



Opinions of Exam Question Writers and Teachers on Skill-Based Science Questions

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Abstract

This study aims to obtain and compare the opinions of exam question writers and teachers on skill-based exam questions. 24 science teachers and 11 context-based exam question writers participated in the study, which was carried out according to the convergent parallel design. Opinions of both parties on the skill-based exam questions were collected and compared with the qualitative and quantitative data. Semi-structured interview forms prepared by the researchers were used as a data collection tool, and the collected answers were analysed by content analysis. In addition, the teacher opinion questionnaire on skill-based exam questions was applied to both parties and a significant relationship was sought. Although there was a significant difference between the opinions of the exam question writers and the teachers on life-based questions, their opinions on the positive and negative aspects of life-based questions show parallelism. Teachers think that the new generation questions are unnecessarily long and time-consuming and that the quality of the questions in the market should be increased. It is recommended that more detailed studies on skill-based exam questions and the foundations on which they are based be carried out. Also, providing teachers with more in-service training on skill-based exam question writing and studying students' views would contribute to the field.

Key Words: Assessment and evaluation, LGS, skill-based exam questions

Introduction

The rapid change in the constantly changing and developing world, the changing needs of the individual and society, and the innovations and developments in learning-teaching theories and approaches directly affect the roles expected from individuals who develop and change with the world. This change defines individuals who produce knowledge, can use it functionally in life, can use 21st-century skills effectively, and contribute to the society in which they live in terms of knowledge, skills, production and values according to Turkish Ministry of National Education [MNE] (2018). According to this, it is aimed to provide students with daily life skills within the scope of the science course. Situations and events encountered in life also include the reflections of science on daily life (İlhan & Hoşgören, 2017). Through scientific processes in

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science, students acquire necessary life skills and can use these skills in daily life (Kaptan & Korkmaz, 2001). Measuring these skills is also very important in terms of revealing the efficiency of education. Because thanks to measurement and evaluation, it is determined that the students gain the features that are aimed to be gained, that is, how much they have gained (Gündoğdu, Kızıldaş & Çimen, 2010).

Exams such as Programme for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS) aim to measure how well students can apply the information they have learned to daily life, rather than memorisation or recall skills. It is seen that a country has updated its education system accordingly in order to be successful in the PISA exam (Ünal, 2019). Evaluation of recent PISA 2018 and TIMSS 2019 research results show that Turkey's country score and ranking in the field of science literacy have increased significantly (MNE, 2019; 2020). So much so that Turkey's average science score has reached its highest level since 2006. It can be said that the increase in the success in the field is a result of the investments made in the physical and human infrastructure of education in recent years, as well as the curricula and training processes updated by MNE. Curricula have been updated by the MNE to place more emphasis on the role of knowledge in daily life (MNE, 2018). Similarly, skill-based exam questions were needed to measure daily life skills in the central exam (High School Entrance System) exam, which has been implemented since 2018. In particular, the central examination conducted within the scope of the central exam and the large-scale monitoring studies conducted for the first time at all three levels were also structured according to the new approach (MNE, 2020).

Theoretical Framework and Literature Review

When the questions in the international and national exams are examined, it can be stated that there is a tendency towards context, life or skill-based exam questions. Because traditionally defined questions cannot connect with real life, it is crucial to use questions that cover problems involving students' daily life contexts (Benckert, 1997). Asking such questions to students distracts them from answering based on rote and formula and encourages them to reason (Ahmed & Pollitt, 2007; Elmas & Eryılmaz, 2015; Sak, 2018). With context-based questions, it is aimed that students associate information with daily life, analyse and infer, and focus more on the content of processes and facts. According to the context-based approach, Bennett and Holman (2003) argue that the individual gives meaning to the logical and meaningful relationships about knowledge by looking at it from their own perspective. In other words, the context-based learning approach is based on the relationship between knowledge and the real-life situations the student encounters (Kabuklu & Kurnaz, 2019). The REACT strategy that is recommended with this approach (Çepni, Özmen & Ayvacı, 2011) consists of Relating, Experiencing, Applying, Cooperating and Transferring steps, with the transfer-

ring step being the most emphasised (Akpınar & Kasım, 2017; Benckert, 1997; Çepni et al., 2011). It can be said that the context-based learning approach differs from the constructivist approach, especially in terms of transferring knowledge from the lesson to real life and from real life to the lesson. In measuring and evaluating the activities carried out for the context-based approach, assessment and evaluation in accordance with the context-based learning approach should be done, and the transfer step should be carefully examined in this process. The qualities that the questions should have in the context-based assessment and evaluation approach are that (Elmas & Eryılmaz, 2015) it should contain a problem that concerns the individual or society while posing the problem, science concepts, formulas and laws should be related to the context, and the answer should come out as a result of a thinking process instead of memorisation.

For a question to be a high-quality context-based question, it is expected to meet some additional criteria. Although these additional criteria are not clearly stated in the literature, there are opinions that they should be aimed at higher-order thinking skills and should approve a transfer of knowledge that can be used in real life (Ar, 2019; Elmas & Eryılmaz, 2015). In addition, the fact that the context-based learning approach is also used as life-based in the literature suggests that there is no significant difference between these two learning approaches. However, especially since 2018, with the change in the entrance examination system to high schools in Turkey, the concept of “Skill-based exam questions” has emerged apart from the concepts of context-based and life-based. Although there is no definition in the literature regarding this concept, it is seen that the measurement and evaluation system in our country is also changing in line with this understanding, with sample questions, central exam questions and skill-based exam questions for 5th, 6th and 7th grades published by MNE since October 2017, when the change in the exam system was announced. When the sample science test questions published in this period are examined, skill-based exam questions are close to context-based questions. However, it can be seen that skill-based exam questions also have important differences from context-based questions. While skill-based exam questions try to transfer knowledge to real life with context-based questions, associate them with a context from daily life and are similar to TEOG questions in terms of being questions that measure relatively high-level skills (Ar, 2019), they are limited to multiple-choice questions only, contexts and question frames are used in the student’s daily life. It can also be stated that there are important differences such as not having to confront him in his life and being limited to shorter contexts than context-based questions.

The skill-based exam questions published for the science course are mostly composed of experimental setups, use science concepts in real life, and tend to the application areas of knowledge. In this sense, it is understood that the skills mentioned in the definition of skill-based exam questions in MNE are field-specific skills emphasised in the curriculum (Ar et al., 2023; MNE, 2018), and they aim to measure and evaluate

skills such as scientific process skills, life skills and engineering design skills. Skill-based exam questions aim to measure the features necessary for the correct use of information when and where it is needed, which includes learning information and requires a performance where high-level skills are used effectively (Aksoy, Akbaba & Kılcan, 2019, p.10).

In this context, the study aims to determine the opinions of the question writers and teachers about the skill-based science questions used in our country. When the literature is examined, it has been determined that the researchers mostly investigated the effect of the context-based approach on student achievement in science lessons (Acar & Yaman, 2011; Ayvacı & Bilge, 2018; Ayvacı, Nas & Dilber, 2016; Karşlı & Saka, 2017; Sak & Gürel, 2018). Topuz et al. (2013) conducted a study on the applicability of the context-based approach to the science course, regarding teachers' opinions. On the other hand, there are a limited number of studies in the literature on the evaluation dimension of the context-based approach or the context/life/skill-based exam questions. When the studies on this subject are examined, Erden (2020) and Azili and Tutkun (2021) examined the opinions of the teachers on the skill-based exam questions, while Ar (2019) investigated the opinions of the teachers about the life-based open-ended question writing course. Sanca et al. (2021), on the other hand, analysed skill-based exam questions according to Bloom's taxonomy and concluded that most of them were at the level of understanding. Ülger et al. (2022) reviewed the exam questions prepared by teachers who are trained in context-based question writing and concluded even pre-trained teachers failed to generate a satisfactory number of context-based questions in their exams. However, no study was found in which the views of teachers and question writers were examined together. In this context, it is thought that it will be important to include the study conducted to obtain and compare the opinions of the question writers and teachers regarding the skill-based exam questions in the literature. It is thought that determining and comparing the perspectives of the question writers and the teachers who guide the students in the solution of the questions on the skill-based exam questions will contribute to the development of the skill-based exam questions by considering different perspectives. For that reason, the main problem of this study is "Is there a difference between the opinions of question writers and teachers on skill-based exam questions?."

In line with this main purpose, the answers to these questions are sought:

1. What are the opinions of the question writers and teachers on skill-based exam questions?
2. Is there a significant difference between the views of teachers and question writers on skill-based exam questions?

Methodology

The parallel design approach, which converges from the mixed method research

designs, was used in the research. In this design, quantitative and qualitative data are collected simultaneously, the qualitative and quantitative data collected separately are analysed separately, and the qualitative and quantitative parts are combined in the comments section (Çepni, 2018, p.153). The reason for choosing the convergent parallel design in this study is to collect the opinions of teachers and question writers against skill-based exam questions simultaneously and for the same purpose with quantitative and qualitative data collection tools. In this context, the use of convergent parallel design in the study was preferred in terms of analysing the data together.

Participants

The study group of the research consists of 24 science teachers and 11 skill-based exam question writers working in Bursa in the 2019-2020 academic year. The question writers consisted of 11 science teachers who had attended a 60-hour question preparation course on skill-based exam question writing beforehand, who continued to write questions after the training and had at least two years of question writing experience. The teachers, on the other hand, were determined by the snowball method voluntarily among the teachers working in the same schools as the question writers and having similar demographic characteristics. The demographic information of the participants is presented in Table 1.

Table 1.
Demographic Information of Participants

Variable			N	%
Gender	Male	Teacher	15	62.5
		Question writer	6	54.5
	Female	Teacher	9	37.5
		Question writer	5	45.5
Experience	0-5 years	Teacher	8	33.3
		Question writer	0	0
	6-10 years	Teacher	7	29.2
		Question writer	3	27.3
	11-15 years	Teacher	5	20.8
		Question writer	4	36.3
	15+ years	Teacher	4	16.7
		Question writer	4	36.3
Degree	Bachelor's	Teacher	19	79.2
		Question writer	7	63.7
	Master's	Teacher	4	16.7
		Question writer	4	36.3
	PhD	Teacher	1	4.1
		Question writer	0	0

Data collection

The questionnaire and structured interview form prepared by the researchers of this study were used as data collection tools in the study. The questions prepared online by the researchers consist of ten survey questions and four open-ended questions. The questions were prepared to determine the teachers' thoughts on skill-based exam questions, the frequency of use of such questions, and their benefits and weaknesses for students. The survey questions consist of 4 questions aiming to reveal the demographic characteristics of the participants and 10 five-point Likert-type questions.

The interview questions, on the other hand, consist of four open-ended questions that investigate the reasons for the opinions in order to better understand the data collected with the help of the questionnaire. The face and content validity of the questions was provided by the opinions of three field expert academicians who had worked on the subject and four question writer teachers with at least 10 years of experience. As a result of the corrections made in line with the expert opinion, the Cronbach alpha reliability coefficient of the questionnaire was found to be .84.

Data analysis

Open-ended questions containing the opinions of teachers and question writers on skill-based exam questions were analysed by the content analysis method. For this purpose, categories and codes were created in order to gather similar data from the collected qualitative data under certain concepts and themes (Çepni, 2014). The distribution frequencies of the data into these codes and categories were interpreted. These interpretations were exemplified, and teachers are coded as (T) and the question writers as (QW). The data obtained from the questionnaire were analysed with descriptive analyses to determine the opinions of teachers and question writers on skill-based exam questions. In addition, a t-test was applied to determine the difference in opinion between the two groups. In order to determine the statistical method to be used in the analysis of quantitative data, the normality distribution was examined and since it was seen that the kurtosis (-.233) and skewness (-.084) values of the data were between +1 and -1, it was assumed that the data were normally distributed. However, the fact that the mode (37.10), median (36.50) and mean (37.12) values of the data are close to each other also supports the normal distribution of the data (Çepni, 2014).

Findings

The findings of the study were prepared for the following research questions: "What are the opinions of the question writers and teachers about skill-based exam questions?" and "Is there a significant difference between the views of teachers and question writers on skill-based exam questions?"

Findings on the question of “What are the opinions of the question writers and teachers about skill-based exam questions?”

In this section, the findings obtained from the questionnaire and interview forms regarding the opinions of the question writers and teachers on the skill-based science questions are given. At this point, the opinions of the teachers and the question writers were taken and the opinions of the two groups were examined. Table 2 presents the descriptive results of the scores obtained by the teachers and question writers from the opinion survey.

Table 2.

Descriptive Findings Obtained from the Opinion Questionnaire

Group	N	\bar{x}	sd
Teacher	24	37.12	6.50
Question writer	11	43.27	4.42

When Table 2 is examined, when we look at the average scores of the question writers and teachers' views on skill-based exam questions, it is seen that the average score of the teachers is 37.13 and the average score of the question writers is 43.27. In this context, considering that the maximum score that can be obtained from the questionnaire is 50, it can be stated that teachers have positive opinions above the average. It is understood that the question writers have higher scores than the teachers and they have a positive opinion about the skill-based exam questions. At this point, it can be stated that the question writers have a more positive view towards skill-based exam questions than the teachers.

In the interview questions, which is another data collection tool, the teachers and question writers were asked “What are the skills to be measured with skill-based exam questions?” The findings obtained from their opinions regarding the question are given in Table 3 and Table 4, respectively.

Table 3.*Teachers' Views on Skills to be Measured with Skill-based exam questions*

Theme	Code	f	%	Example Teacher View
Skill	Metacognitive thinking	6	25	(T7) <i>I think that the analysis, synthesis and evaluation steps are at the forefront, that the knowledge does not remain only at the level of understanding and comprehension.</i>
	Reasoning	3	12.5	(T10) <i>Reasoning skills of students</i>
	Science process skill	2	8.33	(T21) <i>Scientific process skills, design skills...</i>
	Problem-solving	2	8.33	(T2) <i>To be able to establish the necessary sequence in problem-solving</i>
	Critical thinking	1	4.16	(T5) <i>High-level and critical thinking</i>
	Multidimensional thinking	1	4.16	(T18) <i>Multidimensional thinking and gaining different perspectives</i>
	Irrelevant answers	9	37.5	(T19) <i>The ability to achieve something</i>
Total		24	100	

When Table 3 is examined, it is seen that science teachers use metacognitive thinking skills 25% frequently, reasoning skills 12.5%, and scientific process skills or problem-solving skills 8.33% in their views on skill-based exam questions. When the findings are examined, it can be stated that the teachers mostly express their metacognitive thinking skills, and they focus on very few skills. Another important point is that 9 of the teachers gave answers that are not related to skills or that do not express any skills. None of the teachers participating in the study addressed the skills emphasised in the curriculum such as 21st-century skills, life skills, reasoning skills, or engineering design skills. It did not express more than one skill among the participants, which could be included in more than one code. Table 4 reflects the views of the question writers on this issue.

Table 4.

Views of Question Writers on Skills to be Measured with Skill-based exam questions

Theme	Code	f	%	Example Question Writer View
Skill	Metacognitive thinking	5	33.3	<i>(QW8) Ability to transfer knowledge to daily life, high-level thinking</i>
	Problem-solving	4	26.7	<i>(QW5) ... recognising the problem and developing solutions.</i>
	Science process	2	13.3	<i>(QW1) Science process skills</i>
	Critical thinking	1	6.7	<i>(QW2) Critical and creative thinking</i>
	Reasoning	1	6.7	<i>(QW2) ...acquiring different perspectives, reasoning.</i>
	Engineering and design	1	6.7	<i>(QW4) ...engineering or design skills</i>
	Life skills	1	6.7	<i>(QW4) ...changing variables in a life event, life skills...</i>
Total		15	100	

When Table 4 is examined, in the opinions of the question writers on skill-based exam questions, metacognitive thinking skills are used 33.3%, problem-solving skills 26.7%, and scientific process skills 13.3%. At this point, it is seen that the question writers have a comparable situation to the teachers and similar skills are expressed.

Question writers and teachers asked, “What are the positive aspects of skill-based exam questions?” The findings obtained from the analysis of the answers given to the question are given in Table 5 and Table 6.

Table 5.

Teachers' Views on the Question "What are the positive aspects of skill-based exam questions?"

Theme	Code	f	%	Example Teacher View
Positive aspects	Upskilling	6	25	(T2) Develops problem-solving skills.
	Transfer to daily life	6	25	(T16) It enables learning by doing and living
	Building self-confidence	4	16.67	(T12) Students gain self-confidence.
	Attracting attention	2	8.33	(T3) It makes the student pay attention to the lesson.
	Making learning easier	2	8.33	(T4) Facilitates learning with examples from daily life.
	No answer	4	16.67	
Total		24	100	

In Table 5, the teachers' views on the skill-based exam questions, the teachers stated that 25% frequently gained skills, 25% often provided transfer to daily life, and 16.67% often gained self-confidence. In addition, two participant teachers think that skill-based exam questions are positive in terms of attracting attention and facilitating learning. In this context, it can be stated that teachers emphasise the positive aspects of skill-based exam questions. However, in the study, it was understood that four teachers left the question unanswered.

Table 6.

Opinions of the Question Writers on the Positive Aspects of Skill-based exam questions

Theme	Code	f	%	Example Question Writer View
Positive aspects	Transfer to daily life	6	50	(QW5) Associating learned information with daily life
	Upskilling	3	25	(QW10) Develops metacognitive thinking skills
	Science literacy	3	25	(QW11) Makes students pay more attention to science literacy
Total		12	100	

When we look at the opinions of the question writers (Table 5), transfer to daily life with 50% frequency, skill acquisition or science literacy with 25% frequency

comes to the fore. At this point, it can be stated that the transfer code to daily life is common with teachers in the views of teachers and question writers on the positive aspects of skill-based exam questions. On the other hand, it can be stated that the opinions of the question writers on the positive aspects of skill-based exam questions are very limited.

Question writers and teachers asked, “What are the negative aspects of skill-based exam questions?” The findings obtained from the analysis of the answers given to the question are as given in Table 7 and Table 8.

Table 7.

Teachers' Views on Negative Aspects of Skill-based exam questions

Theme	Code	f	%	Example Teacher View
Negative aspects	Takes time	13	54.16	(T2) They take too much time.
	Difficult	3	12.5	(T4) Some students find them too hard to solve.
	Long	5	20.83	(T9) The questions are too long.
	Not compatible with course content	1	4.16	(T16) Sometimes it does not fit the course content and sometimes it takes a lot of time.
	None	2	8.33	(T3) No downside at all.
Total		24	100	

When Table 7 is examined, teachers stated that skill-based exam questions are time-consuming 54.16% of the time, 20.83% often long, and 12.5% often difficult. In this context, it can be stated that teachers have more negative opinions about skill-based exam questions.

Table 8.*Opinions of Question Writers on Negative Aspects of Skill-based exam questions*

Theme	Code	f	%	Example Question Writer View
Negative aspects	Unconventional	3	27.27	(QW8) It is a measurement and evaluation method that students and teachers are not accustomed to.
	Takes time	2	18.18	(QW1) May take time to resolve
	Difficult	1	9.09	(QW4) May be difficult to understand May be limited to use for each student
	Long	1	9.09	(QW4) May be boring to students because it is long
	None	5	45.45	(QW7) No downside
Total		11	100	

When we look at the opinions of the question writers in Table 8, negative opinions are less than the opinions of the teachers, but they are not unusual (27.27%) and take time (18.18%). 45.45% of the opinions of the question writers are that there is no negative aspect. In this context, the question authors emphasised an environmental negative factor that did not arise from the skill-based exam questions themselves.

Findings on the question of “Is there a significant difference between the views of teachers and question writers on skill-based exam questions?”

In this section, the findings on the relationship between the opinions of the question writers and the teachers on the skill-based science questions are given. The findings regarding the t-test results of the scores obtained by the teachers and the question writers from the opinion questionnaire are given in Table 9.

Table 9.*T Test Results Obtained from Opinion Questionnaire*

Participants	N	\bar{x}	sd	df	t	p
Teacher	24	37.1250	6.51	33	-2.835	.008
Question writer	11	43.2727				

When Table 9 is examined, it can be concluded that there is a difference between the opinions of the question writers and the teachers about the skill-based exam questions ($p < .05$) and that the opinions of the question writers towards the skill-based exam questions are more positive than the teachers.

The findings regarding the comparison of teachers and question writers regarding the skills to be measured in skill-based exam questions in interview questions, which

is another data collection tool, are given in Table 10.

Table 10.

Comparison of Teachers and Question Writers on the Skills to be Measured with Skill-based exam questions

Theme	Teacher Code	f	%	Question Writer Code	f	%
Skill	Metacognitive thinking	6	25	Metacognitive thinking	5	33.3
	Reasoning	3	12.5	Problem-solving	4	26.7
	Science process	2	8.33	Science process	2	13.3
	Problem-solving	2	8.33	Critical thinking	1	6.7
	Critical thinking	1	4.16	Reasoning	1	6.7
	Multidimensional thinking	1	4.16	Engineering and design	1	6.7
	Irrelevant answers	9	37.5	Life skills	1	6.7
	No answer	0	0			
Total		24	100	Total	15	100

When Table 10 is examined, it is seen that metacognitive thinking skill is the most repetitive skill by both teachers and question writers. In addition, reasoning, problem-solving and scientific process skills are among the other skills that are repeated by both teachers and question writers. In this context, the skills expressed by the teacher and the question writers are similar. While unrelated answers were given 9 times by the teachers in the study, it is an important finding that there were no unrelated answers by the question writers. In addition, another important finding is that although it is more common among teachers, very few participants express life skills, reasoning skills or engineering design skills in skill-based exam questions. The findings regarding the comparison of teachers and question writers regarding the positive aspects of skill-based exam questions are given in Table 11.

Table 11.

Comparison of Teachers and Question Writers on the Positive Aspects of Skill-based exam questions

Theme	Teacher Code	f	%	Question Writer Code	f	%
Positive aspects	Upskilling	6	25	Transfer to daily life	6	50
	Transfer to daily life	6	25	Upskilling	3	25
	Building self-confidence	4	16.67	Science literacy	3	25
	Attracting attention	2	8.33			
	Making learning easier	2	8.33			
	No answer	4	16.67			
Total		24	100	Total	12	100

When Table 11 is examined, the most repeated positive aspects by both teachers and question writers are skill acquisition/development and transfer to daily life. In addition, while gaining self-confidence, attracting attention and facilitating learning were other positive aspects, only science literacy was stated by the question writers. At this point, it is understood that the positive aspects are expressed more by the teachers. It can be said that it is an interesting finding that the positive aspects of skill-based exam questions are so little expressed by the question writers. The findings regarding the comparison of teachers and question writers regarding the negative aspects of skill-based exam questions are as given in Table 12.

Table 12.

Comparison of Teachers and Question Writers on the Negative Aspects of Skill-based exam questions

Theme	Teacher Code	f	%	Question Writer Code	f	%
Negative aspects	Takes time	1	54.16	Unconventional	3	27.27
		3				
	Difficult	5	20.83	Takes time	2	18.18
	Long	3	12.5	Difficult	1	9.09
	Not compatible with course content	1	4.16	Long	1	9.09
None	2	8.33	None	5	45.45	
Toplam		2	100		1	100
		4			1	

When Table 12 is examined, it is understood that the views of teachers and question writers on the negative aspects of skill-based exam questions differ. Most of

the teachers find skill-based exam questions time-consuming (54.16%). However, the opinions of the question writers on the negative aspects of skill-based exam questions focus on the fact that teachers and students are not used to such questions (27.27%). In this context, it can be said that teachers have a more negative view towards skill-based exam questions than question writers. In addition, while the negative aspects were expressed more by the teachers, it was stated less by the question writers, or it was stated that there were no negative aspects. At this point, it can be said that the question writers think that skill-based exam questions have fewer negative aspects.

Discussion and Conclusion

In the findings obtained from the study conducted with teachers and question writers, it was determined that the average score of the teachers was 37.13 and the average score of the question writers was 43.27. In this context, it can be stated that both teachers and question writers scored above average and had a positive opinion about skill-based exam questions. Azili and Tutkun (2021) found that teachers' opinions were positive in their study. Today, when the questions in national exams or the questions prepared by many question writers are examined, it is seen that there is a tendency to skill-based exam questions day by day. In parallel with this, teachers and question writers are also dealing with skill-based exam questions more, and as they use these questions, they realise their positive aspects and have a positive view of skill-based exam questions. The interviews also support this situation, namely the quantitative data. In the interview form, it is seen that the opinions of the question writer and the teachers about the skills that the skill-based exam questions want to measure are close to each other. Both teachers and question writers stated that metacognitive thinking skills, scientific process skills or problem-solving skills were used in skill-based exam questions. This situation is parallel to the conclusion reached in the studies of Sanca et al. (2021). When skill-based exam questions are examined, it is seen that they include features such as identifying the problem, observing, interpreting data, reading graphs, and determining variables. When students solve these questions, they contribute to skills such as problem-solving, scientific process or high-level thinking. In our study, the question writers think that skill-based exam questions encourage students to think at a higher level, compared to teachers. This situation points to the difference in opinions between teachers and question writers. Considering that the question writers encountered more skill-based exam questions or received training on this than the teachers, it is expected that they would emphasise the positive aspects more.

In the study, while the question writers stated that science process skills, which have a prominent place in science education programs, were developed with skill-based exam questions, the teachers did not emphasise scientific process skills at all. As a matter of fact, Karşlı et al. (2009) stated in their study that most science teachers do not know the scientific process skills theoretically. This situation shows that teachers

may have made comments with incomplete information while evaluating skill-based exam questions from this aspect. Çataldere (2022) and Ar et al. (2023), in their studies examining skill-based exam questions, revealed that these questions contain scientific process skills at various levels. In this study, the positive opinions of the question writers about the place of scientific process skills in skill-based exam questions overlap with the studies of Çataldere (2022) and Karşlı et al. (2009). From this point of view, it can be concluded that skill-based exam questions include more scientific process skills.

In addition, it was understood that the question writers and teachers had similar views on the positive aspects of skill-based exam questions, but also had different views. While the teachers emphasised the positive effect of skill-based exam questions more in the classroom, the question writers emphasised their importance in real life outside of the classroom. In terms of the opinions of the question writers, this situation is in parallel with the findings obtained in the studies carried out by Sak and Gürel (2018) and Ayvacı et al. (2016), while in terms of teachers, Azili and Tutkun (2021) and Ar (2019) reached out in terms of encouraging high-level thinking. compatible with the results. In this case, it can be concluded that the skill-based exam questions of the question writers are important in terms of transferring them to daily life, and the teachers in terms of supporting high-level thinking skills.

In the study, the opinions of the question writers and teachers about the negative aspects of skill-based exam questions differ significantly. Most teachers find skill-based exam questions time-consuming. Kurtulus and Çavdar (2011) stated that although teachers found some activities useful, they skipped and tended towards shorter-term activities because they were time-consuming. However, the opinions of the question writers on the negative aspects of skill-based exam questions focus on the fact that teachers and students are not used to these types of questions. In order for students to get used to this question type, exams prepared with context-based questions on different subjects can be applied (Elmas, 2020). Teachers can familiarise students with the questions by including skill-based exam questions in their written exams. Question writers often emphasised negative environmental factors that were not caused by the skill-based exam questions themselves. In the study, it can be said that the opinions of the question writers towards skill-based exam questions are more positive than the teachers. In other words, teachers have a more negative view towards skill-based exam questions than question writers. However, it should not be forgotten that these negative opinions of teachers may decrease as skill-based exam questions are applied.

Another research question examined whether there was a significant difference between the opinions of the question writers and teachers on skill-based exam questions. According to the data obtained from both the questionnaire and the interview form, it can be said that the opinions of the teachers and the question writers towards the skill-based exam questions are different from each other and that the question

writers have a more positive opinion. In the study of Ünal (2019), it was determined that the perspectives of teachers who received PISA-style question writing training changed positively before and after receiving training on such questions. It can be said that the study is similar to our study when we consider the teachers as untrained and the question writers as trained. One of the most important reasons for this change is that teachers do not feel sufficient for such questions. In order to generate questions that will activate students' thinking systems, teachers must first become competent in this regard (Koray et al., 2004). In Ar (2019)'s research, it was stated that the teachers who participated in the life-based question writing course stated that there were crucial differences between the questions prepared in the first and last week of the course and that they developed themselves professionally with this course. In this context, it can be said that teachers who have not received question-writing training may be biased towards skill-based exam questions. The rapid change in the question style with skill-based exam questions after the TEOG exam, where the questions were mostly at a sub-cognitive level, and the fact that the questions were more life-based and at a metacognitive level, affected the views of the teachers towards the question types they were not accustomed to. However, the opinions of teachers who write questions towards skill-based exam questions are more positive.

Conclusion

In the findings obtained from the study, the skills included in the questions were expressed by both teachers and question writers as metacognitive thinking skills, problem-solving, and scientific process skills, while life skills, reasoning skills or engineering design skills were expressed by very few participants. In this context, it is thought that the situation in the questions cannot be understood in parallel with the fact that these skills are less known by the teachers and the question writers. In addition, the nine unrelated answers given by the teachers in the study are an indication that the teachers are less familiar with the skill-based exam questions than the teachers. At this point, the fact that questions related to engineering design skills are frequently included in the central exams requires teachers and question writers to focus on this skill. Another finding obtained in the study is as follows. It is an interesting finding that both the teachers and the question writers used very few expressions regarding the positive aspects of the skill-based exam questions. Although positive features such as transfer to daily life and skill development are expressed, science literacy is an indication that both teachers and question writers have deficiencies in this regard. Finally, in the results obtained from the findings regarding the negative aspects of skill-based exam questions, it was determined that the views of teachers and question writers on the negative aspects of skill-based exam questions differed. While most of the teachers found skill-based exam questions time-consuming, the question writers focused on the fact that teachers and students were not used to these types of questions. In addition,

the use of very few negative expressions by the question writers or the fact that half of them do not express their negative side supports the quantitative findings.

Suggestions

As a result of the study, it was determined that although science teachers had positive views on skill-based exam questions as well as some negative opinions, the opinions of the question writers were more detailed and positive. In this context, it is thought that giving awareness and question-writing seminars to science teachers against skill-based exam questions will give teachers a different perspective and contribute to the teaching processes as they can consider the features they want to highlight in the assessment and evaluation process. In addition, in these trainings, bringing together academicians and question writers working in the field and conducting more in-service training and question writing activities are important for both teachers and students to refresh their theoretical knowledge and gain awareness about innovative approaches, and to approach the measurement and evaluation process with different perspectives. can be said to have positive effects.

In the next process, it can be suggested that studies be carried out in terms of the opinions of the students as well as the question writers and teachers about the skill-based exam questions. In addition, it is thought that examining the opinions of the question writers and teachers in each branch will contribute to the literature.

Limitations

This study examined and compared the opinions of professional question writers and science teachers on skill-based exam questions. For that, the sample of the study was limited to question writers who had been trained on question-writing and skill-based exam questions beforehand. This situation, along with the convenient sampling of the study limits the generalizability of the results of the study. Also, the study is limited to the opinions of Turkish science teachers on skill-based exam questions.

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