Investigation of the Evaluation Questions in 5th Grade Science Textbooks According to Revised Bloom's Taxonomy*

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ABSTRACT
The aim of this study is to investigate the end-of-unit evaluation questions in 5th grade primary school science workbook according to dimensions of the Revised Bloom's Taxonomy (RBT). For that purpose, 191 end-of-unit evaluation questions of 5th grade science workbook which is approved by the Republic of Turkey -the Ministry of National Education, the Board of Education and Discipline- were evaluated with document analyses method with considering RBT. During the evaluation, document analysis was performed that is one of the qualitative investigation methods. Classification of the questions were performed via considering previously published studies and the criteria of Anderson et al which is published in 2001, and translated into Turkish in 2010 by Ozcelik et al. The results of the analyses were interpreted with obtaining ratio and frequencies. As a results of this study, we observed that unit evaluation questions of 5th grade science workbook was belonging to low level cognitive domain step of RBT. As a conclusion, we believe that the unit evaluation questions of 5th grade Science Workbook should be equally distributed between low and high level cognitive domain steps of RBT.
Keywords: Science, Curriculum, Revised Bloom's Taxonomy, 5th grade

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INTRODUCTION

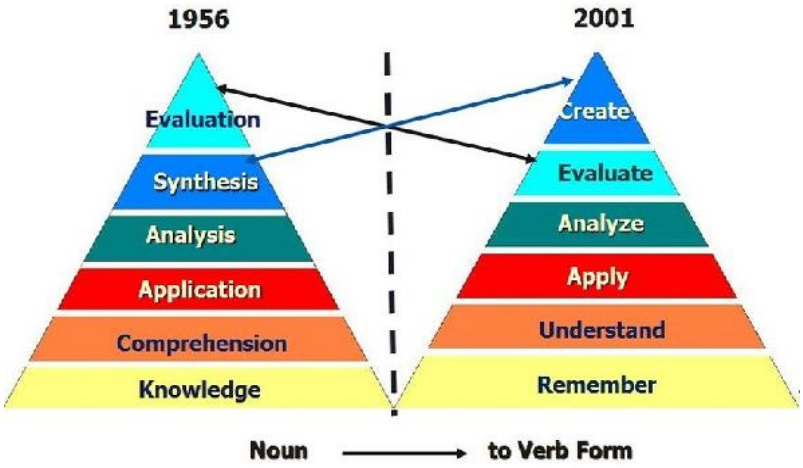
It is believed that the most important thing needed to improve the quality of education is teachers who can prepare appropriate and good questions (Karamustafaoğlu et al., 2003). Humans are social creatures and interact and communicate with each other. The beginning of communication is asking questions. Because asking questions is a way of learning and development throughout life. In order to make children active in education, the ability to ask questions should be developed. It is thought that a good science education starts with well-formed questions (Koray.ve Yaman, 2002). Learning occurs with the formation of synapses between two neurons in the brain. In other words, questions that will spark sparks in the minds of students increase the permanence of learning. Questions that will shine in the minds of students increase the permanence of learning. Because the moment when we learn a piece of information best and we don't forget it is when we interact with intense emotion and information. Good and qualified questions are one of the basic and most important tools that can be used to increase the interaction between the teacher and the student, to experience whether learning takes place and to encourage learning (Topçu, 2017). The content of the questions and the methods of creating the questions by the teachers are an important factor in determining the reliability of the question.

Revised Bloom's Taxonomy (RBT)

Bloom's taxonomy approach; some features that are aimed to be gained by the person through education and training; There are three basic structures as cognitive feature, affective feature and psychomotor feature. The cognitive domain is concerned with knowledge. It includes the recognition, understanding and use of information by people (Doğanay & Sarı, 2017). The most important feature of RBT is that this taxonomy transforms the one-dimensional structure of the cognitive domain into a two-dimensional structure (Krathwohl, 2002). Between 1995-1999, under the leadership of Anderson and Krathwohl, a research group consisting of cognitive psychologists, curriculum development, teaching and assessment and evaluation experts created a new taxonomic classification in order to reorganize Bloom's taxonomy (Anderson et al., 2014). This classification includes the ability of individuals to recognize, understand and use information (Doğanay & Sarı, 2017). The most striking feature of this revised arrangement is that the one-dimensional cognitive field has been transformed into a two-dimensional structure (Krathwohl, 2002). In the taxonomic structure, the information level used "noun and verb cases" together. In order for an action to be activated, the information had to be in the students' memory and remembered. Another aspect of the revised taxonomy that makes it different from the original is that the

steps of "knowledge, comprehend and synthesis" can be renamed as "remembering, understanding and creating". In addition, in the revised taxonomy, the synthesis and evaluation steps have been replaced with each other. The prerequisite rule of the revised taxonomic approach was canceled and the criticisms against the original taxonomy in this direction were blocked (Arı, 2011).

Blooms vs Anderson/Krathwohl taxonomy revised



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In the original Bloom's Taxonomy, the noun and verb forms of the knowledge level were used together. In order for students to turn it into an actual activity, they must first keep the information in their memory and remember it. In the revised taxonomy, this situation has been changed and discussed in two separate categories as knowledge and cognitive process dimensions (Hamurcu & Ekinci 2020). In the revised taxonomic structure, similar to the original classification, cognitive process dimensions consist of six basic parts, from simple to complex, and six main categories were divided into categories within themselves and grouped in a total of 19 steps in order to avoid information confusion. The validity of Bloom's Taxonomy, which Bloom gave his name in 1956, has been the subject of relevant field articles for many years. As a result of these researches and discussions, Anderson et al. put forward the Revised Bloom Taxonomy in 2001 to reorganize the Original Bloom Taxonomy. Two of the most basic reasons for the renewal of Original Bloom Taxonomy have been suggested. First; To enable educators to focus on Taxonomy, second; America's progress in the field of psychology is the development of developmental psychology and the psychology of learning, and teaching methods and techniques, measurement and evaluation are adapted to the contemporary education system and tried to be combined with taxonomy.

AIM OF RESEARCH

The aim of this research is to try to determine which level of RBT they belong to, considering the end-of-unit evaluation questions included in the Science Curriculum, which is based on the constructivist attitude. For this purpose, it is aimed to examine the questions in the said curriculum.

IMPORTANCE OF RESEARCH

The 4 basic elements of the training program are; The target is content, learning-teaching process and measurement-evaluation, and the evaluation process should be considered as a whole with other elements. Bloom's Taxonomy (1956), one of the most well-known taxonomies, was created to determine the knowledge and skill levels in order to make the evaluation process more systematic and regular (Zorluoğlu et al., 2017). Teachers need to know which cognitive process the questions correspond to for formative or summative assessments in order to better understand the lesson topics. A certain part of the questions in the curriculum can set an example for teachers. For this reason, it may be important to know at which cognitive level the questions in the curriculum are.

MODEL OF THE RESEARCH

This study, which aims to examine the end-of-unit evaluation questions of primary school 5th grade science textbooks according to the Cognitive Field Levels of the Revised Bloom Taxonomy, is a descriptive study conducted with the survey model. Survey models are research approaches that aim to describe a situation that is in the past or still exists (Karasar, 2007). Research data were obtained through document analysis, which is one of the qualitative research methods. Document analysis includes the analysis of written materials containing

information about the case or cases that are aimed to be investigated (Yıldırım & Şimşek, 2013). Document analysis is the process of systematically analyzing the data obtained by reviewing and evaluating electronic and printed materials (Bowen, 2009). In the research, 191 evaluation questions at the end of the units of the 5th grade science textbooks, which were accepted as an educational tool with the 2018-2019 dated and 76198665 letter of the Board of Education and Discipline (TTK) affiliated to the Ministry of National Education, were examined using the document analysis method. According to Karasar, (2005), the document analysis method enables the analysis of a certain text, document, by enumerating certain features with content analysis. The document review method used as an information collection method, as stated by Foster;

1- Access to documents,
2- Checking the originality,
3- Understanding the documents,
4- Analyzing the data,
5- Using the data
made in the form (cited in Yıldırım and Şimşek, 2008, p. 193)

DATA COLLECTION TOOLS AND ANALYSIS

In this research, it was accepted as a textbook for 5 (five) years with the board decision dated 18.04.2019 and numbered 8 and the letter 10444088 of the Ministry of National Education, Board of Education and Discipline, which is included in the science course curriculum in the 2020-2021 academic year. 191 questions in the end-unit evaluation questions of the science textbooks, which were prepared and approved to be taught, were classified according to the dimensions of knowledge and cognitive process, taking into account the criteria in the YBT table and two program development experts were presented and the classification was made in line with the feedback received. The classification was finalized in line with expert opinions. The percentages and frequencies of the findings were taken and transferred to various tables and graphics. The data obtained in the research were analyzed using the SPSS 2.0 package program in the computer environment.

FINDINGS

Table 1: The Ratio of Unit Evaluation Questions in the 5th Grade Science Curriculum Units at the Lower and Upper Level Cognitive Field Levels.

Cognitive Process size	**1. Unit**	**2. Unit**	**3. Unit**	**4. Unit**	**5. Unit**	**6. Unit**	**7. Unit**	**Total**	
Remember	22	19	11	20	12	15	13	**112**	**53,10%**
Understanding	4	6	12	9	13	11	5	**60**	**39,20%**
Apply	1	1	1	1	5	0	5	**14**	**5,20%**
Total	**27**	**26**	**24**	**30**	**31**	**25**	**23**	**186**	**97,40%**
Analyze	0	0	2	0	0	1	1	**4**	**2,10%**
Evaluation	0	0	0	0	1	0	0	**1**	**0,50%**
Creating	0	0	0	0	0	0	0	**0**	**0,00%**
Total	**0**	**0**	**2**	**0**	**1**	**1**	**1**	**5**	**2,60%**
The overall Total	**27**	**26**	**27**	**30**	**31**	**27**	**27**	**191**	**100,00%**

When Table 1 is examined; Out of a total of 191 questions in the 5th Grade Sciences Curriculum, 186 (97.4%) of the sub-cognitive domain steps are seen. 112 (53.1%) of these questions belong to remembering, 60 (39.2%) comprehension, 14 (5.2%) implementation steps. Out of a total of 191 questions, there are 5 (2.6%) questions belonging to the upper level cognitive domain steps. Of these questions, 4 (2.1%) belong to the analysis step and 1 (0.5%) to the evaluation step. In the 8th Grade Science Curriculum, there are too many questions for low-level cognitive domains, while there are very few questions for high-level cognitive domains.

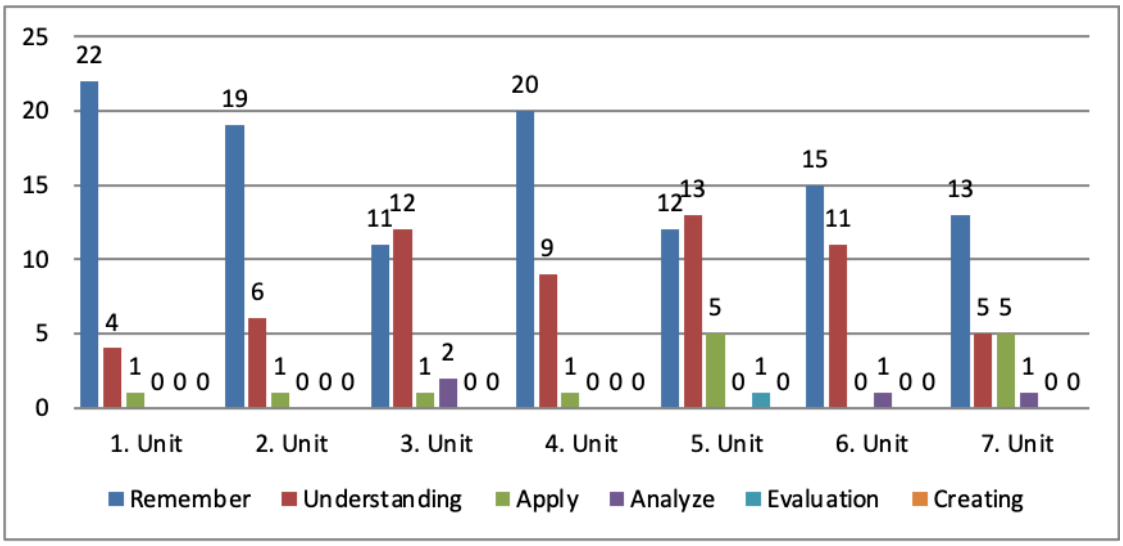

Figure 1: Graph of Distribution of 5th Grade Science Curriculum End-of-Unit Evaluation Questions by YBT.

Looking at Figure 1; In the units in the 5th Grade Science Curriculum, it is seen that the rates in the Remembering step are high, so it is concentrated at the sub-cognitive level.

Table 2: The Ratio of the Questions at the End of the Units of the 5th Grade Science Curriculum in the Lower and Upper Level Cognitive Field Levels.

5th grade	**Low Level Cognitive Domain Levels Number of Questions**		**Top level Cognitive Domain Levels Number of Questions**		**Total Number of Questions**	
1. Unit	27	100,00%	0	0,00%	27	100,00%
2. Unit	26	100,00%	0	0,00%	26	100,00%
3. Unit	24	92,60%	2	7,40%	26	100,00%
4. Unit	30	100,00%	0	0,00%	30	100,00%
5. Unit	30	96,90%	1	3,10%	31	100,00%
6. Unit	26	96,20%	1	3,80%	27	100,00%
7. Unit	23	92,00%	2	8,00%	27	100,00%

When Table 2 is examined; Unit 1: Sun, Earth and Moon, there are 27 questions in total. 100% of these questions belong to the lower level cognitive domain steps. There are no questions pertaining to the higher-level cognitive domain steps. Unit 2: World of Creatures has a total of 26 questions. 100% of these questions belong to the lower cognitive steps and there are no questions related to the metacognitive domain steps. 3. Unit: Measuring Force and Friction There are 26 questions in total, 92.6% of which belong to the lower cognitive domain steps, and 7.4% of them are questions related to the metacognitive domain steps. Unit 4: Matter and Change consists of 30 questions in total, 100% of which belong to the sub-cognitive domain steps. Unit 5: Propagation of Light has a total of 31 questions. Of these questions, 96.9% belong to the lower cognitive domain steps and 3.1% belong to the metacognitive domain steps. Unit 6: Man and the Environment There are 27 questions. 96.2% of these questions belong to the lower cognitive domain steps, and 3.8% of them belong to the metacognitive domain steps. 7. Unit: Electrical Circuit Elements There are 7 questions in total. 92% of these questions belong to the lower cognitive steps and 8% of them are questions related to the metacognitive domain.

CONCLUSIONS

When the questions in the 5th Grade Science Curriculum were classified according to the cognitive process dimension of the RBT, it was determined that the number of questions belonging to the lower-level cognitive domain steps was the highest in the number of recall steps, while the number of questions belonging to the higher-level cognitive domain steps was higher. Among the higher-level cognitive domain steps, more questions related to the decoding step were included. 5. When the transitions between the units in the Science Curriculum are examined; The rates of the classified questions in the lower-level cognitive domain and high-level cognitive domain levels differ. In Units 1, 2 and 4, there are mostly questions related to the lower level cognitive domain

steps. In Units 3, 5 and 7, there are more questions pertaining to higher cognitive domain levels than Units 1, 2 and 4. In addition, when analyzed according to the knowledge dimension, the most factual information and the least metacognitive information are asked. Göçer and Kurt (2016) found that the majority of the questions they analyzed were low-level questions, which is consistent with the results of this study. Since each level requires using different mental skills, while the questions asked in determining the success of the learners should be at a balanced level from each step of the Renewed Bloom Taxonomy, it can be seen as an important deficiency that the questions are asked at the remembering step of the subcognitive domain.
In the studies conducted, it is seen that the questions asked by science teachers during the lesson are more at the lower level cognitive domain levels (Ayvacı & Şahin, 2009; Koray & Yaman, 2002; Baysen, 2006) compared to Bloom's Taxonomy (Özcan & Oluk, 2007).

Balta (2006), in his research examining the importance of using Bloom's Taxonomy in exams applied in primary schools, determined that no progress could be made in the steps such as analysis, synthesis and evaluation, which require examination by measuring the knowledge level of students only in the exams. Additional unplanned exam applications do not provide much benefit in terms of mental development in primary schools, and there is evidence of low achievement performances detected in national exams.

Similarly, Dindar and Demir (2006) analyze the 5th grade science exam questions according to Bloom's Taxonomy, which shows homogeneity with the research. In both studies, it was determined that most of the questions were at the knowledge level. Similar to these studies, Ayvacı and Türkdoğan (2009) concluded that the questions in the exam papers examined by science teachers according to RBT belong to low-level cognitive domain steps. Gündüz (2009) examined the 6th, 7th and 8th grade science and technology exam questions according to the cognitive domain steps of Bloom's Taxonomy; It was determined that 92.19% of the questions were asked to measure low-level thinking skills and 7.79% to measure high-level thinking skills.

SUGGESTIONS

• The revised taxonomy that brought these important changes to the field of curriculum development should be included in in-service and pre-service teacher education in our country. Planning the trainings on this subject, rather than being theoretical, is practical and based on examples can increase efficiency.
• It should not be ignored that the deficiencies of the previous years should be eliminated in the new training programs to be created.
• In order to increase teachers' awareness of Taxonomy, it is necessary to give importance to the Revised Bloom Taxonomy in in-service trainings.
• More studies should be conducted in order to show parallelism between the acquisitions in the science curriculum and the questions according to the cognitive domain steps.

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