in high-level cognitive steps. For this, the type of questions in the central exams should be changed, open-ended questions should be included in addition to multiple-choice questions, or high-level cognitive skills should be measured with multiple-choice questions.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Statements of publication ethics

I/We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

Ethics Committee Approval Information

As this study is of the document analysis method, the Ethics Committee Approval Document is not needed.

REFERENCES

Aktan, O. & Sevinç, Ö. S. (2018). *İlkokul Fen Bilimleri Dersi Öğretim Programı ders kazanımlarının yenilenen Bloom Taksonomisine incelenmesi* II. International Congress of Multidisciplinary Studies, Adana. 4-5 May 2018.

Anderson, L. W. (1999). Rethinking Bloom's taxonomy: Implications for testing and assessment. Department of Education.Reports. ED 435630.

Anderson, L. W. (2002). Curricular alignment: A re-examination. *Theory Into Practice, 41*(4), 255-260

Anderson, L. W., Krathwohl, D. R., Airasian, P., Cruikshank, K., Mayer, R., Pintrich & Wittrock, M. (2001). A taxonomy for learning, teaching and assessing: A revision of Bloom's taxonomy. New York. Longman

Arı, A. (2011). Bloom'un gözden geçirilmiş bilişsel alan taksonomisinin Türkiye'de ve uluslararası alanda kabul görme durumu. *Kuram ve Uygulamada Eğitim Bilimleri, 11*(2), 749–772

Arı, A. & Gökler, Z. S. (2012). İlköğretim fen ve teknoloji dersi kazanımları ve SBS sorularının yeni Bloom taksonomisine göre değerlendirilmesi. X. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi, Niğde. 20-30 Haziran 2012.

Arı, A. ve İnci T. (2015). Sekizinci sınıf fen ve teknoloji dersine ilişkin ortak sınav sorularının değerlendirilmesi. *Uşak Üniversitesi Sosyal Bilimler Dergisi, 8* (4), 17-50.

Ayvacı, H. ve Türkdoğan, A., (2010). Yeniden yapılandırılan Bloom taksonomisine göre fen ve teknoloji dersi yazılı sorularının incelenmesi. *Türk Fen Eğitimi Dergisi, 7*(1).13-25.

Baş, G. & Beyhan, Ö. (2012). Seviye belirleme sınavı (SBS) ingilizce sorularının bilişsel alan taksonomisine göre değerlendirilmesi. *Uluslararası Hakemli Sosyal Bilimler E-Dergisi, 31* (2), 1-18.

Bümen, N. (2006). Program geliştirmede bir dönüm noktası: Yenilenmiş Bloom Taksonomisi. *Eğitim ve Bilim, 31*(142), 3-14.

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2018). Bilimsel araştırma yöntemleri. *Ankara: Pegem Yayınları.*

Cangüven, H. D., Öz, O., Binzet, G. & Avcı, G. (2017). Milli Eğitim Bakanlığı 2017 fen bilimleri taslak programının yenilenmiş Bloom taksonomisine göre incelenmesi. *International Journal of Eurasian Education and Culture, 2,* 62-80.

Çevik, Ş. (2010). Ortaöğretim 9, 10 ve 11. sınıf fizik ders kitaplarında bulunan sorular ile 2000- 2008 yılları arasında öğrenci seçme ve yerleştirme sınavlarında sorulan fizik sorularının Bloom taksonomisi açısından incelenmesi ve karşılaştırılması. Yayınlanmamış Yüksek lisans Tezi. *Dicle Üniversitesi Fen Bilimleri Enstitüsü*, Diyarbakır.

Demir, M. (2011). 5. ve 6. sınıf Fen ve Teknoloji ders sınav sorularının Bloom Taksonomisine göre değerlendirilmesi. *Milli Eğitim Dergisi, 41*(189), 131–143.

Demir, S. B. & Yılmaz T. A. (2019). En iyisi bu mu? Türkiye'de yeni ortaöğretime geçiş politikasının velilerin görüşlerine göre değerlendirilmesi. *Bolu Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi, 19* (1), 164-183. doi.org/10.17240/aibuefd.2019.19.43815-445515.

Dursun, A., & Parim-Aydın, G. (2014). YGS 2013 matematik soruları ile ortaöğretim 9. sınıf matematik sınav sorularının Bloom taksonomisine ve öğretim programına göre karşılaştırılması. *Eğitim Bilimleri Araştırmaları Dergisi, 4* (1), 16-37.

Gündüz, Y. (2009). İlköğretim 6, 7 ve 8. Sınıf fen ve teknoloji sorularının ölçme araçlarına ve Bloom' un bilişsel alan taksonomisine göre analizi. *Van Yüzüncü Yıl Üniversitesi Eğitim Fakültesi Dergisi. 6*(2), 150-165. https://dergipark.org.tr/en/pub/yyuefd/issue/13712/166018

Güven, Ç. & Aydın, A. (2017). Yedinci sınıf fen ve teknoloji dersi öğretim programı sorularının yenilenmiş Bloom taksonomisi bakımından analizi ve değerlendirilmesi. *Atatürk Üniversitesi Kazım Karabekir Eğitim Fakültesi Dergisi, (35),* 223-233

İncikabı, L., Pektaş, M., & Süle, C. (2016). Ortaöğretime Geçiş Sınavlarındaki Matematik ve Fen Sorularının PISA Problem Çözme Çerçevesine Göre İncelenmesi. *Journal of Kirsehir Education Faculty*, *17*(2), pp. 649-662.

Kablan, Z., Baran, T. & Hazer, Ö. (2013). İlköğretim matematik 6-8 öğretim programında hedeflenen davranışların bilişsel süreçler açısından incelenmesi. *Ahi Evran Üniversitesi Kırşehir Eğitim Fakültesi Dergisi, 14* (1), 347-366.

Karaman, M. & Bindak, R. (2017). İlköğretim matematik öğretmenlerinin sınav soruları ile TEOG matematik sorularının yenilenmiş Bloom taksonomisine göre analizi. *Current Research in Education, 3* (2), 51-65.

Köğce, D., & Baki, A. (2009). Farklı türdeki liselerin matematik sınavlarında sorulan soruların Bloom taksonomisine göre karşılaştırılması. *Kastamonu Eğitim Dergisi, 17 (*2), 557-574.

Krathwohl, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory into Practice, 41*(4), 212–218. https://doi.org/10.1207/s15430421tip4104_2

Miles, M. & Huberman, A. M. (1994). *Qualitative data analysis.* Newbury: CA SAGE.

MoNE, (2018). Sınavla öğrenci alacak ortaöğretim kurumlarına ilişkin merkezî sınav başvuru ve uygulama kılavuzu. Ankara. Received from

http://www.meb.gov.tr/sinavlar/dokumanlar/2018/MERKEZI_SINAV_BASVURU_VE_UYGULAMA_KILAVUZU.pdf on 27th December 2022

Sönmez, V. (2015). Program geliştirmede öğretmen el kitabı. Ankara: Anı Yayınları.

Sönmez, Ö. F., Koç, H. & Çifçi, T. (2013). ÖSS, YGS ve LYS sınavlarındaki coğrafya sorularının Bloom taksonomisi bilişsel alan düzeyi açısından analizi. *Karadeniz Araştırmaları, 36*, 257- 275.

Thompson, T. (2008). Mathematics teachers' interpretatıon of higher-order thinking in Bloom's Taxonomy. *International Electronic Journal of Mathematics Education, 3*(2), 96-109.https://doi.org/10.29333/iejme/221.

URL1. (2022). http://odsgm.meb.gov.tr/.

Yaz, Ö. V. & Kurnaz, M. A. (2017). 2013 Fen Bilimleri öğretim programının incelenmesi. *Uluslararası Türk Eğitim Bilimleri Dergisi, 5* (8), 173-184.

Yolcu, H. H. (2019). İlkokul öğretim programı 3 ve 4. sınıf fen bilimleri dersi kazanımlarının revize edilmiş Bloom taksonomisi açısından analizi ve değerlendirilmesi. *Elementary Education Online, 18*(1), 253-262

Yüksel, S. (2007). Bilişsel alanın sınıflamasında (taksonomi) yeni gelişmeler ve sınıflamalar. *Türk Eğitim Bilimleri Dergisi, 5*(3), 479-509.

Zorluoğlu, S. L., Kızılaslan, A. ve Sözbilir, M. (2016). Ortaöğretim kimya dersi öğretim programı kazanımlarının yapılandırılmış Bloom taksonomisine göre analizi ve değerlendirilmesi. *Necatibey Eğitim Fakültesi Elektronik Fen ve Matematik Eğitimi Dergisi, 10* (1), 261-279