

Assessment and Evaluation Applications and Practices of Science and Physics Teachers in Online Education during Covid-19

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ABSTRACT

The Covid-19 epidemic, which deeply affected educational practices all over the world, caused significant difficulties in the process of effective evaluation of students with the suspension of face-to-face education. This research deals with the assessment-evaluation methods applied by science and physics teachers in the online education process in high schools due to the Covid-19 pandemic in Turkey, and with the problems they have experienced in this process and with the proposed solutions. The research covers a 13-week period. A total of 65 teachers were included in the research. Qualitative method and phenomenology design was used in this research. Qualitative findings were evaluated with content analysis. During the online education period, it was determined that the teachers made assessments by sending questions and exams to the students via the Education Information Network (EBA), and sharing individual and group questions on social media, and there was no evaluation due to insufficient student participation in the courses. Alternative assessment-evaluation methods are mostly preferred by teachers who are open to academic development and a high level of digital literacy. Considering that online education applications are inevitable in emergency situations such as epidemics, the development of eligible assessment and evaluation applications and practices for online education is necessary as well as their presentation to teachers under the guidance of action researchers.

Key words: Online Education, Covid-19, Science Education, Assessment And Evaluation

INTRODUCTION

The Covid-19 pandemic, which started in 2020 and deeply affected all countries in terms of socio-economic conditions, health, and education, continues also to have profound effects on Turkey. The biggest effects in Turkey happened in education (SETAV, 2021). In this context, schools were closed in the first week of the epidemic in Turkey and online education implementation was started after the second week (MEB, 2020a). Online education activities were provided firstly as live programs on TV channels. In addition to this, in which interaction between students and teachers could not be realized, live lessons were developed and put into practice by the Turkish Ministry of National Education (MEB) in the following period (MEB, 2020b). The Education Information Network (EBA) was developed by the National Education on March 23, 2020, as a transitional form of online education platform due to the Covid-19 pandemic, which has become the most followed educational content platform in the world that had until May 28, 2021, approximately 24 billion visitors, 12 thousand lecture broadcast videos, 35 million downloads and nearly 180 million live lesson hours (YEGITEK, 2021a). In addition to the EBA applications applied locally

in Turkey, Zoom online lessons were also implemented in order to continue the education more effectively and uninterruptedly also depending on the preferences of the teachers. In online education many needs have emerged when it comes to assessment-evaluation procedures. In addition to those needs, structural problems have emerged related to assessment and evaluation procedures, which are one of the basic practices which provide dynamics in teaching. MEB has published a statement that students will not carry the responsibility for the courses taught in the second semester (YEGITEK, 2021b).

LITERATURE REVIEW

Determining the effects of face-to-face or online education activities on the development and success levels of students with appropriate tools and methods and expressing them with numbers and other symbols is expressed as assessment in education (Hannah et al., 2017). The absence or lack of quality assessment and evaluation in education reveals that teaching is not implemented holistically (Pereira et al., 2016), and as a result, students and teachers are not able to determine the quality of the educational performance in line with the

objectives of the programs (Boylu, 2021). Students are encouraged to spend more time and effort in learning through assessment and evaluation practices. As a result of this situation, students are given the opportunity to correct their mistakes and provide feedback, which increases their motivation and self-respect (Akdağ et al., 2021). Deficiencies in assessment and evaluation in online education also include the absence of students from the decision-making phase which removes the opportunity for teachers to adapt teaching according to students' needs (Aydin & Erol, 2021).

The Covid 19 pandemic, which affected all countries in the world, caused high schools with very high contact rates to be, closed (Crawford et al., 2020; Rose, 2020; Toquero, 2020). During the pandemic, schools in more than 190 countries were closed and the school life of 1.4 billion students was interrupted (HRW, 2021). New applications such as Zoom, Hangouts, Skype, Teams, Screencastify, Kultura and EBA live have become crucial for teachers in high schools and academics at universities (Christian et al., 2021). With the rise of online education in the world, problems regarding technological infrastructures emerged. The problems regarding the access to online education of less privileged students negatively affected their learning opportunities (Jæger & Blaabæk, 2020). Teacher and academics faced problems in the effective use of technology and effective teaching methods. During the Covid-19 pandemic difficulties were not only faced in the teaching process of online education but also in the assessment and evaluation processes of students (Kumaş, 2021). The process of bringing the epidemic under control and returning to normal life in terms of social life and education is uncertain. Until the returning of face-to-face education in schools, education in most countries is implemented online. Considering the importance of assessment-evaluation in education in general, there is an emerging importance of including assessment-evaluation practices suitable for the content of online education (Aluko & Omidire, 2021; Karakaya et al., 2020).

To effectively apply assessment-evaluation in online education, which is one of the most important elements of education, appropriate conditions such as the improvement of teachers' digital literacy and other technological possibilities must be made available to teachers (Besser et al., 2020; Nicol, 2007). In Turkey, during the 13-week online education period in the second semester of the 2019-2020 academic year, the subject objectives were not officially measured and evaluated. Despite this, some teachers applied individual assessment and evaluation as the pandemic process started (Chetwynd & Dobbyn, 2011). To carry out the online education process efficiently and effectively, assessment-evaluation practices should be inclusive and appealing to all students (Viner et al., 2020). We have not found any research regarding assessment and evaluation methods in online education during Covid 19 when it comes to sources written in Turkey. But we have found some international sources and articles which dealt with the topic of assessment-evaluation in online education in universities (Guangul et al., 2020; Mohapatra, 2020; Senel & Senel, 2021). We have not found any study that deals with the topic

of assessment-evaluation in online education in high schools or the teachers' experience and proposed solutions regarding this matter. It is very important to define parameters for planning assessment-evaluation in accordance with online education, to determine appropriate materials, to maximize the participation of students and ensure a more effective education process. It is very important to determine how the assessment and evaluation is executed in terms of different parameters in science courses in online education. To contribute to the improvement and development of the teaching process, assessment and evaluation should be carried out effectively and in accordance with the objectives throughout the process by teachers with a high level of digital literacy (Tan & Erdoğan, 2004).

Research Problem

In this research, within the physics and other science courses who deal with physics matters, the assessment-evaluation methods were analysed during the suspension of face-to-face education throughout the country due to the Covid-19 epidemic. In this context, we analysed three applications and practices that were frequently used, which are assessments and evaluations on EBA TV, on EBA online lessons and on Zoom online lessons. We analysed and compared suggestions regarding these applications and practices. Within the scope of the research, solutions were sought for the following problems:

- Which assessment-evaluation applications and practices are used on EBA and Zoom online lessons in science education and physics courses during Covid-19, and how often are they used?
- What are the problems experienced in assessment and evaluation in the online science and physics teaching process and what are the proposed solutions?

METHODOLOGY

General Background

In this research the qualitative research method and phenomenology design were used. This type of research is used when there a lack of data and the research is partially predictable. The existing situations and variables were not influenced (Karasar, 2012). In this study systematization, the researcher cannot influence the facts or events and is analysing the events in depth and in detail (Yıldırım & Şimşek, 2008). The aim of this research is to analyse the sub problems of the assessment-evaluation practices in physics and science courses in Turkey during Covid-19 after the face-to-face education process is suspended and to offer solutions. The phenomenology method in this research coincides with the principle of "trying to remove the uncertainty in an existing situation" (Padilla-Díaz, 2015).

Sample

In qualitative studies in which in-depth research is conducted, in the process of determining participants, attention

should be paid to whether the information to be obtained from the participants is compatible with the objectives, not the number of participants (Toloie-Eshlaghy et al., 2011). In this study, while determining the participants, the maximum variety in the purposeful participant and the criterion participant application, which is one of the non-random participant methods, was used (Anyan, 2013). In the study process, it was aimed to reach the participants who could best contribute to the purpose of the study. Sample group used in the research and according to the type of research has been presented in detail in Table 1.

As seen in Table 1, most of the participating teachers are science teachers ($n=53$) and university graduates ($n=53$), while some ($n=12$) are action researchers. The research was conducted in Turkey with 65 teachers in total, in four different provinces, namely Trabzon, Rize, Giresun and Samsun, and in four different school types.

Data Collection

EBA TV started to be implemented by the MEB on March 23 (2nd week of the leave or closed schools) at all grade levels, and on April 13 (the 5th week of the holiday) at the 8th grade, 12th-grade class levels. The implementation started on April 27 (7th week of the holiday) for grade levels except for 1st and 2nd grade. The Zoom platform was used voluntarily by teachers from the first week. While obtaining the research data, the applications in Table 2 were used.

Data Collection Tools

To test the sub problems of this research, video recordings of physics and science courses on EBA TV were examined in depth during the 13-week period and it was determined which and how often an assessment-evaluation activity was used. While the video recordings are being reviewed, there is the opportunity to review more than one. At the end of the 2019-2020 academic year teachers' committee's meetings, within the scope of science related to assessment and evaluation; the views of science, technology and physics teachers were analysed. The observations of 28 teachers in four different types of schools were coded and analysed separately.

The teachers' district branch committees' meetings are carried out with certain agenda items according to the directive and implementation regulations which are put into effect in 2019 by the Ministry of National Education (MEB, 2019). In the teachers' branch committees held at the beginning, middle, and end of the academic year, observations about assessment and evaluation from the agenda items were separated and these views were coded and analysed. In the

process of semi-structured interviews individual interviews with the teachers, the assessment-evaluation applications on EBA and Zoom online lessons based on the statements of the interview groups were evaluated, categorized, and coded. The difficulties experienced in assessment and evaluation within the scope of online education regarding science courses and the proposed solutions were categorized and analysed. Throughout the process, taking into consideration the answers of the participants, new questions were formed, while trying to describe the process as clearly as possible.

Six open-ended questions were prepared for the semi-structured interview. Interview questions were addressed to two academicians and eleven teachers in the field of science. After receiving their expert opinion, three questions were removed, and the numbers of interview questions were reduced to three. A pilot study was conducted with one participant to determine the functionality of the interview questions. As a result of the pilot study, it was concluded that there are no problems regarding the functionality of the questions and that it was a working data collection tool serving the research's objectives.

In this research, structured laboratory study was used as an observational model. In this observational model, the researcher, as an outside observer, observes the process with the help of a standard assessment tool without taking direct participation (Yıldırım & Şimşek, 2016). In this research, the researcher participated in Eba and Zoom online lessons as an outside observer and made observations. The Structured Observation Form (SOF) was used as a data collection tool (Stuessy et al., 2003) which was adapted to the research requirements. Teachers teaching on EBA TV, EBA and Zoom platform were observed and the assessment-evaluation methods used in each lesson were marked and categorized separately. The observation data obtained from the teachers were systematically classified and combined with the findings obtained from the interviews. The data was grouped according to the content status and evaluated.

Data Analysis

The content analysis method was used in the analysis of the semi-structured interviews. Also, original answers were chosen from the teachers' answers and presented as an example. To determine the validity and reliability of the study, interview transcripts were submitted to the opinion of three field educators. The codes created by the researchers were gathered under themes to provide unity and they were presented in tables. Two months after the study was completed, the tables were re-examined, and the Miles and Huberman (1994) formula ($\text{Reliability} = \text{agreement} / (\text{agreement} + \text{divergence})$)

Table 1. The number of teachers in the research and distribution by groups

Gender	Rate (%)	Physics Teacher	Science Teacher	Graduated from a University	Postgraduate
Male	63	4	37	38	7
Female	37	8	16	15	5
Total	100	12	53	53	12

Table 2. Online education applications and contents in physics teaching

Education program type	Application systematization
EBA TV	The courses planned by the MEB start at 9:30 and continue until 13:30 every day. Repetitions of the courses are given in the afternoon. Lecture video recordings are available on the ministry's website. Courses can be taught in durations ranging from 5 minutes to 30 minutes. Two hours of physics and science classes are taught at each grade level per week.
EBA Online Lessons	It is an interactive online lesson application developed and offered by the MEB. A course is limited to a maximum of 40 minutes. Students can attend the lesson with video or audio, teachers manage the audio and video controls of the students. The language of the program is Turkish, which is the mother tongue of students and teachers.
Zoom Online Lessons	It is free of charge with limited use application or platform for interactive online lessons. A lesson is limited to a maximum of 40 minutes. Students can attend the lesson with video or audio, and the teachers manage the audio and video controls of the students. Program usage language is English.

of percentage calculation was applied. According to Miles and Huberman, a study should have the value of percentage of compliance at least 70%. As a result of the calculations made within the scope of this study, the Miles and Huberman (1994) value of percentage of compliance was found to be 91%. Some parts of the answers given by the participants in the interviews are presented in quotation to ensure the validity-reliability of the research and the credibility and transferability of the research findings. To increase the credibility of the study, long-term interaction, depth-oriented data collection, diversification, expert reviews, and participant confirmation collections were carried out. The applied research stages are reported and presented in detail. A consistency review was applied to ensure internal reliability, as well as confirmation review to ensure external reliability (Büyüköztürk et al., 2017; Yıldırım & Şimşek, 2016).

Some abbreviations were used in the interview results. The abbreviations are as follows: T1: first teacher; T2: second teacher. In the observation findings the following abbreviations were used: ST1: first science teacher; ST2: second science teacher; PT1: first physics teacher; PT2: second physics teacher. Documents and observation results were gathered based on the descriptive analysis method. In the descriptive analysis method, the data is usually classified according to predetermined themes or categories, the findings

are connected or put into relation to the categorized data and summarized, and summaries are interpreted by the researcher's subjective judgment. In addition, the researcher establishes a cause-effect relationship between the findings and, if necessary, makes comparisons between the cases with structural difference analyses (Castleberry & Nolen, 2018; Kitzinger, 1995; Loeb et al., 2017). In the systematization that can be followed within the scope of descriptive analysis, four stages are generally applied: Creating a framework, processing the data according to the determined thematic framework, defining and interpreting the findings (Aspers & Corte, 2019; Boddy, 2016; Connelly, 2016; Yates & Leggett, 2016). Within the scope of this research, these four systematizations were followed.

FINDINGS

Assessment-Evaluation Tools used in the Online Education Process

After the school interruption in high schools in Turkey during the Covid-19 epidemic, the first teaching application applied was the lectures of teachers from EBA TV. Video recordings of the teachers were also available on the website. The findings obtained from EBA TV video documents within the scope of this research are shown in Table 3.

A total of 308 minutes of lectures on 13 subjects on EBA TV were analysed separately by examining EBA TV recordings. Obtained findings are as follows: Based on the findings, assessment and evaluation applications, and multiple choice questions ($f=70$), homework ($f=13$), open-ended questions ($f=11$), gap-filling ($f=9$), matching ($f=2$) and true-false ($f=2$) categories were obtained. 12 codes belonging to the categories were used and the total number of content used in the codes was ($f=107$). Codes in the category of "multiple choice"; traditional multiple-choice item ($f=32$), matched multiple-choice item ($f=16$), alternative-choice item ($f=10$), best-answer item ($f=6$) and complex multiple-choice item ($f=6$) grouped as. Codes in the "homework" category were grouped as practice ($f=7$), preparation ($f=3$), and extension ($f=3$). The codes in the "open-ended questions" category were grouped as fully open ($f=8$) and semi-open ($f=3$). Codes in the "gap-filling" category are grouped into single gap-filling ($f=7$) and multiple gap-filling ($f=2$). It was determined that in 85% of the subject topics' assessment activities were carried out by solving multiple-choice questions, without evaluation activities. On EBA TV, it was seen that the gap filling ($f=9$) and open-ended questions ($f=11$) assessment practices were partially applied in class, the matching method and the true-false method is rarely applied ($f=2$).

The assessment-evaluation methods used by the physics and science teachers on the EBA online lessons and Zoom online lessons during the learning process in which the researcher participated as a participant observer are shown in Table 4.

On EBA online lessons and on Zoom online lessons almost all observed teachers have applied the assessment practices through multiple choice questions ($f=57$) and homework ($f=61$). It is seen that assessment practices are

Table 3. Assessment and evaluation applications used in Eba TV lecture videos

Method	Topics	Lesson Time (Minute)	Gap-filling	Matching	Open-ended	True-False	Multiple Choice	Homework
Traditional	DNA structure	21	-	-	-	-	6	1
Traditional Video	Photosynthesis	30	4		1		10	1
Traditional	Respiratory	29	-	-	1	-	8	1
Traditional Video	Matter cycle	22	-	-	-	--	7	1
Traditional Video	Global climate change	18	-	-	-	-	-	1
Traditional	Development	18	1	1			4	1
Traditional	Inheritance	29			3	1	3	1
Traditional Video simulation	Electric charges	26	-	-	1	-	2	1
Traditional Video	Electrically charged objects	25	1		1	1	3	1
Traditional	Inheritance repetition	18	1		1	-	9	1
Traditional	Electric charges repetition	25	1			-	12	1
Traditional video	Conversion of electrical energy	20	-	1	1	-	-	1
Traditional	Genetic repetition	27	1	-	2	-	6	1
Total	13	308	9	2	11	2	70	13

Table 4. Teachers’ assessment and evaluation practices on EBA and zoom lessons

Sample	n	Lesson Time (Minute)	Assessment and evaluation methods					
			Open-ended	Multiple choice	Matching	Written examination	Gap-filling	Homework
Physics teachers	12	265	6	10	1	1	2	11
Science teachers	53	1325	21	47	5	2	25	50
Total	65	1590	27	57	6	3	27	61
Rate	100		42	88	9	5	42	94

also partially applied through open-ended questions ($f=27$) and the gap filling method ($f=27$). Written examination ($f=3$) and the matching method ($f=6$) seem to be the assessment application that very few teachers choose to apply. In the on-line science teaching process teachers did homework ($f=61$), multiple choice ($f=57$), open-ended questions ($f=27$), fill-in-the-blank ($f=27$), matching ($f=6$) and written examination ($f=3$) they applied to assessment applications. 36 codes belonging to the categories were used and the total number of assessment applications observed for the codes was ($f=181$). The codes in the “homework” category were grouped as practice ($f=33$), preparation ($f=19$) and extension ($f=9$). The codes in the “multiple Choice” category were grouped as traditional multiple-choice ($f=24$), matched multiple-choice ($f=13$), alternative choice ($f=8$), best answer item ($f=7$), and complex multiple-choice ($f=5$). The codes in the “open-ended questions” category were grouped as fully open ($f=19$)

and half-open ($f=8$). The codes in the “fill in the blanks” category were grouped as single fill in the blank ($f=20$) and multiple fill in the blank ($f=7$). It has been determined that evaluation practices are only used in multiple-choice questions. The 72%percentage of teachers who did apply alternative assessment-evaluation methods are those who continue academic studies by who have a high level of digital literacy in their field and 14% of other teachers.

Some examples of open-ended questions given to students in the online lesson environment are shown in Figure 1 and Figure 2:

“Calculate the ohm value of the resistor R in the electrical circuit in the shown figure” (PT11).

“Calculate the RK/RL ratio using the graph” (PT2).

“What can we do to reduce the volume of a balloon immersed in water in a pool without expelling the air inside of it?” (ST26), “While Messi scores from a free

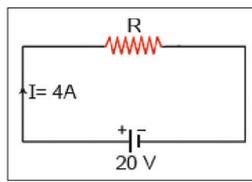


Figure 1. An example of an open-ended question given to students about the topic of Ohm

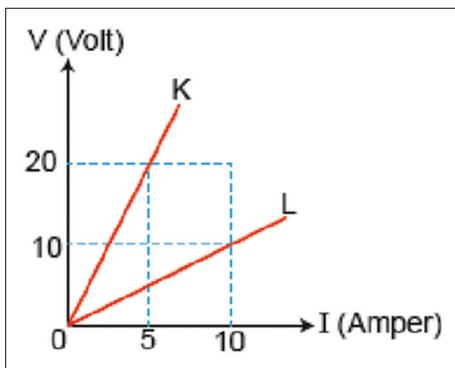


Figure 2. An example of an open-ended question given to students about the topic of electricity

kick, what are the types of forces affecting the ball?” (ST47), *“Why do vehicles shake when two vehicles are moving together side by side?”* (ST4).

Some examples of multiple-choice questions that teachers use as assessment tools are shown in Figure 3.

The matching questions method was generally given to students at the end of the subject topic. An example of this method is shown below:

Match the following concepts with the relevant ones (ST16).

Increases solids pressure	The shape of the pool
Reduces fluid pressure	The depth of the liquid
Increases fluid pressure	Object weight
Reduces solids pressure	Decreased fluid density
No effect on fluid pressure	Increased cross section area

Homework is the most used assessment method by teachers. Almost all teachers gave homework at the end of the class, and evaluation was carried out by only four teachers. Examples of homework assignments: *“children, I want you to solve five questions about pressure after the lesson”* (ST6), *“children solve the questions at the end of the unit by repeating the subject about static electricity”* (PT1), *“solve the questions on pages 173-174”* (ST 44), *“search ten examples from daily life about mechanical waves”* (ST 53).

Assessment-evaluation Methods Offered by Teachers in the Online Education Process

Table 5 shows the arrangement of the findings obtained from the suggestions of physics and science teachers regarding

the assessment-evaluation methods that could be applied on EBA online lessons and on Zoom online lessons.

As a response to the question: *What methods will increase the success of EBA and Zoom online lessons?* The following results were obtained by classifying and coding teacher opinions as seen in Table 5. As a result of examining the teachers’ suggestions for assessment and evaluation of online science education, multiple choice ($f=131$), gap-filling ($f=106$), homework ($f=88$), open-ended ($f=78$), true-false ($f=45$), matching ($f=44$), individual presentation ($f=44$), project ($f=34$), group presentation ($f=22$), concept map ($f=11$) and self assessment ($f=11$) categories were found. 29 codes belonging to the categories were used and the total number of opinions of the codes was 642.

The codes in the “multiple choice” category were grouped as traditional multiple choice ($f=67$), matched multiple choice ($f=28$), alternative choice ($f=19$), best answer item ($f=13$) and complex multiple choice ($f=4$). The codes in the “fill in the blanks” category were grouped as single fill-in-the-blank ($f=56$) and fill-in-the-blank ($f=50$). The codes in the “homework” category were grouped as practice ($f=54$), preparation ($f=19$) and extension ($f=5$). The codes in the “open-ended questions” category were grouped as fully open ($f=58$) and half open ($f=20$). The codes in the “Individual presentation” category were grouped as experiment-practice ($f=58$) and theoretical ($f=20$). All physics teachers stated that it would be beneficial to include multiple-choice questions in all subjects also as an opportunity for practice. One teacher stated that it would be beneficial to students to self-assess at the end of each subject topic. It has been stated also that concept maps, performance assignments and group presentations on EBA online lessons and Zoom online lessons will have little effect on the quality of students’ assessment and evaluation applications. Gap filling, matching, open-ended questions, true-false questions, individual presentations, and written exams are proposed suggestions from which the online live lesson implementation process would contribute positively regarding the assessment-evaluation practices. It has been stated that the development of teachers’ digital literacy will contribute positively to the online assessment-evaluation process.

The frequencies and percentages of teachers’ answers in determining the problems experienced in assessment and evaluation within the scope of physics and science courses in online education are shown in Table 6.

Participating teachers were asked, *“What are the problems you have in assessment and evaluation in EBA and Zoom online lessons?”* question was posed. The following results were obtained by classifying and coding teacher opinions. The problem areas that teachers experience the most in the online education process are *“students are not officially evaluated with grades”* ($f=23$), *“little participation in classes”* ($f=22$), *“problems in receiving feedback”* ($f=18$), *“lack of time”* ($f=17$) and *“difficulty in applying alternative assessment-evaluation”* ($f=16$). These first two situations are seen as problems by 92% of the teachers. 19 codes belonging to the categories were used and the total number of opinions of the codes was 149. As a result of examining the teachers’

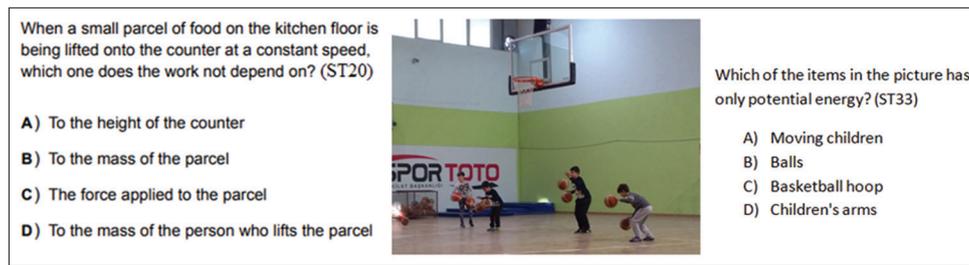


Figure 3. Some examples of multiple-choice questions

problems have in for assessment and evaluation of online science education, the codes in the category of “students are not officially evaluated with grades”; ministry effect ($f=13$), peer effect ($f=10$), family effect ($f=10$), school effect ($f=8$) and technological literacy effect ($f=7$) categories were found. The codes in the “low participation in classes” category were grouped as students’ interest ($f=10$), family follow-up ($f=8$), technological literacy ($f=6$) and lack of sanctions ($f=7$). The codes in the “problems in receiving feedback” category were grouped as practice freedom of attendance ($f=10$), ministry influence ($f=8$), technological problems ($f=6$) and lack of sanction ($f=7$). The codes in the “lack of time” category were grouped as practice student effect ($f=10$), technological literacy ($f=8$), socioeconomic factors ($f=6$). The codes in the “difficulty in applying alternative assessment-evaluation” category were grouped as practice time ($f=10$), technological literacy ($f=8$) and continuity ($f=6$).

Some teachers’ views are as follows; T13: “*in the early days of the Covid-19 lockdown, students began to ask questions about how the exams would be held. They asked to do more exam related questions that may arise in the exam. After the ministry announced that there would be no evaluation with grades, the interest and motivation of the students completely disappeared*”, T18: “*after the ministry announced that there would be no exams, students’ participation in the course decreased a lot. We no longer have the opportunity to assess and evaluate*”.

The lack of student participation in online science and physics classes is seen as the second most important problem in online education (88%). The irregularity of the students’ participation in class caused the lecture and education process in class to break down and made meaningful assessment and evaluation impossible. Some teachers’ views are as follows; T7: “*the lack of compulsory attendance in online learning draws students into complacency, a student who attends one lesson doesn’t attend the next lesson, in that way the integrity of the class is disrupted, and assessment and evaluation become impossible*”.

In the online education process, it is difficult to use alternative assessment-evaluation methods effectively due to the limitations of direct interaction with students (64%). It has come to the fore that new assessment-evaluation methods should be included to ensure that students become more active and participatory. Some teachers’ views on this matter are as follows; T10: “*I gave the students a project assignment as homework to present that project at the end of the course. In the next lesson, we had difficulties due to low attendance and students did not count impossible technological difficulties*

while making their presentations. I did not give a project assignment again”.

Due to the lack of face-to-face interaction, there is not sufficient feedback (72%) in assignments related assessment-evaluation activities. In this process, students do not see themselves as a part of the process; they do not attend the lesson or leave the live lesson when they face some difficulties. Some teachers’ views are as follows; T2: “*students do not see online education as a normal education process yet. I gave an experiment and animation as homework, and after a week I asked everyone to present the assignments on video or online. The feedback from the students was very insufficient*”, T16: “*I gave homework and project assignments few times. Since the feedback was insufficient, I started not to give assignments anymore*”.

Since online education is provided with technological opportunities, it is very difficult to fully reflect the abstract contents of the science courses. Therefore, more time is needed to explain the subject topics and not enough time can be allocated for assessment and evaluation practices (68%). Some teachers’ views are as follows: T5: “*I have problems with communicating with my students during classes. When I ask a question, I spend an average of five minutes to get an answer. This situation negatively affects my teaching and finishing the class. Students’ technological literacy should be developed*”, T11: “*There are many topics, physics topics require processing, and there is no time for assessment and evaluation*”.

Evaluation of problems related to assessment and evaluation on the teachers’ committees at the end of the year based on groups is shown in Table 7.

As it can be seen in Table 7, a high rate of negative views regarding assessment and evaluation competencies in the online education process were stated in group teachers’ committees’ meetings (89%). The findings were classified as positive ($f=3$) and negative ($f=25$). 7 codes belonging to the categories were used and the total number of observations of the codes was ($f=28$). Codes in the “positive” category in assessment and evaluation competencies; material ($f=2$) and family ($f=1$). Codes in the “Negative” category; readiness ($f=10$), grading ($f=8$), receiving feedback ($f=6$) and lack of sanction ($f=7$). Some “positive” views from teachers’ committees’ meetings are as follows: “*EBA tests and some tests on EBA Academy have been very useful in the assessment-evaluation process*”, “*After the subject is covered; the feedback of the assignments given on the EBA Academy are categorized and displayed on the system, which is very useful*”. Some of the views from the “negative” category are as

Table 5. Assessment-evaluation methods suggested by physics and science teachers on EBA online lessons and zoom online lessons

Topics	n	Gap-filling	Matching	Open-ended	True-False	Multiple choice	Performance assignment	Concept Map	Self assessment	Project	Group Presentation	Individual presentation	Written examination
Matter and properties	12	10	5	7	6	12	3	2	1	4	2	4	8
Durability	11	9	9	7	8	11	6	1	1	2	2	4	5
Force	7	4	4	6	2	12	1	0	1	0	2	4	9
Energy	8	9	9	4	4	12	1	0	1	1	2	4	9
Heat and temperature	12	8	8	4	9	12	2	2	1	3	2	4	10
Pressure	10	3	3	6	4	12	2	2	1	4	2	4	4
Motion	11	0	0	7	3	12	2	1	1	4	2	4	5
Electricity	10	2	2	9	0	12	3	1	1	2	2	4	9
Magnetism	10	2	2	8	3	12	3	1	1	4	2	4	8
Waves	8	1	1	9	2	12	1	1	1	5	2	4	10
Optical	9	1	1	11	4	12	4	0	1	5	2	4	11
Total	106	44	44	78	45	131	28	11	11	34	22	44	88

Table 6. Teachers' views on determining the difficulties experienced in assessment-evaluation in online education

Problems	n	f	%
Students are not officially evaluated with a grade	25	23	92
Low attendance		22	88
Difficulty applying alternative assessment-evaluation methods	16		64
Problems in getting feedback	18		72
Lack of time	17		68

Table 7. Opinions of the group teachers' committees to determine the difficulties experienced in online education

School type	Teachers' committees opinions		
	n	Positive (f)	Negative (f)
Middle school	18	2	16
Anatolian High School	5	1	4
Anatolian Imam Hatip High School	3	-	3
Anatolian Vocational High School	2	-	2
Total	28	3	25

follows: “the lack of assessment with grades during covid-19 in online education the students were abandoned and that dragged us to despair”; “the fact that the second semester was not evaluated with grades caused students to be aimless and indecisive, making learning meaningless.”; “I can't get feedback on the questions and projects we have given as homework after the live lessons, most of the students do not do any homework because there is no evaluation with grades”.

DISCUSSION AND CONCLUSION

In Turkey, during the Covid-19 pandemic face-to-face education suspension, various assessment-evaluation methods were used in science and physics lessons within the scope of online education. On EBA TV lessons, assessment-evaluation is mostly provided with multiple choice questions. The reason for this situation is that standardized examinations are made with multiple-choice questions, they take less time, and the education process needs assessment-evaluation through multiple-choice question models. Studies conducted by (Hebecci et al., 2020; Sahbaz, 2020; Ilmiyah & Setiawan, 2020; Amin et al., 2020) show that methods that do not take much time in assessment and evaluation in online education and that can meet the needs of students standardized examinations are preferred. It is seen that on EBA TV lessons, filling in the blanks (gap filling) and, open-ended questions are partially used, the matching method is never used, and the true-false method is applied rarely. The reason why very little space is given to alternative assessment-evaluation practices is that this research had to be prepared in a short period due to the unpredictability of the online education

process during Covid-19, and that there was an inability to reach teachers who have a high level of competence in their field, who had advanced technological literacy and who can systematically apply alternative assessment-evaluation methods. Assessment-evaluation practices in online education during Covid-19 have been insufficient. This research shows also those teachers who are experts in their field exhibit much more effective and successful practices (Barcelona, 2020; Carr & Kemmis, 2009; Kozlinska, 2011; McAteer, 2013).

On EBA and Zoom online lessons, almost all of the teachers have applied multiple-choice questions as an assessment method. Open-ended questions, giving homework, and gap filling are also partially used. Written examination and matching seem to be the assessment application that very few teachers apply. Most of the teachers who use alternative assessment-evaluation methods other than multiple-choice questions consist of teachers who are open to innovation and do graduate studies in their field. This situation reveals that when faced with a new situation, educational coordination practices in which action researchers are at the forefront can make the teaching process more successful. With the emphasis on constructivist education in the educational system of Turkey since 2006, the use of alternative methods in assessment-evaluation has increased. In the context of this system, new teachers started to get education majors, and professional education activities were carried out to provide teachers with the needed skills (Bayat & Şentürk, 2015; Mertoğlu et al., 2019; Çeliköz & Erişen, 2017). The advanced performance of teachers who have recently graduated from education faculties in alternative assessment-evaluation applications supports the results of this research.

During the Covid-19 in online education in Turkey, science and physics teachers have used alternative assessment and evaluation methods very rarely in their online live lessons. The optimal assessment-evaluation methods in online education are multiple choice questions, gap filling and written exams according to the views of teachers. In addition to these, assessment and evaluation in online education can be successfully supported with the following methods: matching, open-ended questions, true-false questions, performance assignments, projects and individual presentations. Although teachers suggested alternative assessment-evaluation methods in lessons they do not use them because they use a lot of time, there is a lack of sufficient equipment to carry out the assessment-evaluation practice. Research evidence (Çalışkan & Kaşıkçı, 2010; Payne et al., 2020; Reeves, 2000; Huerta-Macias, 2002) shows that although teachers are encouraged the use alternative methods in assessment and evaluation, teachers are not using them due to insufficient time and lack of skill.

Problems in assessment and evaluation in online education in Turkey have significantly reduced the quality of education. Some of the problems are; suspension of grades, difficulty in assessing students' progress due to the lack of participation in class, difficulty of reliable and high-level assessment methods, failure of students to demonstrate their own performance at a high level, and teachers'

inability to provide sufficient feedback in homework and project presentations. Providing students with high-level technological support and alternative technological classroom applications and periodically conducting assessments and evaluations in predetermined environments and conditions is going to be effective in solving these problems. The fact that students are aware of the assessment and evaluation process (Mabry, 1999; Hancock, 1994) supports the research results. In addition, students' displaying the knowledge they have learned in a properly assessed environment is presented by (Reeves, 2000) as a positive contribution to students' learning motivation, and this coincides with the results of the research.

Considering the results of this research, regarding the interruption of face-to-face education during Covid-19, assessment-evaluation applications emerge as a necessity simultaneously with the start of online education. The biggest problem is the quality of the assessment and evaluation methods put into practice by the ministry and which are offered to teachers, while these are not being adopted and applied by teachers. In online education, starting from the first week, alternative assessment-evaluation activities that all students can access on equal terms should have been implemented. It can be concluded that special environments are not provided by the MEB or local administrations for students who have financial and technological inadequacy or an inadequate learning environment or other inequality in education. The Ministry of National Education needs learning environments where assessment-evaluation practices are designed by experts to increase the effect and efficiency of online education.

Considering that although the MEB did not initiate assessment-evaluation practice in the Covid-19 online education process in Turkey, innovative teachers conducted alternative assessment and evaluation methods. It can be concluded that if the ministry allocates more budget for teacher education and encourages all teachers, the quality of education can be increased. Parents, who have become the most important element of online education, need systematic information about the evaluation process. Informing the parents based on the assessment-evaluation data of the students at the end of the unit and the inability to determine their contribution to the assessment-evaluation because of the learning process can be shown as the limitations of the research. Since the current research covers assessment-evaluation practices in education, problems experienced and solutions developed during epidemic periods, this research will contribute to the development of national and international solution proposals by considering the problems experienced in assessment-evaluation during epidemic periods. The information will be beneficial for new researches because it offers opinions of students and parents regarding the online education process and the assessment-evaluation methods, which are important in the improvement of quality of online education.

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