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AN INTEGRATED ANALYSIS OF HIGH SCHOOL ENTRANCE EXAMINATION MATHEMATICS QUESTIONS AND 8TH GRADE MATHEMATICS TEXTBOOK QUESTIONS[1]

LİSELERE GİRİŞ SINAVI MATEMATİK SORULARI İLE 8. SINIF MATEMATİK DERS KİTABINDAKİ SORULARIN BÜTÜNLEŞİK İNCELENMESİ

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ABSTRACT

The purpose of this study is to examine the mathematics questions in the central exam for secondary education institutions (2018-2022) and the questions in the 8th grade mathematics textbook in the context of the Revised Bloom's Taxonomy. The research was conducted with document analysis, one of the qualitative research designs. The Central Examination Numerical Section A Booklet and the 8th grade mathematics textbook implemented in 2018-2022 were used as documents in the study. In addition, teacher opinions were collected to support the documents. Descriptive analysis was used to analyze the research data. The study results showed that 4% of the questions asked in the central exams for secondary education institutions in the last five years (2018-2022) were at the level of understanding, 56% at the level of application, 39% at the level of analyzing, and 1% at the level of evaluation, and no questions were asked at the recall and construction levels. In the 8th grade mathematics textbook, 10.83% of the unit evaluation questions were at the level of recall, 41.66% at the level of comprehension, 47.50% at the level of application, and no questions were asked at the level of analysis, evaluation and construction. It was determined that higher level questions were included in the central exam compared to the textbook. As a result of teachers' exam-oriented education; not using the textbook and neglecting students who did not prepare for the exam were identified as problems.

ÖZET

Bu araştırmanın amacı, sınavla öğrenci alacak ortaöğretim kurumlarına ilişkin merkezi sınav matematik soruları (2018-2022) ile 8. sınıf matematik ders kitabında yer alan soruları, Yenilenmiş Bloom Taksonomisi bağlamında incelemektir. Araştırma nitel araştırma desenlerinden doküman incelemesi ile gerçekleştirilmiştir. Araştırmada doküman olarak 2018-2022 yıllarında yapılan Merkezî Sınav Sayısal Bölüm A Kitapçığı ve 8. sınıf matematik ders kitabı kullanılmıştır. Ayrıca, dokümanları desteklemek için öğretmen görüşleri alınmıştır. Araştırma verilerinin analizinde betimsel analiz kullanılmıştır. Araştırma sonuçlarına göre son beş yılda (2018-2022) ortaöğretim kurumlarına ilişkin merkezi sınavlarda sorulan soruların %4'ünün anlama, %56'sının uygulama, %39'unun analiz etme ve %1'inin değerlendirme düzeyinde olduğu, hatırlama ve oluşturma basamağında soru sorulmadığı belirlenmiştir. 8. sınıf matematik ders kitabındaki ünite değerlendirme sorularının ise %10,83'ünün hatırlama, %41,66'sının anlama, %47,50'sinin uygulama düzeyinde olduğu belirlenirken analiz etme, değerlendirme ve oluşturma basamağında soruya rastlanmamıştır. Merkezi sınavda, ders kitabına kıyasla daha üst düzey sorulara yer verildiği tespit edilmiştir. Öğretmenlerin sınav odaklı eğitim yapması sonucu, ders kitabını kullanmaması ve sınava hazırlanmayan öğrencileri ihmal etmesi sorun olarak belirlenmiştir.

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[1] Bu çalışma, birinci yazarın ikinci yazar danışmanlığında tamamlanan yüksek lisans tezinden üretilmiştir.

Introduction

Education is a supervised and feedback based process that aims to maximize the personal development of an individual (Tezcan, 1996). In order for the goals to be accomplished, this open system needs to be organized and structured. The first step in this process is to set goals (Sönmez, 1993). In this context, the Turkish Ministry of National Education (MoNE) adopted the constructivist education approach in 2005 and updated the vision of mathematics education in the form of raising individuals who can use mathematics in their lives, solve problems, discuss with others, work in teams, develop positive attitudes towards mathematics and be confident in terms of mathematical skills (MoNE, 2009). In this approach, students are defined as individuals who actively question, think critically, express their ideas, construct and solve problems, and participate in the learning process (Delil & Güleş, 2007). As a result of this new understanding, it is seen that supporting students' high-level cognitive development is emphasized (MoNE, 2018). Bloom's Taxonomy, which was revised in order for learners to structure metacognitive knowledge more easily and to provide permanent learning, addresses the dimensions of recall, comprehension, application, analysis, evaluation and creation (Krathwohl, 2002).

In order to identify whether the goals are evident in the individual level or to which extent present in the individual, the act of testing must take place. Testing is making a decision by comparing the observed results with one criterion or several criteria (Turgut & Baykul, 2015). In this regard, an objective assessment and evaluation system that measures students' knowledge and skills is necessary (Şad & Şahiner, 2016). In Türkiye, various exams have been applied for this purpose in the past. One of them is the "Centralized Examination for Secondary Education Institutions that will take students by Examination" (Ekinci & Bal, 2019), which has been implemented since 2018 to measure student achievement at the end of eight years of education and to place students in high schools. In the central exam, rather than measuring students' processing skills, questions are asked that measure higher-order thinking skills such as analytical thinking, interpretation, and inference and include more than one outcome (Biber et al., 2018). The skill-based question style that measures higher-order thinking skills asked in the central exam is similar to the question models of PISA (Program for International Student Assessment) and TIMSS (Trends in International Mathematics and Science Study) (Erden, 2020).

Today's one of the most significant tools of the education system where skill-based questions measure higher order thinking skills gain importance is textbooks, which marks 72% of usage rate in Türkiye (Kolaç, 2003; Seven, 2001). There are various concerns for textbooks. First, textbooks should be the primary source for students in preparation for central exams (Korkmaz et al., 2020). Second, textbooks should give students the opportunity to arrive classes prepared and revise the subject afterwards, and they should be sufficient in preparation for the central exam for the 8th grade students and should not make them feel the need for other resources (Kılıçoğlu, 2021; Korkmaz et al., 2020). Next, textbooks should allow students to reinforce their knowledge with different question types and question solving methods (Dane et al., 2004; Duman et al., 2001). However, as a result of the research conducted by Özmantar et al. (2017), it was found that the majority of the teachers participating in the research, 80%, used source books other than textbooks. Most of the teachers agreed that particularly the assessment and evaluation sections of the textbooks should be updated and more questions from higher cognitive levels should be included. In this way, it is considered that textbooks, which are freely available to every student in Türkiye, can be used as a primary source in preparation for exams (Etyemez, 2021). In Turan's (2019) study, the majority of the teachers stated that the content of the 6th grade mathematics textbook was in line with the program outcomes, but the number of questions was insufficient and questions serving for every student's level were not included. More specifically, 65% of the teachers participating in the study stated that the number of questions in the textbook was insufficient, and 51% stated that the questions in the textbook did not measure students' higher-order thinking skills. In addition, Tutak and Güder (2012) conducted a study on the 5th grade mathematics textbook and found that teachers used the textbook as a primary source but found the assessment and evaluation activities in the textbook inadequate.

Primary school 8th grade students take the central exam for secondary education institutions that will take students by exam and are placed in high schools as a result of the exam. One of the courses that determines the outcome of this exam is mathematics. According to the report published by MoNE (2021), the average correct answer in the 20-question mathematics test in the central exam for secondary education institutions that take students with exams is 7.56. According to PISA 2018 results, Türkiye ranked 42nd among 79 countries and 33rd among 37 OECD countries in mathematics (Koçak, 2022). In TIMSS 2019, Türkiye ranked 20th among 39 countries in the eighth grade mathematics assessment (Koçak, 2022). Türkiye lags behind the average score of

OECD countries in mathematics skills in PISA and TIMSS exams (Sarıer, 2021). In the light of this information, it can be stated that problems in mathematics education in Türkiye continue.

Another problem is that the textbook is not used by teachers on the grounds that it is insufficient to prepare students for the central exam (Özmantar et al., 2017). However, some of the questions in the textbooks are related to lower level basic skills. Considering textbooks as only exam-oriented may pose a problem for the 8th grade mathematics education. While the questions asked in the central exam are aimed at selecting and placing students, the questions in the textbooks are asked to determine whether students have achieved the outcome. The fact that there are objectives at all levels in mathematics course makes it necessary to ask questions serving to these objectives in the textbooks. Therefore, it is reasonable to include questions in the textbook in line with the level and type of the objectives. Teachers' exam-oriented education (Çetin & Ünsal, 2019) may mean that they neglect students who are not prepared for the exam and students with low academic achievement. This is expected to have a negative impact on the mathematics score averages of mathematics students and the use of textbooks. In this context, it is critical to inform teachers about the function of textbooks by analyzing the questions in the central exam and textbooks. In the light of all this information, the purpose of this study is to examine the central exam mathematics questions (2018-2022) and the questions in the 8th grade mathematics textbook in the context of the Revised Bloom's Taxonomy. For this purpose, the following research questions were formed:

Q1. What are the levels of the central exam mathematics questions for the secondary education institutions that accept students through exam and the questions in the 8th grade mathematics textbook in the context of the Revised Bloom's Taxonomy?

Q2. What are the opinions of mathematics teachers who teach 8th grade mathematics courses about the questions in 8th grade mathematics textbooks?

Method

In this section, information about the research model, data source, data collection, analysis of the collected data, validity and reliability are presented.

Research Design

In this study, document analysis method, one of the qualitative research designs, was used since the mathematics questions in the central exam for secondary education institutions taking students with exams between 2018-2022 and the unit evaluation questions in the 8th grade mathematics textbook were classified and examined in an integrated manner according to the Revised Bloom's Taxonomy. Document analysis is the process of collecting information about a study and organizing and analyzing it with a certain coding system (Çepni, 2014). The documents to be examined in document review should be examined according to scientific principles (Kiral, 2020). The process in document review is accessing the document, confirming its authenticity, understanding and analyzing the document, and then reporting and publishing it (Yıldırım & Şimşek, 2016).

Data Source

In the study, 100 mathematics questions from the 2018, 2019, 2020, 2021 and 2022 Central Examination for Secondary Education Institutions that take students through exams and 120 unit evaluation questions from the 2021 edition mathematics textbook of MoNE publications approved by the Board of Education were used as the data source of the study. In addition, 30 mathematics teachers working in secondary schools affiliated to the MoNE in the provincial center of Osmaniye were consulted as the study group. Criterion sampling, one of the purposeful sampling methods, was used to determine the study group. Criterion sampling is the study of situations that meet a set of criteria determined by the researcher (Yıldırım & Şimşek, 2016). Having at least five years of service experience, being a mathematics teacher in secondary schools affiliated to the MoNE, and teaching 8th grade students were taken as criteria. The interviewed teachers were coded as P1, P2, P3..., while presenting their opinions. Seventeen of the participants were female and 13 were male.

Semi-structured interview forms were used to obtain participants' views. The interview forms were prepared by examining various sources related to the textbooks, taking the opinions of two experts in the field of curriculum and instruction and three experts in the field of mathematics education. The interview forms consisted of two sections: personal information and interview questions. While creating the interview questions, it was paid attention that the questions should be open-ended, understandable, avoid directing, and be organized in a logical order (Yıldırım & Şimşek, 2016). In the interviews with the participants, their opinions on whether they use the textbook as the main source or not, the quality, quantity, achievement appropriateness of the questions in the textbook, and the relationship with the central exam were included. After the interview forms were drafted as a result of a detailed literature review, expert opinion was obtained and they were made ready for pre-interview. Three mathematics teachers were interviewed and the form was finalized in line with their opinions and suggestions. The interviews were recorded on a voice recorder with the permission of the participants, then transcribed and analyzed.

Data Analysis

While descriptive analysis was used to analyze the documents in the study, content analysis was used to analyze the data obtained from teacher opinions. In descriptive analysis, data are classified, summarized and interpreted according to predetermined themes. In content analysis, concepts and themes are reached to explain the data obtained (Yıldırım & Şimşek, 2016). In this study, the Revised Bloom's Taxonomy was taken as a reference for descriptive analysis.

Table 1. Features and Skills in the Cognitive Process Dimension of the Revised Bloom's Taxonomy

Steps	Description	Keywords
Remembering	Retrieving information from long-term memory.	Remember, define, list, tabulate, use what is appropriate
Understanding	Making sense of messages and explaining concepts.	Summarize, define, interpret, translate, transform, realize, report, show differently
Application	Reusing the given information.	Select, categorize, use, calculate, configure, draft
Analyzing	Separating a whole into its parts, determining the relationship between parts.	Criticize, explain, compare, contrast, see a difference, test
Evaluation	Judging a situation according to a criterion.	Decide, conclude, evaluate, appraise, discuss, judge, defend
Creation	Creating a new original product using parts.	Assemble, build, formulate, create, design

Source: (Anderson et al., 2001, p.31).

In this analysis, for example, if a question involves "comparing, distinguishing", this question is considered to belong to the analyzing level, and if it involves "remembering, defining" information, the question is considered to belong to the remembering level.
Examples suitable for the steps of the Revised Bloom's Taxonomy are given below.

Example of a question suitable for the recall level:
Which of the following is true? (MoNE, 2021, p. 292).
A. A triangular right pyramid has five surfaces.
B. The surface area of a cylinder is the product of the base area and the height.
C. A square right pyramid has five vertices.
D. There is no circle in the expansion of a cone.

The question asked about the basic properties of geometric shapes. Since the question requires remembering the information, it is accepted at the recall level in the Revised Bloom's Taxonomy.

Example of a question suitable for the comprehension level:

'There are at least 6 plates on the table.' Which of the following is the inequality corresponding to the sentence? (MoNE, 2021, 187) .

A. $t < 6$
B. $t > 6$
C. $t \leq 6$
D. $t \geq 6$

This question was accepted at the comprehension level because it was about remembering information and showing this information in a different way.

Example of a question suitable for the application step:

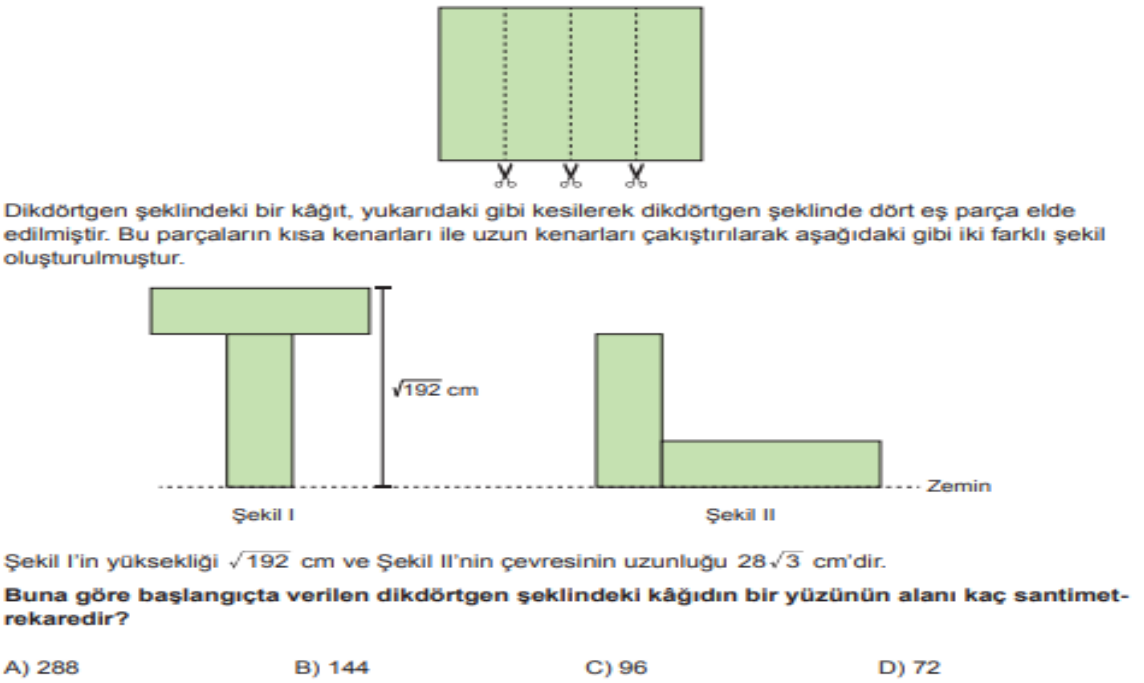

Figure 1. Sample Question Suitable for the Implementation Step

In 2021, this mathematics question in the central exam for secondary education institutions that take students with the exam is a sample question belonging to the application step since it is asked to calculate using the knowledge of operations in square roots.

Example of a question suitable for the analyzing step;

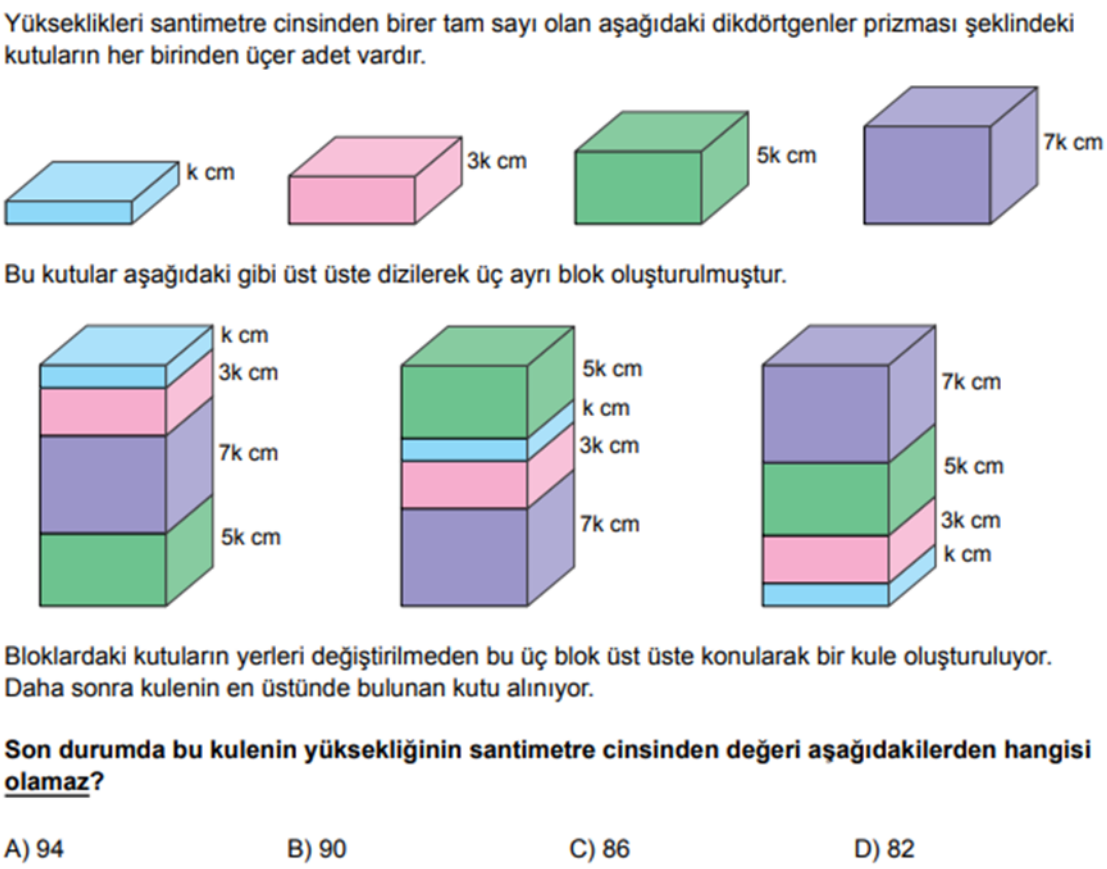

Figure 2. Sample Question for the Analyzing Step

In 2019, this mathematics question, which is in the central exam for secondary education institutions that take students with the exam, is in the analyzing step because it is related to thinking the parts together, thinking about the relationship between the parts and finding an answer according to the possibilities.

Example of a question suitable for the evaluation step:

How many ordered pairs (a, b) are there such that a x b = 120?

a) Determine the prime factors of the number 120

b) a x b = 120 Finding the values of a and b by experimenting

Which of the above methods is more useful to use to answer the question (Karaman, 2016)?

Since it is a question of making a decision and judgment by taking into account the available data, it is a question belonging to the evaluation step.

Example of a question suitable for the creation step:

Construct and solve a problem according to the information given below. Mother, father and 4 children, Adult: 45 TL, Children: 35 TL (Karaman, 2016).

The question asks for an original solution by developing a different perspective. Since building, creating, and designing are in question, it is a question belonging to the creating step.

The interviews with teachers were analyzed through content analysis (Yıldırım & Şimşek, 2016). The data obtained from the interviews with the teachers were transferred to the MAXQDA Program and analyzed. The

findings were divided into themes, sub-themes and codes, digitized and frequency values were found and presented in tables.

Validity and Reliability

The credibility, transferability, consistency and confirmability strategies suggested by Lincoln and Guba (1985) for qualitative research were utilized. In order to increase credibility in the research, both document analysis and interview method were used to diversify the data. In addition, support was received from experts at every stage of the research. In order to ensure transferability, the research was described in detail, direct quotations from the participants' views were included, a comprehensible language use for reader-friendly purposes was employed. To ensure consistency, the questions were analyzed by one researcher and one expert. In this study, two coders coded the data set separately, the agreement between the coders was calculated using Miles and Huberman's (1994, p. 64) formula [Reliability = (Agreement / Agreement + Disagreement) X 100], and the agreement rate between the coders was calculated as .92. Values of 0.70 and above obtained from the formula are accepted as reliable (Yıldırım & Şimşek, 2016). Accordingly, the data obtained from the study were considered reliable. In the questions where there was a difference of opinion, the opinion of the lecturer was taken and the final form was given regarding the steps of the questions. In order to ensure verifiability, the research data were analyzed and stored in computer environment.

Findings

In this section, the 100 mathematics questions asked in the central exam for the secondary education institutions that take students through exam and the unit evaluation questions in the 8th grade mathematics textbook are analyzed according to the Revised Bloom's Taxonomy. In addition, the findings obtained from the opinions of mathematics teachers are also included.

Findings Related to the Analysis of Central Exam Mathematics Questions and 8th Grade Mathematics Textbook Questions According to the Revised Bloom's Taxonomy

The findings obtained from the analysis of 100 mathematics questions asked in the central exams between 2018 and 2022 according to Bloom's Taxonomy are given in Table 2.

Table 2. Analysis of Central Exam Mathematics Questions According to the Revised Bloom's Taxonomy

Bloom's Taxonomy	2018		2019		2020		2021		2022		Total	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Remembering	-	-	-	-	-	-	-	-	-	-	-	-
Understand	1	5	-	-	1	5	2	10	-	-	4	4
Implement	13	65	12	60	10	50	12	60	9	45	56	56
Analyze	6	30	8	40	9	45	6	30	10	50	39	39
Evaluate	-	-	-	-	-	-	-	-	1	5	1	1
Creating	-	-	-	-	-	-	-	-	-	-	-	-

When Table 2 is examined, it is seen that 1 (5%) of the 2018 central exam mathematics questions were at the comprehension level, 13 (13%) were at the application level, and 6 (30%) were at the analysis level. In the central exam in 2018, mathematics questions were mostly asked at the application level. There were no examples of questions from the recall, evaluation and creation levels.

In the 2019 central exam, 12 (60%) of the mathematics questions were at the application level and 8 (40%) were at the analyzing level. In the central exam in 2019, mathematics questions were mostly asked at the application level. There were no questions at the level of recall, comprehension, evaluation and creation.

In the 2020 central exam, 1 (5%) of the mathematics questions were at the comprehension level, 10 (50%) were at the application level and 9 (45%) were at the analyzing level. In the 2020 central exam, mathematics questions

were mostly asked at the application level. There were no examples of questions from the recall, evaluation and creation levels.
2 (10%) of the 2021 central exam mathematics questions were at the understanding level, 12 (60%) were at the applying level, and 6 (30%) were at the analyzing level. There were no examples of questions from the recall, evaluation and creation strand. 9 (45%) of the 2022 central exam mathematics questions were at the application level, 10 (50%) at the analysis level and 1 (5%) at the evaluation level. In the 2022 central exam, most questions were asked at the analyzing level. There were no questions at the recall, comprehension and creation levels.

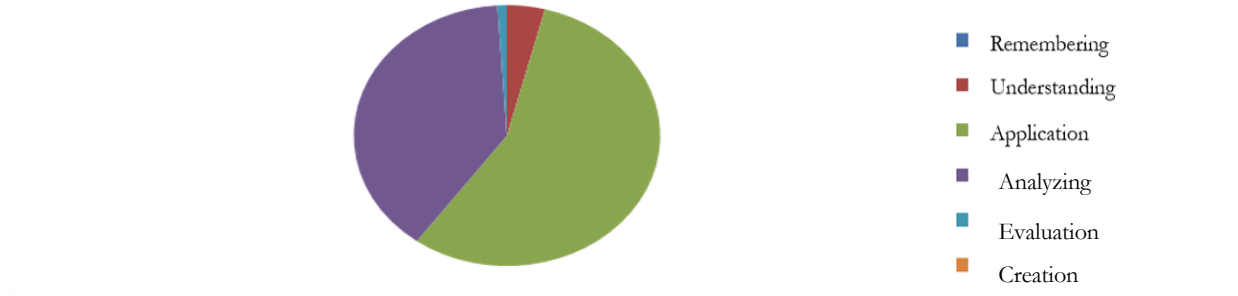

Figure 3. Distribution of Mathematics Questions in the Central Examination between 2018 and 2022 according to the Revised Bloom's Taxonomy

When Figure 3 is examined, it is seen that the central exam mathematics questions were mostly in the application step (56%), then analyzing (39%), then understanding (4%) and least in the evaluation step (1%). There were no questions at the remembering and creating stages.
A total of 120 unit evaluation questions in 6 units in the textbook were analyzed according to Bloom's Taxonomy and the data obtained are presented in Table 3.

Table 3. Analysis of Unit Evaluation Questions in the Textbook According to the Revised Bloom's Taxonomy

Bloom's Taxonomy	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	*f*	%
Remembering	1	1	2	4	3	2	13	10.83
Understanding	9	8	8	7	8	10	50	41.66
Application	10	11	10	9	9	8	57	47.50
Analyzing	-	-	-	-	-	-	-	-
Evaluation	-	-	-	-	-	-	-	-
Creation	-	-	-	-	-	-	-	-
Total	20	20	20	20	20	20	120	%100

When Table 3 is examined, 120 unit evaluation questions from a total of 6 units were analyzed. Of the unit evaluation questions, 13 (10.83%) were at the recall stage, 50 (41.66%) at the comprehension stage, and 57 (47.50%) at the application stage.

Figure 4. Analysis of Unit Assessment Questions in the 8th Grade Mathematics Textbook According to the Revised Bloom's Taxonomy

When Figure 4 is examined, it is seen that the unit evaluation questions are mostly in the application, then in the comprehension and at least in the recall step. There were no questions in the analyzing, evaluating and creating steps.

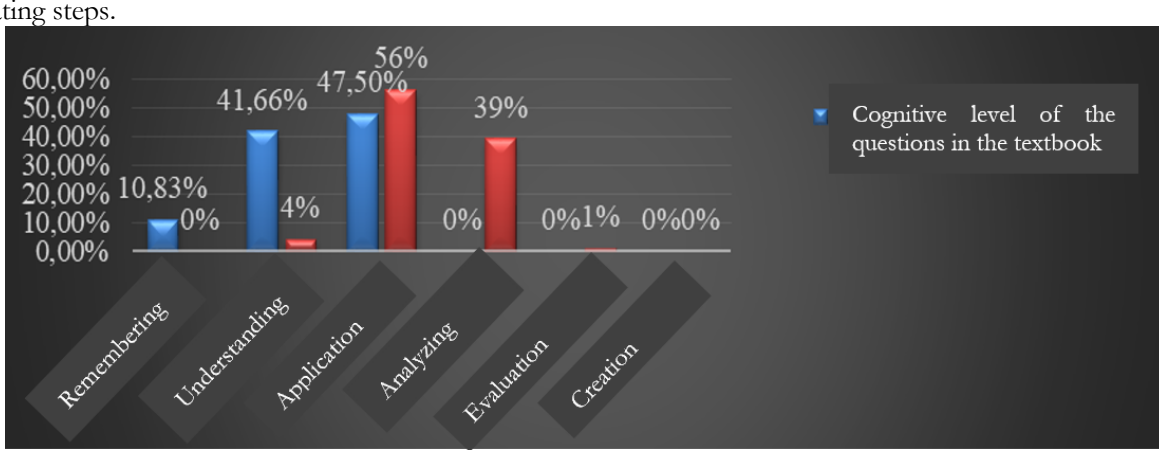

Figure 5. Comparison of the Cognitive Levels of 2018-2022 Central Exam Mathematics Questions and Unit Evaluation Questions in the 8th Grade Mathematics Textbook

When Figure 5 is examined, it is seen that both the unit evaluation questions in the mathematics textbook and the central exam mathematics questions are mostly at the application level. While there were many questions at the analyzing level in the central exam, there were no questions at the analyzing level in the textbook. While there were questions at the recall level in the textbook, there were no questions at the recall level in the central exam.

Findings Regarding the Opinions of Mathematics Teachers on the Questions in the 8th Grade Mathematics Textbooks

In the interview with the participants, their opinions on whether or not to use the textbook as the main source, the quality, quantity, achievement appropriateness of the questions in the textbooks and the relationship with the central exam were included. According to the findings obtained from the opinions of the participants, most of the participants (f=22) do not use textbooks as a basic source. The reasons of the participants who do not use the textbook as a main source are; not being suitable for LGS (High school entrance exam; original in Turkish) (f=19), inadequate subject expression (f=10), inadequate questions (f=17). Some of the participants (f=8) use the textbook as the main source. The justification of the teachers who use the textbook as the main source is that it follows the curriculum (f=5) and is suitable for the student. Direct quotations from the participants' opinions are as follows.

P22: "I never use the textbook because the number and quality of questions are not suitable for the system. I need additional resources and I use additional resources. LGS and textbooks are very different. In my opinion, it is impossible for a child who only prepares for the exam from the textbook to pass LGS."

P2: "I use the textbook as the main source because I follow the curriculum and my students' level is a bit low. Apart from the textbook, I also use auxiliary test books to do more activities, solve questions, and see different question styles."

Table 4. Opinions on the Central Exam Mathematics Questions and the Questions in Secondary School 8th Grade Mathematics Textbooks

Themes	Codes	*f*	Sum of codes	
			f	%
Adequate	Using the questions in the textbook in the lesson	13		
	Finding the questions in the textbook appropriate to the objectives	9		

	Finding the questions in the textbook sufficient in the terms of quantity	8		
	Finding the question variety in the textbook sufficient	5	43	23
	Finding the questions in the textbook appropriate to the student level	5		
	Finding the questions in the textbook sufficient in preparation for the central exam	3		
Inadequate	Finding the questions in the textbook insufficient in preparation for the central exam	27		
	Finding the question types in the textbook insufficient	25		
	Finding the questions in the textbook inadequate in terms of quantity	22		
	Finding the lower level of the questions in the textbook	20		
	Using additional resources other than the textbook	19	141	77
	Not using the questions in the textbook in the lesson	17		
	Lack of skill-based questions in the textbook	11		

As a result of the interviews with the participants, it was seen that 23% of the participants stated that the questions in the textbook were sufficient and 77% stated that they were insufficient. The teachers who reported that the questions in the textbook were sufficient reported that they used the questions in the textbook in the lesson (f=13), they found the questions sufficient in preparation for the central exam (f=3), they found the questions sufficient in quantity (f=8), they found the question variety sufficient (f=5), they found the questions appropriate for the student level (f=5) and they found the questions appropriate for the achievements (f=9). Direct quotations from the participants' opinions on finding the questions in the textbook sufficient are below.

P7: "I think the questions are sufficient and provide the basic learning outcomes. Therefore, after we have already covered the subject, we definitely go over the questions. I like the questions in the book in terms of giving achievements."

P2: "I think the questions are sufficient, I think they are good in quality, but there is not enough variety. It would be better if more different kinds of questions were added."

P11: "Obviously, it is ideal in terms of comprehending the subject, you cannot solve skill-based questions without learning the subject anyway. In this respect, textbooks should not be thrown aside, they should be utilized."

The participants who expressed opinions that the questions in the textbook were insufficient stated that they did not use the questions in the textbook in the lesson (f=17), that the textbook did not include skill-based questions (f=11), that they found the questions in the textbook insufficient in terms of quantity (f=22), that they found the questions in the textbook low level (f=20), that they found the question variety in the textbook insufficient (f=25), that they turned to additional sources other than the textbook (f=19) and that they found the questions in the textbook insufficient in preparation for the central exam (f=27). Direct quotations from the participants' opinions on finding the questions in the textbook insufficient are below.

P12: "The number of questions is not sufficient in any way. It is also very weak in terms of quality. It should include more examples that will develop different solutions to the subject. Skill-based questions that require logic and reasoning should be included. Because this is how math questions come in the exam"

P18: "I never solve the questions in the textbook. I had each class buy 3 source books for the course and to solve them in the course. We solve them."

P17: "There are always questions in the textbook that consist of certain patterns and never reflect the exam. There is not even one example in the school book of the question styles that students need to solve. It is far away from the exam and we are forced to turn to additional resources. Textbooks should be adapted to today's system as soon as possible and be a guide for teachers."

P1: "I assign the questions in the textbook as homework after explaining the subject and then I solve the questions I set in class. The questions I research and solve for the students are exactly the questions that will improve my students. The questions in the book are not quite like that, but it is still good for them to fully grasp the acquisitions. In addition, they do not leave a solution place in the questions in the book, there is so little space that it is difficult for me to control. And there are always questions in the same style, children get bored while solving them."

Discussion and Conclusion

According to the results of the research, according to the Revised Bloom's Taxonomy, 4% of the questions asked in the central exams for secondary education institutions in the last five years (2018-2022) were at the level of understanding, 56% at the level of application, 39% at the level of analyzing and 1% at the level of evaluation, and no questions were asked at the level of recall and creation. In the 8th grade mathematics textbook, 10.83% of the unit evaluation questions were at the level of recall, 41.66% at the level of comprehension, 47.50% at the level of application, and no questions were asked at the level of analysis, evaluation and construction. It was identified that higher level questions were included in the central exam compared to the textbook. It was also determined that the textbook was not used as the main source by the teachers on the grounds that it was insufficient to prepare students for the central exam. However, it is a normal situation that the questions asked in the central exam and the questions in the textbook are qualitatively different from each other. The problem that emerges here is that teachers do not use the textbook as a result of exam-oriented education, the textbook is garbage and students who are not prepared for the exam are neglected.

In this study, it was seen that the questions asked in the central exam were mostly at the application and analysis level, only one question was found at the evaluation level, and no questions were found at the creation and recall level. It was determined that the questions were concentrated at the application and analyzing level. Similar to the results of this study, Ekinci and Bal (2019) examined the 2018 central exam questions according to Bloom's Taxonomy and found that the questions were asked at the analyzing and application levels, and there were no questions at the recall and comprehension levels. Again, Öztürk (2020) examined the 2018 and 2019 transition to secondary education institutions central exam questions according to the PISA mathematics literacy proficiency scale and concluded that the questions were generally at the first three levels requiring sequential decision-making, determining the solution method of the problem and application skills; questions at the 4th, 5th and 6th levels requiring metacognitive knowledge and skills were less common. Similarly, in Üzümcü and İpek's (2022) study, no questions at the recall and creation levels were found in the central exam questions.

As a result of this study, it was seen that the unit evaluation questions in the textbooks examined were at the level of recall, comprehension and application. There were no questions at the level of analyzing, evaluating and creating in the textbooks. It was seen that the questions in the mathematics textbook were at a low level. This result of the study is supported by the result of Üredi and Ulum' study (2020). Arslan and Özpınar (2009) stated that the questions in the mathematics textbook did not go beyond the application stage, and Bakılan Mutu (2008) stated that the questions in the textbook were low-level and did not match the multiple-choice question style. These results support the results of the current study. Similarly, Şaban (2019) examined the sample questions and problems in the textbook according to PISA mathematics proficiency levels and stated that the questions in the textbook were at the lower level and that there were no high-level questions. Supporting this result of the study, İskenderoğlu and Baki (2011) examined the questions in the textbook according to the PISA mathematics proficiency level and concluded that the questions in the textbook remained at a low level and that the book did not include questions and activities that would develop higher level thinking skills.

In this study, while 39% of the central exam questions were at the analyzing level, it was seen that there were no questions at the analyzing level in the mathematics textbook. Azili and Tutkun (2021) reported in their study that the questions in the central exam were highly discriminative, and they measured high-level skills, but they were not compatible with the textbooks. Again, this result is supported by the result of Etyemez's (2021) study, which shows that while most of the questions in the textbooks are at the comprehension level, questions at the application and analysis level are included in the exam. The results of the study by Kablan and Bozkuş (2021), which examined the opinions of students and teachers on central exam questions, also support the results of the present study in that the questions in the central exam were more difficult than the questions in the textbook and included several acquisitions together. Dönmez and Dede (2020) examined the central exams according to mathematical competencies and concluded that questions measuring logical competence were mostly included in the exam. Bingölbali and Özdiner (2022) found that the mathematics textbook did not include activities that require higher-order thinking skills such as effective problem solving and mathematical modeling. Again, in Erden's (2020) study examining teachers' opinions on skill-based questions in mathematics lessons, teachers reported that textbooks were insufficient in providing guidance on skill-based questions for the exam. All these research results are similar to the results of the current study.

In this study, it was revealed that most of the participants did not use textbooks as a main source. The reasons given by the participants who did not use the textbook as the main source were listed as the textbook was not suitable for LGS, the subject expression was insufficient, and the questions were insufficient. Similar to the results of this study, 94% of the mathematics teachers who participated in Özmantar et al.'s (2017) study found the questions in the textbook insufficient in terms of quality and quantity in preparation for the exam. The results of Korkmaz et al.'s (2020) research on the evaluation of secondary school mathematics textbooks by mathematics teachers support the results of this study, and the majority of the teachers stated that the questions in the textbook were not suitable for LGS, so they did not use the textbook actively in the lesson. Katipoğlu and Katipoğlu (2016) interviewed teachers and students about the textbook and reached similar results with those of the present study. Özmantar et al. (2017), according to the results of their research, 80% of the teachers stated that they used source books other than the textbook. Again, Korkmaz et al. (2020), in their research on the evaluation of teachers' views on mathematics textbooks, reported that the majority of teachers did not use the textbook actively, used textbooks mostly to give homework to students, and turned to additional resources. Very few of the participants stated that they used the textbook as the main source. The justification of the teachers who use the textbook as the main source is that it follows the curriculum and is suitable for the student. As a matter of fact, Turan (2019) reported in their study that the majority of teachers stated that the mathematics textbook meets the learning outcomes. Taşdemir et al. (2018) found that the content of the 5th grade mathematics textbook is compatible with the learning outcomes and the activities are appropriate for the student level. Tutak and Güder (2012), in their interviews with 5th grade mathematics teachers on the textbook, concluded that most of the teachers used the textbook as a primary source. The reason why the results do not overlap with the results of this study may be that the central exam is not yet on the agenda of students and teachers in the 5th grade and that the textbook is sufficient to meet this need since teachers are more achievement-oriented. According to the research results of Çetin and Ünsal (2019), the success of students in central exams is paramount of importance for the prestige of teachers, and for this reason, teachers reported that they made the education and training process exam-oriented in order to achieve success in the exam. In this respect, the research results are similar. Similarly, in Güler et al.'s (2019) study, it was stated that central exams are at the focus of teachers' teaching activities and that teachers need questions that require high-level reasoning and logical inference to prepare students for the exam. The fact that students and teachers, particularly in the 8th grade, think exam-oriented, turn to additional resources in this direction, and work on as many central exam-style skill-based questions as possible can be considered as the reason why the textbook is not preferred. According to the results of Gökçek and Karadeniz's (2013) research on the reasons for preferring alternative sources instead of textbooks, most of the students stated that they found the textbooks inadequate. The students stated that they preferred alternative sources because they included examples appropriate to the question formats in the exam.

As a result, it was revealed that the central exam includes higher level and comprehensive questions that include several acquisitions compared to the textbook. For this reason, it was identified that the textbook was not used as the main source by the teachers on the grounds that it was insufficient to prepare students for the central exam. However, the questions in the textbook should include the questions in the central exams and lower level acquisitions. While the questions in the central exams are used for the selection and placement of students, the questions in the textbooks are used to measure whether students have acquired the learning outcomes. The problem is that teachers do not use the textbook as a result of exam-oriented education and neglect students who are not prepared for the exam. When the literature is examined, it is seen that there is a misconception among the researches and teachers that the textbook should be compatible with the central exam. The questions in the textbook can guide students preparing for the exam. However, questions that can measure basic mathematics outcomes should also be included in the textbook.

Recommendations

Considering the results of the research, the following suggestions were made.

1. Unit evaluation questions in the textbooks can be updated to include examples of all cognitive domain steps.
2. Sections consisting of skill-based questions can be added to the assessment and evaluation sections of the textbooks to make the textbooks more attractive for students in preparation for the central exam.

3. Textbooks can be enriched by including questions in the format of the central exams held in Türkiye and international exam questions.
4. In addition to the textbooks, preparation books for the central exams, which contain only questions and activities, have started to be provided for students since 2022. This implementation can be maintained.
5. Teachers can be informed about the function of textbooks and the exam-oriented education and training process, so that they can actively use textbooks and students who are not prepared for the exam can gain the specified gains.
6. In this study, mathematics textbooks and central exam mathematics questions were examined. Similar studies can be conducted for other fields.

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This article is derived from the first author's master's thesis. The researchers contributed equally to the planning, execution and writing of this research.

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The researchers do not have any financial or personal conflicts of interest with other institutions and individuals related to the research.

Ethics Committee Declaration

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TÜRKÇE GENİŞLETİLMİŞ ÖZET

İlköğretim 8. Sınıf öğrencileri sınavla öğrenci alacak ortaöğretim kurumlarına ilişkin merkezi sınava girerek sınav sonucunda liselere yerleşmektedir. Bu sınavın sonucunu belirleyen derslerden biri de matematik dersidir. MEB'in (2021) yayınladığı rapora göre sınavla öğrenci alacak ortaöğretim kurumlarına ilişkin merkezi sınavda 20 soruluk matematik testinde doğru cevap ortalaması 7,56'dır. PISA (Uluslararası Öğrenci Değerlendirme Programı) 2018 sonuçlarına göre Türkiye matematik alanında 79 ülke arasında 42. sırada ve 37 OECD ülkesi arasında 33. sırada yer almıştır (Koçak, 2022). TIMSS (Uluslararası Matematik ve Fen Eğilimleri Araştırması) 2019'da Türkiye sekizinci sınıf matematik değerlendirmesinde 39 ülke arasından 20. sırada yer almıştır (Koçak, 2022).Türkiye PİSA ve TIMSS sınavlarında matematik becerilerinde OECD ülkelerinin puan ortalamasının gerisinde kalmaktadır (Sarıer, 2021). Bu bilgiler ışığında Türkiye'de matematik eğitiminde problemlerin devam ettiği söylenebilir.

Diğer bir problem ise ders kitabının öğrencileri merkezi sınava hazırlamada yetersiz kaldığı gerekçesiyle öğretmenler tarafından ana kaynak olarak kullanılmamasıdır. Oysa ders kitabında yer alan sorular; kazanımların düzeyine ve türüne göre yer almaktadır. Öğretmenlerin sınav odaklı eğitim öğretim yapması (Çetin ve Ünsal, 2019), toplamda matematik öğrencilerin matematik puan ortalamalarına ve ders kitaplarının kullanımına olumsuz yansıması beklenen bir durumdur. Bu kapsamda merkezi sınavda ve ders kitaplarında yer alan soruların analiz edilerek ders kitaplarının işlevi konusunda öğretmenlerin bilgilendirilmesi önem arz etmektedir. Araştırma nitel araştırma desenlerinden doküman incelemesi ile gerçekleştirilmiştir. Araştırmada doküman olarak 2018-2022 yıllarında yapılan "Sınavla Öğrenci Alacak Ortaöğretim Kurumlarına İlişkin Merkezî Sınav Sayısal Bölüm A Kitapçığı" ve Millî Eğitim Bakanlığı Talim ve Terbiye Kurulunun kararı ile ders kitabı olarak kabul edilmiş 8. sınıf matematik ders kitabı kullanılmıştır. Ayrıca dokümanları desteklemek için öğretmen görüşleri alınmıştır. Araştırma verilerinin analizinde betimsel analiz kullanılmıştır.

Bu araştırmanın amacı, sınavla öğrenci alacak ortaöğretim kurumlarına ilişkin merkezi sınav matematik soruları (2018-2022) ile 8. sınıf matematik ders kitabında yer alan soruları; Yenilenmiş Bloom Taksonomisi ve öğretmen bağlamında bütünleşik incelemektir. Bu bağlamda araştırma soruları aşağıdaki gibi oluşturulmuştur.

S1. Sınavla öğrenci alacak ortaöğretim kurumlarına ilişkin merkezi sınav matematik soruları ile 8. sınıf matematik ders kitabındaki soruların Bloom Taksonomisi bağlamında düzeyleri nedir?

S2. Ortaokul 8. Sınıf matematik dersine giren matematik öğretmenlerinin ortaokul 8. Sınıf matematik ders kitaplarında yer alan sorulara yönelik görüşleri nelerdir?

Araştırma sonuçlarına göre son beş yılda (2018-2022) ortaöğretim kurumlarına ilişkin merkezi sınavlarda sorulan soruların %4' ünün anlama, %56'sının uygulama, %39'unun analiz etme ve %1'inin değerlendirme düzeyinde olduğu, hatırlama ve oluşturma basamağında soru sorulmadığı belirlenmiştir. 8. sınıf matematik ders kitabındaki ünite değerlendirme sorularının ise %10,83 'ünün hatırlama, %41,66 'sının anlama, %47,50'sinin uygulama düzeyinde olduğu belirlenmiş analiz etme, değerlendirme ve oluşturma basamağında soruya rastlanmamıştır. Merkezi sınavda, ders kitabına kıyasla daha üst düzey sorulara yer verildiği tespit edilmiştir. Ders kitabının öğrencileri merkezi sınava hazırlamada yetersiz kaldığı gerekçesiyle öğretmenler tarafından ana kaynak olarak kullanılmadığı tespit edilmiştir.

Bu araştırmada merkezi sınavda sorulan sorularının en çok uygulama ve analiz etme basamağında olduğu görülmüş, sadece 1 tane değerlendirme düzeyinde soruya rastlanmış, yaratma ve hatırlama basamağından hiç soruya rastlanmamıştır. Soruların uygulama ve analiz etme düzeyinde yoğunlaştığı görülmüştür. Alanyazında yer alan araştırmalar araştırmanın bu sonucunu desteklemektedir (Ekici ve Bal, 2019. Öztürk, 2020; Üzümcü ve İpek, 2022). Bu araştırmada kullanılan ders kitabındaki ünite değerlendirme sorularının hatırlama, anlama, uygulama düzeyinde olduğu görülmüştür. Ders kitaplarında analiz etme, değerlendirme ve yaratma basamağında soruya rastlanmamıştır. Matematik ders kitabındaki soruların alt düzeyde kaldığı görülmüştür. Araştırmanın bu sonucu alanyazındaki araştırmalar desteklemektedir (Arslan ve Özpınar, 2009; Bakılan Mutu, 2008; İskenderoğlu ve Baki, 2011; Şaban, 2019).

Bu araştırmada katılımcıların çoğunun ders kitaplarını temel kaynak olarak kullanmadıkları tespit edilmiştir. Ders kitabını temel kaynak olarak kullanmayan katılımcıların gerekçeleri; LGS' ye uygun olmama, konu anlatımının yetersiz olması, soruların yetersiz olması şeklindedir. Özmantar ve arkadaşlarının (2017) araştırmasına katılan matematik öğretmenlerinin %94' ü ders kitabındaki soruları nitelik ve nicelik açısından sınava hazırlıkta yetersiz bulmuştur. Korkmaz ve arkadaşlarının (2020), ortaokul matematik ders kitaplarının matematik öğretmenlerin

tarafından değerlendirilmesi yönünde yaptıkları araştırma sonuçlarına göre, öğretmenlerin büyük çoğunluğu ders kitabındaki soruların LGS' ye uygun olmadığı bu sebeple ders kitabını derste aktif bir şekilde kullanmadıkları yönünde görüş bildirmiştir. Katipoğlu (2016) araştırmasında ders kitabı hakkında öğretmen ve öğrencilerle görüşmüş benzer sonuçlara ulaşmıştır.