Science Education International
33(3), 296-305
https://doi.org/10.33828/sei.v33.i3.5

ORIGINAL ARTICLE

The Comparison of Distance Physics Education Applications and Practices and Determining the Problems

Ahmet Kumaş[1]*, Sabri Kan[2]

[1]Department of Medical Services and Techniques, Higher Vocational School of Ulubey, Opticianry Programme, Uşak University, Uşak, Turkey,
[2]Department of Physics, Maarif Schools of Sarajevo, Sarajevo, Bosnia and Herzegovina

***Corresponding Author:** ahmetkumas_61@hotmail.com

ABSTRACT

In this research, we studied distance education practices in high schools which were closed by the Turkish Ministry of National Education (MNE) due to the COVID 19 pandemic and evaluated comparatively within the scope of the physics course. In this context, a comparative evaluation has been made by examining live lecture applications on television (EBA TV), remote live lessons (EBA live lessons), and another internet application (Zoom). The research covered a 13-week period starting with the interruption of the face-to-face education on March 16, 2020, until June 12, 2020. This research included six physics teachers, 15 science teachers, 20 parents of high school students, and 1.275 students in three different Anatolian high schools and four middle schools in Trabzon. In this study, we used the scanning model. The collected data were analyzed by calculating weekly average follow-up values and percentage values. At the end of this research, it was determined that the viewership of the physics lessons on EBA TV in the 1st weeks of distance education was 89% and that the viewership of EBA TV decreased considerably as the process continued. On the other hand, in online education applications and practices, it is seen that there were important problems arising from the lack of technological appliances, family situations, assessment, and evaluation. As a result of this study, we present proposed solutions for these problems.

KEY WORDS: Distance education; physics education; distance educational applications; live course

INTRODUCTION

Distance education, where teachers and students are separated in the place, is present the quickest growing variety of domestic and international education. Synchronous distance education (SDE), in turn, involves simulation of the communication models of ancient education to an explicit extent by registration teaching and learning, as in live internet conferences and virtual classrooms. The employment of SDE has gained increasing attention in recent years, particularly in science education fields. Many colleges have tried delivering SDE to lab students who were in satellite fields, office laboratories that were off from the most campus, or international students who were in numerous countries (Bergdahl and Nouri, 2021; Tudorache, 2020).

The year 2020 was marked by the COVID-19 pandemic which impacted the world. This pandemic has deeply affected the education process in most countries, and face-to-face education has been suspended by many Ministries of Education due to the directive that is beneficial to suspend schools to reduce the risk of infection. Although some studies have shown that the interruption of face-to-face education has uncertain effects on the pandemic when taking into consideration different variables, many countries have found it more beneficial to switch to distance education (Brooks et al., 2020; Eames et al., 2010; Jackson et al., 2016). The COVID-19 pandemic has caused many schools to suspend formal face-to-face education in 206 countries and to enter an indefinite closing period in 106 countries with a later starting date (Stewart et al., 2021). In this context, administrators, decision-makers, and researchers, instead of creating alternative education systems in extraordinary circumstances, have started the process of creating an effective and systematic way within the scope of existing distance education practices (Turamanlar and Güzel, 2021).

A study conducted in England in 2014 with 100 epidemiological studies and 45 models, drew attention to the fact that at the beginning of the epidemic school holidays were effective in preventing the spread of the epidemic (Nafisah et al., 2018). Compilation of 31 studies conducted in 2018 and studies conducted in 2020, Cowling et al. (2020) pointed out that the suspension of schools reduced the spread of the disease by up to 65% and that the pandemic increased again with opening the schools (Jackson et al., 2014). Thus, each country has tried to apply different methods to maintain education within the scope of its own economic, technological, and physical competencies. Unplanned holidays in schools due to the pandemic has affected countries by putting students in a difficult situation both socially and psychologically by reducing social contacts without completely eliminating them (Brooks et al., 2020).

One study showed that if the influenza pandemic continued for 4–14 weeks, the economy of countries such as England, France, and Belgium would drop by 2–14% annually, and this

Science Education International
33(3), 296-305
https://doi.org/10.33828/sei.v33.i3.5

situation would also deeply affect the education system of the country as well (Sadique et al., 2008). In another study, it was determined that the absence rate of children of working parents, especially health workers, increased up to 30% during the influenza pandemic period (Rashid et al., 2015). Many alternative models have been studied to reduce the effects of such economic and social problems and to continue the education process during the pandemic. The first of these is the learning environment, which is called the core classroom model, where the teacher continues teaching independently within the class but with no contact with other student groups. With this learning environment, it was determined that the spread of the influenza pandemic decreased significantly (Yen et al., 2014). The second is the distance education model. In this model, students are isolated from their own social life and follow their educational processes from their homes and family environments. This practice, where social contagion is minimal, is a model applied during the Covid-19 process in countries with strong technological infrastructure when it comes to education, such as Turkey. This model is the most effective practice in controlling the contagion of children who are usually asymptomatic as a risk to other vulnerable groups (Pokhrel and Chhetri, 2021).

The COVID-19 pandemic, which has made its impact felt intensely all over the world, has revealed that alternative applications to face-to-face teaching are inevitable. Due to the laboratory-supported applications of physics and chemistry courses, it has become necessary to bring a new perspective to alternative applications. Especially in the abstract and experimental subjects in the physics course, the teaching practices offered by the countries were insufficient. In this context, the lack of alternative teaching practices that would overlap with the contents of science courses during the COVID-19 process in Turkey reinforced the prejudices of the students against these disciplines in a negative way. One of the important elements of education is equality of opportunity. In this case, it is important to ensure the participation of all students in the teaching activities offered by the school and teachers in the distance education process. The efficient and effective execution of this process is largely related to teachers' ability to adapt to new situations (Berry et al., 2013). Many parameters such as planning the lessons in accordance with the spirit of distance education, determining appropriate materials, and maximizing the participation of students will ensure that the education is maintained in a more productive way. In this context, it is very important to reveal the problems regarding students' participation in physics courses in distance education in terms of different parameters and to offer solutions. In this study, in which distance education practices were compared, answers to the following questions were sought.

1. Which teaching practice was used and how often during the distance physics education process during the COVID-19 pandemic?
2. What are the students' participation rates in EBA TV, EBA Live Physics lessons, and Zoom physics applications?
3. What are the reasons for students' absences in distance physics education classes?
4. What are the suggestions of students, teachers, and parents to increase the efficiency of distance physics education practices?

METHODS

Research Design

In this study, the scanning (survey) model was used. A scanning model is a research approach that aims to describe a past or present situation as it exists. The individual or object that is the subject of the research is tried to be defined in its own conditions and as it is (Karasar, 2012). In survey models, the aims are usually to ask "What was it?, What is it?, and What is it about?" Finding the answer to these questions is a primary priority (Büyüköztürk et al., 2017). For this reason, it was seen that the sub-problems of the research overlap with the aims of the scanning model.

Research Participants

The study was conducted among 1,275 students (604 males and 671 females) which were receiving education in public schools during the spring term of the 2019–2020 school years. This study was granted approval and permission to be conducted from the Trabzon Provincial Directorate of National Education. The interview data were acquired after gaining appropriate informed consent. Similarly, all observation data were obtained with the consent from all participants. The sample group participating in the research and its distribution according to the type of distance physics education application applied are presented in Table 1.

The distance physics education application types and application systematics applied within the scope of the research are shown in Table 2.

Data Collection Tools

In this research, document analysis and individually structured interviews were used as data collection tools.

Document analysis

With the help of this approach, systematic data were obtained from written materials and their meaning is provided within the scope of qualitative data analysis (Yıldırım and Şimşek, 2008). Çepni (2014) defines document analysis as documentary scanning. To determine which distance education applications and practices were used and how often during the process of the research, EBA live physics course application reports and

Table 1: The number of students in the research and distribution by groups

Gender	Rate (%)	EBA TV Course	EBA Live Course	Zoom Live Course
Male (N=604)	47	142	604	604
Female (N=671)	53	177	671	671
Total (1275)	100	319	1275	1275

Science Education International
33(3), 296-305
https://doi.org/10.33828/sei.v33.i3.5

Table 2: Distance physics education practices and contents in physics education

Distance education practices	Application systematics
EBA TV	The duration is 30 min, decided by the Ministry of National Education. It is 6 days a week and every day from 9:30 to 13:30. Physics lessons are taught for 2 h/week by the assigned teachers in accordance with the curriculum.
EBA Live Physics Course	The duration is 45 min, as appointed by the Ministry of National Education and it is a live broadcast. Students participate through audio and video. The language of use is Turkish. The physics class is 2 h/week.
Zoom Live Physics Course	It is a limited and interactive live meeting application. A lesson lasts for a maximum of 45 min. It is a practice that the teacher starts voluntarily, and the students participate through audio and video. The language of use is English. The physics course is optional.

Zoom application reports, which were submitted in writing by the teachers to the school administration, were used.

Semi-structured interview

Another data source of this study was semi-structured interviews. Semi-structured interviews are a type of interview in which the interview form is semi-structured before the interview and new questions can be added according to the received answers from the participants (Cemaloğlu, 2013). Through this method, which allows observing not only the verbal responses but also the non-verbal behaviors of the participant in the interview and increases the scope of the data (Ertürk and Cemaloğlu, 2014), detailed data were obtained from students, teachers, and parents on their EBA TV. Participants' observations, answers, and proposed solutions were categorized and interpreted. Throughout the process, different questions were asked according to the answers of the participants, and the process was described in detail.

Seven open-ended questions prepared for the semi-structured interview were reduced to five questions by taking the opinions of two academics and eleven teachers. These questions were tested in a pilot study and were reduced to three questions after necessary corrections. The questions for the physics lesson applications are as follows:

1. What are the problems you experience while teaching in the distance education process? (Teacher and student)
2. What are the problems experienced by students in the distance education process? (Teacher and parents)
3. What are your suggestions for solving the problems experienced in the distance education process? (Teacher, Student, and Parents)

Data Analysis

Quantitative data obtained from this study were analyzed statistically. Semi-structured interviews were evaluated with content analysis. The original answers given by the students to the interview questions are presented in the data section. Within the scope of validity and reliability study, interview transcripts were analyzed by taking into account the opinions of three field researchers. The codes created by the researchers were brought together and gathered under themes that would provide unified meaning and the data were transferred to tables. However, 2 months after the study was completed, the tables were re-examined and the Miles and Huberman (1994) percentage of agreement was calculated. According to Miles and Huberman, the percentage of agreement value of a study should be at least 70%. As a result of the examinations made within the scope of this study, the Miles and Huberman agreement percentage value was found to be 86.2%. Some parts of the answers given by the participants in the interviews are presented in the findings section in terms of proof of the validity and reliability of the research and in terms of providing credibility and transferability. In the presentation of the interview findings, the following was used: T1: The first teacher, S1: The first student, and P1: The first parent.

While analyzing the documents, the data were systematically coded and classified. With the help of the coding made, a holistic view was provided in the presentation of the data (Aydoğdu et al., 2017; Karataş, 2015). Percentage values were calculated by calculating the weekly average follow-up values of the data obtained within the scope of EBA TV, EBA Live Physics Course, and Zoom Live Physics course. The usage charts of the applications according to the weeks were presented comparatively and evaluations were made. The findings obtained from the interview data and the findings of the document analysis were interpreted and presented.

Findings

The first problem of this research is related to determining the usage status of the applications used in distance education processes. The participation statistics of 1275 students participating in the study in all applications used for distance education are shown in Table 3.

According to the data in Table 3, it was seen that the students followed the EBA TV continuously in the first 4 weeks, but with the start of live lesson practices, the rates of following EBA TV classes started to decrease continuously and dropped to a very low percentage (4%) in the last weeks. EBA Live Physics lesson applications started in the 5th week of the transition period to distance education. Due to university exam preparation, this transition was only in the 12th grade.

With the interruption of face-to-face education during the COVID-19 pandemic, it was seen that there was some indecision in the 1st week and the use of some applications started late. This was due to the fact that the MNE and teachers did not have a clear plan about how the situation would develop. In the 2nd week, lectures were started on EBA TV with the help of television channels. In this process, since there was no other teaching tool recommended by the ministry, almost all of the students followed this practice.

Science Education International
33(3), 296-305
https://doi.org/10.33828/sei.v33.i3.5

Table 3: Participation rates in physics course through EBA TV, EBA Live Course, and Zoom Live Course

Application	Frekans Rate	Weeks												
		1	2	3	4	5	6	7	8	9	10	11	12	13
EBA TV	f	0	285	273	269	165	162	83	80	74	60	54	40	12
	Rate %	0	89	86	84	52	50	26	25	23	19	17	13	4
EBA Live Course	f	-	-	-	-	181*	196*	314	337	341	353	275	142	65
	Rate %	-	-	-	-	51	55	25	26	27	28	22	11	5
Zoom Live Course	f	-	55	141	255	323	349	355	287	185	128	109	103	43
	Rate %	-	4	11	20	25	27	28	22	15	10	9	8	3

*Only 12th Grade

As shown in Table 3, it has been determined that approximately half of the high school senior (12th) grade students attended EBA Live Physics classes. It was seen that the participation rate in the EBA Live Physics lesson application, which was applied to all grade levels after the seventh week, was 25% in the 1st weeks, but this rate started decreasing considerably (to 5%) in the last weeks.

At the end of the 1st week, teachers with advanced technology skills provided live lessons through the Zoom application. These teachers successfully conducted distance education, especially for students preparing for university exams and high school entrance exams. With the guidance of these teachers, the rate of use of this application increased. This shows that teachers who took an initiative held a very important role in distance alternative teaching practices. In the 1st weeks of distance education, where very few options were available, these successful teachers used their own creativity. These successful teachers, who not only introduced the not yet well-known Zoom application to most of their students, but also successfully ensured the participation and motivation of the students in this way.

Zoom live lesson lessons planned by teachers after the transition to distance education have been done by extraordinary teachers on their own initiative. The initiatives of these actionist teachers led to more interactive lessons with students. In the first 3 weeks and the last 4 weeks, students' participation in Zoom lessons was low, and in the other 6 weeks, it was between 20% and 28%. The proportional comparison of these three different distance education applications is shown in Figure 1.

As shown in Figure 1, the rate of EBA TV usage was quite high since there were no alternative learning tools available in the 1st weeks. Although the participation rates from different applications increased in the 7th and 8th weeks, it was seen that the EBA Live Physics lesson application was still followed the most. In the 5th and 6th weeks, it was mostly only high school senior students who used the EBA Live Physics lesson application. On the other hand, it was observed that the rate of EBA TV usage decreased with the spread of the EBA Live Physics lesson application provided by each teacher to their students in the following weeks. As it can be seen from the graph, it was determined that the participation rates of the Zoom live physics lesson application, which was not a

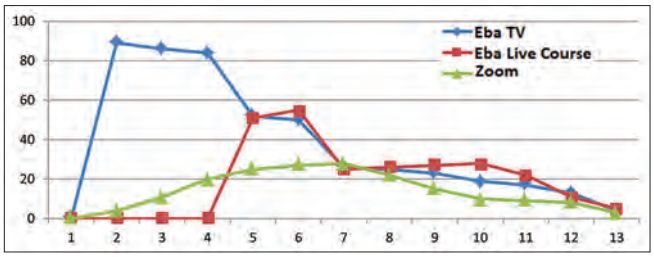

Figure 1: Proportional comparison of EBA TV, EBA Live Physics Courses, and Zoom Live Physics Courses

mandatory practice, were lower than the usage of the other two applications in the same weeks.

Another data collection tool of the research was semi-structured interviews. In these interviews, teachers' observations and opinions were gathered to determine the difficulties experienced in distance education. The findings are shown in Table 4.

According to the findings obtained from the interviews, all of the teachers saw that the reason why some of the students could not attend the classes was due to financial struggles. Teachers said that the most important factors that reduce participation and productivity in distance education were students' indifference (95%), the psychological effects of the risk of getting sick for themselves or their close relatives (86%), and the inability to provide physical and psychological support to the study environment in the family (81%).

What are some factors that negatively affected students and you in distance education? The answers to this question were evaluated within the scope of "Inadequacy of technological possibilities." Some of the statements of teachers were as follows, "Some students do not have internet, computer, or mobile phone. There is an internet connection problem at home or there is a connection problem even though there is internet" (T6, T8, and T11); "Due to the pandemic, contact with neighbors has decreased. Thus, students cannot receive technological support from their environment." (T14); and "Applications such as fast smart boards should be developed" (T5).

The factor expressed by the teachers within the scope of "Financial Insufficiencies" in distance education was also attributed to the fact that the technological infrastructure

Science Education International
33(3), 296-305
https://doi.org/10.33828/sei.v33.i3.5

Table 4: The opinions of teachers, students and parents about the difficulties experienced in distance physics education

Participants	f	Technological Resources	Financial Insufficiencies	Student Indifference	Family Factors	Teacher Relevance	Assessment and Evaluation	Administrative Factors	Central management Applications	Psychological Factors	Teaching Material	Standard Applications	Increasing Persistence
Teachers	21	18	21	17	20	0	16	12	15	18	19	15	13
Rate (%)	100	86	100	81	95	0	76	57	71	86	90	71	62
Students	376	161	44	203	NU*	54	96	11	15	65	121	32	NU
Rate (%)	100	42	11	54	NU	14	26	3	4	17	32	9	NU
Parents	20	4	1	14	17	2	16	8	3	11	NU	NU	NU
Rate (%)	100	20	5	70	85	10	80	40	15	55	NU	NU	NU

*NU: Not Used

could not be provided by the families. The teachers said, "Our technological infrastructure is very good at schools, but some students' parents are not in a position to cope with this burden economically. Parents cannot provide a separate device for their students to follow distance education" (T5, T6, and T10) points out that financial inadequacy caused these technological difficulties.

Teachers associated the "family factors" as an obstacle in the implementation of distance education with the interest of the students, the failure of the parents to take responsibility and their moving to the rural areas. For example, "Some students after moving to villages have reduced our communication opportunities with them" (T13 and T21) and "Students are very reluctant, and participation is very low. Families and their children have much more responsibilities in this period. However, I saw that families could not fulfill their responsibilities and acted irresponsibly" (T19) can be given as an example to this situation.

Teachers' evaluations of "student indifference" can be listed as not following the lessons regularly, students not turning on the cameras in online live lessons, and students' negative influence on each other. Regarding this, "Some students do not open their books and notebooks. Some turn on their computer or cell phone, turn off the camera and go away. Good students are more present. Less good students do not communicate with each other and participate in the lessons." (T2 and T4) statements indicated students' indifference.

Teachers considered the subject of "assessment-evaluation" as the weakest point of distance education. The teachers said that "There is no clear method for measuring and evaluating the subjects we teach to students. Even if we make an assessment of the students' work, we do not have written proof or a real examination opportunity" (T4, T14, and T18).

Regarding "Administrative Factors" and "Central Administration Practices," teachers invited school administrations and the Ministry of Education to apply sanctions and a more egalitarian approach. One teacher said, "The Ministry of National Education and the school administration did not develop a disciplined and systematic practice to increase participation. There is no sanction for students who do not attend the course" (T7 and T9) and "The Ministry of National Education gives importance to distance education in some branches, and releases teachers in others. School administrations cannot make fair and inclusive planning for additional course fees in distance education" (T5 and T6).

Regarding "Psychological factors," teachers drew attention to the inability to establish an effective dialogue and eye contact in distance education and the lack of students' motivation. The teachers explained this situation by saying, "It should be made compulsory by the ministry to open the student's camera in live lessons, I should be able to talk to the student directly. Some of the students got the feeling like they are on a holiday, mentally speaking. It is very difficult to get the

student interested in the class. Instead, students pursue other fun activities with computers or mobile phones without the knowledge of the family" (T6, T11, T16, and T17).

Teachers complain about the inadequacy of "teaching materials".

Teachers complained that the ministry did not have a plan within the scope of "Standard Practices". For example, one of the teachers said, "We were not informed by the ministry about the length of each topic we should teach, which led to arbitrariness in our practices. It would be useful to have a guide or draft regarding this from the ministry" (T5 and T6). Teachers emphasized that experiments and observations suitable for distance education should be designed and group tasks should be defined in order to "increase persistence and motivation."

As it is shown from Table 4, technological equipment (42%) for students, insufficient study environment in the family (54%), lack of standard assessment-evaluation practices (26%), lack of adequate teaching materials (32%), and the psychological effect (17%) of COVID-19 stand out as important factors that reduced participation and productivity in distance education.

Within the scope of this research, we asked the following question: "What are the problems you experience in the distance education process?" It was observed that the students listed problems such as accessing the internet (S45), being deprived of the tools used in distance education (S65), moving to rural areas (S81, S96, and S104) within the scope of "lack of technological opportunities." It was determined that the students listed problems such as access to the internet (P89), the technology needed in distance education, and the inability to afford transportation to this technology (S17) within the scope of "Financial Insufficiencies."

It was determined that the students expressed problems such as not being able to participate as others due to the home environment (S66), other individuals negatively affecting the learning environment (S5), neighbors making noise (S164) which we evaluated in the scope of "Family Factors." Within the scope of "Teacher Relevance," it was determined that students complained about teacher's monotony in teaching. A student said, "At first, I followed EBA TV. It was so annoying. Teachers talk and listen for themselves. They usually just read the textbook. They read fast in some places, and I don't understand. I did not attend the next lessons" (S128 and S332). On the other hand, students stated that teachers could not fully control the remote lessons (S119) and did not give the necessary importance to the lessons (S37, S204, and S362). As a result, students said that was the reason why attendance was low.

Students stated that they were comfortable with the lack of "assessment-evaluation" in distance education. An example given through the following student's statement, "Since we are not going to carry responsibility for the subjects in the second semester, it is of no use for me to follow the lessons, so I did not attend any classes" (S128). Students stated in the "Administrative Factors" that the school administrators were not able to provide an efficient curriculum and necessary information on time. The student statement "An efficient program was not prepared and presented to us by the school administration, so I worked irregularly and inefficiently" (S30) can be given as an example for this.

Within the scope of "central administration practices," students emphasized that the fact that the second-semester subjects were not going to be assessed by the Ministry in the exams affects course participation. An example of this situation was the statement of a student, "I did not want to deal with it for nothing because the Minister of National Education said that you are not going to assess for the second-semester subjects" (S209).

Within the scope of "Psychological Factors," it was determined that the students experienced low motivation due to not being in the school environment, being in vacation mode (S94 and S140), and the risk of getting sick (S332). Students stated that they had difficulty in understanding the subjects because they were away from practical learning such as experiments (S78 and S204). They drew attention to the different teaching methods of students between schools about "standard practices" (S89, S17, and S242). Accordingly, students emphasized that the individual efforts of teachers and the difference in school opportunities violated equality of opportunity in distance education. One of the students said, "The live lessons which are offered in some schools are much better than what we have."

Within the scope of the research, the following question was posed to the parents, "What are the problems that your students experience during the distance education process?" Parents defined the students' lack of interest in distance education (85%) and students not being evaluated with grades (80%) as the biggest problem of distance education. In addition, they added that they think that the family environment will not be suitable for students to study for a longer period of time (70%) and that the psychological effects of the pandemic have a negative effect on distance education (55%).

The first of the parents' views on categorized problems is within the scope of "Lack of technological possibilities." Accordingly, parents complained that they were deprived of distance education tools such as computers and tablets (P2) and that they had insufficient access to the internet (P12) because they lived in rural areas. Similar complaints were also identified within the scope of "Material inadequacies." The parents stated that they could not reach the tools that enable them to benefit from distance education due to the lack of financial means (P1, P2, and P12). A parent said, "Our financial situation is not good enough to maintain continuous internet use. Therefore, my child could not attend the live lessons. They could only watch EBA TV." Regarding the "Family Factors," it was determined that the parents did not see the students' studying at home as sufficient and productive (P3 and P38).

The parents stated that they found a difference in the "quality and interest of the teachers." Some teachers were very

Science Education International
33(3), 296-305
https://doi.org/10.33828/sei.v33.i3.5

interested and taught the lesson well, while others were quite uninterested (P3, P12, and P19). For example, a parent said, "Some teachers call when my child does not attend classes and ask for the reason" (P9). The parents stated that they did not attend the classes because their child did not have any grade concerns, so distance education was problematic in terms of "Assessment-Evaluation." "Teachers said they would not evaluate students with grades. That is why my child sometimes did not attend live classes" (P11).

Parents complained that there was not enough information about the curriculum and distance education content within the scope of "Administrative Factors" (e.g., P2). Within the scope of "Central Administration Practices," they also complained that the Ministry of National Education do not act in a previously planned manner (P4) and that the Ministry reduced distance education only to computers (P19).

The parents emphasized that their own children were also affected psychologically in a negative way (P16) due to the fact that all students did not attend classes, and their interest in the lessons decreased due to the lack of socialization (P10). The parents pointed out that the students watched EBA TV like a normal channel (P1), did not take notes (P12), and were reluctant to switch to the next after one lesson (P38).

After determining the problems experienced in distance education, we evaluated the solution proposals of teachers, students, and parents to these problems. The obtained data were associated with nine different solution suggestions. The encodings and frequency values given to these solutions are shown in Table 5.

The participants in this research offered as a solution a technology room independent of the social environment for distance education for student groups who have insufficient financial means, and do not have independent opportunities at home, and are disturbed by their family members during the study process. Some of the participants argued that schools should be opened partially during the pandemic. Participants indicated that within the scope of diluted teaching practices, the contact of the isolated classes with the students and teachers of the other class should be resolved with separate breaks. They think that face-to-face education should be limited to working at separate times and separate breaks. On the other hand, the participants stated that the using of social media and watching news of the student groups who were psychologically affected by the process should be prevented by the families. Participants argued that attendance to classes should be followed by making attendance-absence lists and assessments, and students who did not attend classes regularly should be controlled by teachers. It was emphasized that besides the students' attendance in class, productivity in class should be ensured by performing assessment-evaluation practices every week. They also stated that teachers and parents should be educated about this process in order to adapt to innovation and change in a timely manner. Participants believed that teachers who were diligent in practice should be encouraged to evaluate other teachers' lesson implementation reports on a weekly basis. In addition, it was suggested that individual support should be provided to students by classroom teachers.

DISCUSSION AND CONCLUSIONS

In this research, it has been determined that students showed more interest in online live lessons as compared to EBA TV. The reason for this interest may be the similarity of the practice of face-to-face education. This situation coincided with the principle of a strong bond between teacher-student-teaching application in the effectiveness of the teaching system according to the Eygü and Karaman (2013) research. On the other hand, students' following live lessons through the Zoom platform decreased significantly with the start of live lessons on EBA. This is thought to be due to the Ministry of National Education encouraging teachers to use this program.

In this study, it was observed that teachers who used the Zoom platform early on became more successful in executing the classes. This example supports the study of Kocasaraç and Karataş (2018) where the positive effect of innovative teachers on the learning environment and their competence in adapting to the process was shown. On the other hand, it has been determined that EBA Live lesson and Zoom live lesson applications were used effectively by students with good technological and economic opportunities. We can also say that this situation was related not only to the economic opportunities but also to the shown interest of the parents in the education of their children.

According to the findings of this research, students were more interested in the Zoom live lesson application instead of EBA TV, as it provided direct student-teacher interaction. Another reason for this situation could be expressed as the

Table 5: Categorical coding representation of suggestions and solutions for the problems of distance physics education

Participants	f	Solution proposals (f)								
		Technology room	Parent education	Student coaching	Teacher education	Central follow-up reports	Weekly assessment and evaluation	Admission to a controlled course	Social media isolation	Independent classroom model
Teacher	21	9	17	8	4	12	17	6	5	3
Student	376	105	47	102	61	NU	65	73	96	54
Parents	20	2	NU	8	2	NU	10	1	8	1

*NU: Not Used

opportunity for students to ask the teachers direct questions, and the opportunity to learn the needed topics from teachers directly. Some studies (Bartlett, 2005; Howe et al., 2019; Mc Partlant, 1990; Witkin, 1973) support that the healthier the interaction between the teacher and the learner, the higher is the desire, motivation, and success in learning. In addition to this, the teachers' knowledge of the students' inadequacy in the subjects and the teachers' efforts to re-teach the lessons according to the student's cognitive level increased the students' interest in live lessons. As a result of this, students made the transition from watching EBA TV to watching live lectures on Zoom. This situation stands out as an option that was preferred more by senior students who are preparing for the university exam.

Students who did not participate in distance education classes put the following reasons forward such as technological inadequacies, the uncertainty of the central placement exams, the feeling of not being able to pass the university placement exams, and a complete reluctance towards the courses. These answers were consistent with other studies (Anderson and Keith, 1997; McMillan and Reed, 1994; Parker et al., 2004; Tomlinson and Jarvis, 2014) revealing that students with high academic achievement also have high levels of volunteering in alternative education practices and activities.

In the research, it was thought that the interest in Zoom application decreased with the prolongation of the distance education process, the teachers had to follow the instructions of the Ministry, the application was not in the mother tongue and the ministry requested the EBA Live Lesson application reports. On the other hand, the school administrations' making the lesson programs based on the EBA Live Lesson application and the recording of the lessons in the electronic environment created the obligation to use the EBA Live Lesson application more. This result is similar to other results in Rhodes (1988), Sun et al. (2019), and Zha (2009) that the incentives and suggestions of the central authority in teaching practices are taken into account by the teachers in these processes. On the other hand, it was determined that at the beginning of the COVID-19 pandemic, some students were not able to attend live classes due to their families moving to rural areas.

Within the scope of the research, it was observed that the participation of the students in EBA TV, EBA Live Lesson, and Zoom applications began to decrease after the 10th week. This was because of the announcement made by the Ministry of National Education that there would be no second-semester grade evaluation in intermediate classes. This result coincided with some other studies (Bal and Doğanay, 2010; Kumpulainen and Lankinen, 2016; Özdemir, 2009) revealing the negative effects of uncertainties in the assessment and evaluation process on students' achievement. On the other hand, the experience of more than twenty years of the educators who conducted this research reveals the reasons for this reluctance of Turkish students toward university placement exams, to the fact that some students with high academic success tended to approach this problem by having an early leave from the intermediate classes in the second semester.

In the findings obtained in this research, it was determined that distance education applications based on interactive lessons attracted more attention from the students. It should be clearly stated that the biggest problem that awaits us in long-term distance education will be the danger of choosing a limited method such as knowledge or content transfer. In the distance education model, the classes should come close in approach to the educational activities carried out in the face-to-face education model. Similar studies showed that in the distance education model, where the students used applications in which the students could participate in person while the subjects were taught and the interaction with their teachers was active, the student interest, attitude, and motivation toward the lesson was higher (Isikoglu et al., 2009; Krahenbuhl, 2016; Sandholtz, 1997). The positive effects of student-centered distance education practices in the mentioned studies overlapped with the results obtained in this study.

According to the findings obtained from this research, it was seen that some students due to technological and financial shortcomings did not participate in distance education applications despite their high level of motivation. In this study, the low participation rate of disadvantaged groups in the distance education process due to both technological and financial difficulties was also expressed in other studies (Grootenboer and Edwards-Groves, 2019). In this case, it is necessary to include supportive learning methods in alternative learning practices in distance education.

It has been determined that the students who actively participate in the distance education process for 14 weeks were students who were guided and supported by their families, followed one-on-one by their teachers, had high academic achievement scores and wanted to succeed, and had high expectations for the central placement exams. This situation highlights the influence of families on students, especially to increase the quality of distance education. On the other hand, it has been seen that the individual attention and dedication of teachers was one of the most important factors affecting the distance education process in involving students in the process and ensuring continuity.

Recommendations

It is possible to offer some suggestions based on the results obtained from the findings in this research. Alternative distance education activities should be implemented so that all students who have moved away from schools during the pandemic period can reach them on equal terms. In this context, isolated learning environments could be provided by the relevant administrations to students who have financial and technological difficulties or an unsuitable learning environment problem due to their families. This may require additional planning for students moving to rural areas.

Assessment and evaluation steps, which are one of the most important components of education, should be continued with appropriate methods in distance education applications. In this sense, it is necessary to develop qualitative and quantitative measurement and evaluation approaches compatible with the distance education approach. A similar situation should be ensured in terms of participation in classes.

Frequent use of alternative teaching methods in distance physics lesson applications will keep under control the students' motivation and attendance in physics course and will be also beneficial in teaching new subjects. In this context, academic and practical studies should be carried out by the ministry on new learning/teaching methods in which experiments, simulations and project studies can be applied to transform distance education into an effective and productive education process.

Parents, who have become the most important element of distance education, need systematic information about the learning processes. Precautions can be taken by parents by separating a room only for studying and classes at home. For this purpose, it may be necessary to remind parents of responsibilities such as making the learning environment independent from the social environment of the family, having the necessary course materials ready 10 min before the lesson, meeting the nutritional and physical needs of students and providing comfortable and clean clothes for the student.

It was also determined that some physics teachers while presenting mathematical operations and drawings had problems in demonstrating some physics subjects and using the mouse. In order to solve this problem and to explain fast and effectively some class content it may be necessary to seek support from some video and simulation applications, not doing the presentation live.

Making positive expectations and orientation in the first weeks of distance education had a positive effect on the rate of student attendance. However, as the process continued and the grading was suspended (assessment-evaluation), in Turkey the participation in classes and learning motivation dropped and students' participation in distance education decreased significantly. It is thought that the student participation rate will increase significantly with the integration of grading practice into distance education.

Ethical Statement

This research was carried out with the permission of Trabzon Provincial Directorate of National Education.

REFERENCES

Anderson, E.S., & Keith, T.Z. (1997). A longitudinal test of a model of academic success for at-risk high school students. *The Journal of Educational Research*, 90(5), 259-268.

Aydoğdu, Ü.R., Karamustafaoğlu, O., & Bülbül, M.Ş. (2017). The relation between research methods and sample in academic research: A case of confirmatory document analysis. *Dicle University Journal of Ziya Gokalp Education Faculty*, 30, 556-565.

Bal, A.P., & Doğanay, A. (2010). An analysis of problems encountered in the process of measurement and evaluation in teaching mathematics at primary school 5th grade. *Educational Administration Theory and Practice*, 16(3), 373-398.

Bartlett, L. (2005). Dialogue, knowledge, and teacher-student relations: Freire an pedagogy in theory and practice. *Comparative Education Review*, 49(3), 344-364.

Bergdahl, N., & Nouri, J. (2021). Covid-19 and crisis-prompted distance education in Sweden. *Technology Knowledge and Learning*, 26(3), 443-459.

Berry, B., Byrd, A., & Wieder, A. (2013). *Teacher Entrepreneurs: Innovative Teachers who Lead but Don't Leave*. Hoboken: John Wiley and Sons.

Brooks, S.K., Webster, R.K., Smith, L.E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G.J. (2020). The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. *The Lancet*, 395(10227), 912-920.

Büyüköztürk, Ş., Çakmak, E.K., Akgün, Ö.E., Karadeniz, Ş., & Demirel, F. (2017). *Bilimsel Araştırma Yöntemleri Scientific Research Methods*. Turkey: Pegem Academy.

Cemaloğlu, N. (2013). Liderlik [Leadership]. In: Özdemir S. editor. *Theory and Practice in Educational Administration*. Turkey: Pegem Academy. pp. 131-183.

Cepni, S. (2014). Reflections of science and technology concepts on educational programs. In: Cepni, S., (Ed.), Teaching Science and Technology from Theory to Practice. 11th ed. Turkey: Pegem Publishing.

Cowling, B.J., Ali, S.T., Ng, T.W., Tsang, T.K., Li, J.C., Fong, M.W., Liao, Q., Kwan, M.Y.W., Lee, S.L., Chiu, S.S. We, J.T., Wu, P., & Leung, G.M. (2020). Impact assessment of non-pharmaceutical interventions against coronavirus disease 2019 and influenza in Hong Kong: An observational study. *The Lancet Public Health*, 5(5), e279-e288.

Eames, K.T.D., Tilston, N.L., White, P.J., Adams, E., & Edmunds, W.J. (2010). The impact of illness and the impact of school closure on social contact patterns. *Health Technology Assessment*, 14(34), 267-312.

Ertürk, A., & Cemaloğlu, N. (2014). Causes of mobbing behavior. *Procedia Social and Behavioral Sciences*, 116, 3669-3678.

Eygü, H., & Karaman, S. (2013). A study on the satisfaction perceptions of the distance education students. *Kırıkkale University Journal of Social Sciences*, 3(1), 36-59.

Grootenboer, P., & Edwards-Groves, C. (2019). Learning mathematics as being stirred into mathematical practices: An alternative perspective on identity formation. *ZDM Mathematics Education*, 51(3), 433-444.

Howe, C., Hennessy, S., Mercer, N., Vrikki, M., & Wheatley, L. (2019). Teacher-student dialogue during classroom teaching: Does it really impact on student outcomes? *Journal of the Learning Sciences*, 28(4-5), 462-512.

Isıkoğlu, N., Baştürk, R., & Karaca, F. (2009). Assessing in-service teachers' instructional beliefs about student-centered education: A Turkish perspective. *Teaching and Teacher Education*, 25(2), 350-356.

Jackson, C., Mangtani, P., Hawker, J., Olowokure, B., & Vynnycky, E. (2014). The effects of school closures on influenza outbreaks and pandemics: Systematic review of simulation studies. *PloS One*, 9(5), e97297.

Jackson, C., Vynnycky, E., & Mangtani, P. (2016). The relationship between school holidays and transmission of influenza in England and Wales. *American Journal of Epidemiology*, 184(9), 644-651.

Karasar, N. (2012). *Scientific Research Method*. Delhi: Nobel Publication.

Karataş, Z. (2015). Qualitative research methods in the social sciences. *Journal of Spiritual Based Social Work Research*, 1(1), 62-80.

Kocasaraç, H., & Karataş, H. (2018). Innovative teacher characteristics: A scale development study. *Uşak University Journal of Educational Research*, 4(1), 34-57.

Krahenbuhl, K.S. (2016). Student-centered education and constructivism: Challenges, concerns, and clarity for teachers. *The Clearing House A Journal of Educational Strategies Issues and Ideas*, 89(3), 97-105.

Kumpulainen, K., & Lankinen, T. (2016). Striving for educational equity and excellence: Evaluation and assessment in finnish basic education. In: Niemi, H., Toom A., & Kallioniemi, A., (Eds.), *Miracle of Education: The principles and practices of Teaching and Learning in Finnish Schools*, Paderborn: Brill Sense. pp. 69-82.

McMillan, J.H., & Reed, D.F. (1994). At-risk students and resiliency: Factors

Science Education International
33(3), 296-305
https://doi.org/10.33828/sei.v33.i3.5

contributing to academic success. *The Clearing House*, 67(3), 137-140.

McPartland, J.M. (1990). Staffing decisions in the middle grades: Balancing quality instruction and teacher/student relations. *Phi Delta Kappan*, 71(6), 465-69.

Miles, M.B., & Huberman, A.M. (1994). *Qualitative Data Analysis*. 2nd ed. Thousand Oaks: Sage Publications.

Nafisah, S.B., Alamery, A.H., Al Nafesa, A., Aleid, B., & Brazanji, N.A. (2018). School closure during novel influenza: A systematic review. *Journal of Infection and Public Health*, 11(5), 657-661.

Özdemir, S.M. (2009). Examining the problems faced by primary school teachers in the assessment and evaluation processes of new primary education programs. *Journal of Ankara University Faculty of Educational Sciences*, 42(2), 55-79.

Parker, J.D., Summerfeldt, L.J., Hogan, M.J., & Majeski, S.A. (2004). Emotional intelligence and academic success: Examining the transition from high school to university. *Personality and Individual Differences*, 36(1), 163-172.

Pokhrel, S., & Chhetri, R. (2021). A literature review on impact of COVID-19 pandemic on teaching and learning. *Higher Education for the Future*, 8(1), 133-141.

Rashid, H., Ridda, I., King, C., Begun, M., Tekin, H., Wood, J.G., & Booy, R. (2015). Evidence compendium and advice on social distancing and other related measures for response to an influenza pandemic. *Paediatric Respiratory Reviews*, 16(2), 119-126.

Rhodes, R.A. (1988). *Beyond Westminster and Whitehall: The Sub-Central Governments of Britain*. Crows Nest: Allen and Unwin.

Sadique, M.Z., Adams, E.J., & Edmunds, W.J. (2008). Estimating the costs of school closure for mitigating an influenza pandemic. *BMC Public Health*, 8(1), 1-7.

Sandholtz, J.H. (1997). *Teaching with Technology*: *Creating Student-Centered Classrooms*. New York: Teachers College Press.

Stewart, N.K., Rahman, A., Adams, P.R., & Hughes, J. (2021). Same storm, different nightmares: Emergency remote teaching by contingent communication instructors during the pandemic. *Communication Education*, 70(4), 402-420.

Sun, H.P., Sun, W.F., Geng, Y., Yang, X., & Edziah, B.K., (2019). How does natural resource dependence affect public education spending? *Environmental Science and Pollution Research*, 26(4), 3666-3674.

Tomlinson, C.A., & Jarvis, J.M. (2014). Case studies of success: Supporting academic success for students with high potential from ethnic minority and economically disadvantaged backgrounds. *Journal for the Education of the Gifted*, 37(3), 191-219.

Tudorache, P. (2020). International view on the evolution of the e-learning in the Romanian higher education institutions. *Acta Didactica Napocensia*, 13(1), 183-188.

Turamanlar, O., & Güzel, H. (2021). The view of medical students on the anatomy course given by distance education during COVID-19 pandemic. *Anatomy*, 14(3), 202-209.

Witkin, H.A. (1973). The role of cognitive style in academic performance and in teacher-student relations. *ETS Research Bulletin Series*, 73(11), 1-45. Available from: https://www.files.eric.ed.gov/fulltext/ED083248.pdf [Last accessed on 2021 Apr 20].

Yen, M.Y., Chiu, A.H., Schwartz, J., King, C.C., Lin, Y.E., Chang, S.C., Armstrong, D., & Hsueh, P.R. (2014). From SARS in 2003 to H1N1 in 2009: Lessons learned from Taiwan in preparation for the next pandemic. *Journal of Hospital Infection*, 87(4), 185-193.

Yıldırım, A., & Şimşek, H. (2008). *Qualitative Research Methods in Social Sciences.* Ankara: Seçkin Publications.

Zha, Q. (2009). Diversification or homogenization: How governments and markets have combined to (re) shape Chinese higher education in its recent massification process. *Higher Education*, 58(1), 41-58.