**Araştırma Makalesi ⬥ Research Article**

# Examining The Effects Of The Emergency Distance Education System Applied During The Covid-19 Pandemic Process On Secondary School Science Teaching

## Covid-19 Pandemi Sürecinde Uygulanan Acil Uzaktan Eğitim Sisteminin Ortaokul Fen Bilgisi Öğretimine Etkilerinin İncelenmesi

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| ARTICLE INFO | ABSTRACT |
|---|---|
| **Keywords:**<br><br>Covid-19 Pandemic, Secondary School Students, Emergency Distance Education Science Education | This study was carried out to examine the effectiveness of science education given in the emergency distance education process implemented during the Covid-19 pandemic period according to student opinions. According to qualitative research methods, 46 students attending the 5th, 6th, 7th and 8th grades of an official secondary school affiliated to the Directorate of National Education in Uşak province in the 2021-2022 academic year voluntarily participated in the research designed in case study mode. The research data were collected using a semi-structured interview form. The data obtained were analyzed by content analysis. As a result of the research; in order to adapt to the emergency distance science education process, students made arrangements for the environment and understanding of the lessons. According to the students, emergency distance science education had positive and negative effects. At the beginning of the positive effects, they stated that they were able to acces their lessons, that it contributed to their learning and that they did not fall behind in the lessons. Among the negative effects, they stated that the subjects were not fully understood, connection problems, inability to learn the subjects and problems arising from the home environment. According to the students, the main differences between emergency distance science education and face-to-face science education are the limited interaction in distance education and the problem of dropping out of the course in distance education. According to the students in the study, in the emergency distance education process, teachers made serious efforts both to attract interest in the lesson and to ensure participation in the lesson. In the emergency distance science education process, evaluation activities were also carried out in line with the possibilities. In the evaluation of the students, homework assignments were given, written and oral exams were made, and peer evaluation was very limited. Although the control of homework assignments was tried to be ensured, it could not be fully realized. |
| MAKALE BİLGİSİ | ÖZ |
| **Anahtar Kelimeler:**<br><br>Covid-19 Pandemisi Ortaokul Öğrencileri Acil Durum Uzaktan Eğitimi Fen Eğitimi | Bu araştırma Covid-19 pandemi sürecinde uygulanan acil uzaktan eğitim sürecinde verilen fen eğitiminin etkinliğini öğrenci görüşlerine göre incelemek amacıyla gerçekleştirilmiştir. Nitel araştırma yöntemlerine göre durum çalışması modelinde tasarlanan araştırmaya 2021-2022 eğitim öğretim yılında Uşak ilinde bulunan bir ortaokulun 5,6,7 ve 8'nci sınıflarına giden 46 öğrenci gönüllü olarak katılmışlardır. Araştırma verileri yarı yapılandırılmış görüşme formu ile toplanmıştır. Elde edilen veriler içerik analizine tabi tutularak incelenmiştir. Araştırma sonucunda; acil uzaktan fen eğitim sürecine, öğrencilerin uyum sağlamak için ortama yönelik ve derslerin anlaşılmasına yönelik düzenlemeler yapıldığı belirlenmiştir. Öğrencilere göre acil uzaktan fen eğitiminin olumlu ve olumsuz etkileri olmuştur. Olumlu etkilerinin başında; derslerini işleyebilmelerini, öğrenmelerine katkı sağlamasını ve derslerden geri kalınmamasını belirtmişlerdir. Olumsuz etkilerinin başında ise konuların tam olarak anlaşılmaması, bağlantı problemleri, konuların öğrenilememesi ve ev ortamından kaynaklanan sorunları belirtmişlerdir. Öğrencilere göre acil uzaktan fen eğitimi ile yüz yüze fen eğitimi arasındaki temel farklılıklar başında uzaktan eğitimde etkileşimin sınırlı olması ve uzaktan eğitimde dersten kopma sorununun olmasıdır. Araştırmada öğrencilere göre acil uzaktan eğitim sürecinde öğretmenler gerek derse ilgiyi çekmek için gerekse derse katılım sağlamak için ciddi çaba sarf etmişlerdir. Acil uzaktan fen eğitim sürecinde eğitimde değerlendirme etkinlikleri de imkânlar doğrultusunda gerçekleştirilmiştir. Öğrencilerin değerlendirilmesinde ödevler verilmiş, yazılı, sözlü sınavlar yapılmış, akran değerlendirmesi ise çok sınırlı düzeyde kalmıştır. Verilen ödevlerin kontrolü sağlanmaya çalışılsa da tam anlamıyla gerçekleştirilememiştir. |

## 1 INTRUDUCTION

At the end of December 2019, the whole world was introduced to a virus called Covid-19, which emerged in the Chinese province of Wuhan. The disease, which is highly contagious and causes deaths, turned into an epidemic in a short time and affected all countries of the world. Each country started to fight against the pandemic with its own means and policies.

The whole world was caught unprepared for this sudden outbreak. Health workers, teachers, students and parents have been the most affected by the pandemic. In this context, how to carry out educational activities has become one of the main agendas of governments. In the fight against the spread of the virus, distance education has been used as it is the most effective way to stay as close to people as possible and not to go out. Some countries continued to provide face-to-face education because distance education would not replace face-to-face education and the socialization and development of children would be disrupted, but they had to switch to distance education when it was thought that the increase in the number of cases and deaths would lead to transition (Alaca and Şanal, 2020: 22).

As of March 6, 2020, with the postpone of face-to-face education in all educational institutions in Turkey, many educational institutions have started distance education. In this process, children and adolescents continue their education at home and distance education is carried out in different ways. Schools affiliated to the Ministry of National Education (MNE) have completed their distance education tasks for the second semester of the 2019-2020 academic year. During the summer vacation, teachers conducted distance education activities through EBA (Sak, Sak, & Nas, 2020: 172).

Distance education is a planned and designed interdisciplinary formal learning method that can offer a wide range of learning activities to users as a learning activity that eliminates time and place restrictions through digital or written communication resources (Başar, 2022: 484). However, the unprepared transition to distance education during the Covid-19 pandemic brought a lot of confusion and chaos. In this process, most educational institutions decided to adopt a fully online education system. Therefore, while teachers and educators need to learn to use technology to reach students in the classroom, students must also adapt to a fully online classroom. Moreover, students and educators had to adapt to the new measures announced as soon as possible. As expected, this has put enormous pressure on education stakeholders in the already difficult and uncertain course of the pandemic. While society today relied heavily on technology for education before COVID-19, it has also become clear that many people are not ready to fully engage in e-learning (Sak, Sak, & Nas, 2020: 162).

The progress of education in Turkey during the pandemic and the measures taken accordingly have manifested themselves in different ways at various levels. The impact of these measures on the learning performance of children and young people is interesting from an educational perspective, as there has never been such a social experiment in human history. The question of the effects of school closures on children's and young people's learning performance is also important from an educational policy perspective, as current decisions need to be based on these effects in order to understandably meet the educational directive given by the state (Zierer, 2021: 252).

During the Covid-19 pandemic in Turkey, distance education practices were carried out both synchronously and asynchronously. The same is true for science courses in primary and secondary schools. The aim of science courses is to raise individuals who can enable students to acquire the necessary knowledge to understand themselves and their environment and to produce this knowledge. Through science courses, students gain not only the theoretical knowledge they can use in their lessons, but also the ability to produce logical and constructive solutions to the problems they may encounter in daily life (Aslan & Güner, 2021: 400). The question of how the science courses taught through distance education during the pandemic process were experienced by the students constituted the starting point of this study.

The distance education process, which started after the closure of schools due to the pandemic, certainly has many positive and negative aspects for students. Thanks to distance education, students have easier access to the resources provided by the Ministry of National Education and have the opportunity to reinforce the information they have learned by watching the lessons again. However, the fact that schools continue distance education distances students from school and deprives them of all the advantages of face-to-face education that schools offer to students both academically and developmentally (Boğazlıyan, 2020: 50). Accordingly, the main purpose of this study is to examine the effectiveness of science education

provided in the emergency distance education process implemented during the Covid-19 pandemic according to student opinions.

## 2    PANDEMIC PROCESS AND EMERGENCY DISTANCE EDUCATION

Covid-19 is a pandemic disease caused by a virus that affects the education system of both developing and developed countries. Education is the pillar of every country's development. Most schools, colleges and universities around the world are closed to contain the spread of Covid-19. School closures have brought difficulties for students, families and teachers. Therefore, distance education is a solution for the continuation of the education system. However, distance learning in developing countries is difficult because many parents have not attended school, there is a lack of computer and communication technologies (ICT) infrastructure, computers, radio and television. Poor and digitally illiterate families, families with low education levels, and children with low motivation to learn are more affected and this has increased inequality of opportunity in education (Tadesse and Muluye, 2020: 170).

### 2.1  Emergency Distance Education

The Covid-19 pandemic emerged at the end of 2019 and spread to all countries of the world in a short period of time, causing disruption or even stopping social life activities. In this process, the strictest measures have been taken in schools where strong physical contact is intense. To prevent the spread of the pandemic, countries have decided to suspend face-to-face education and take stricter measures.

Upon the realization that the pandemic would not end in a short time and that the process would be prolonged, it became imperative to implement different practices in order not to disrupt education. Among the countries that suspended face-to-face education, China, as the country where the disease emerged, first suspended face-to-face education. In order to prevent the spread of the pandemic, Italy, Iran, Afghanistan, Pakistan, Vietnam, Iraq, Northern Ireland, the United Kingdom, the United States, Germany, France, Japan, Armenia and Azerbaijan suspended face-to-face education after China (Eken et al., 2020: 116). By April 2020, just one month after the World Health Organization officially declared COVID-19 pandemic, governments in 188 countries had closed schools. The proportion of students affected reached 92% (UNESCO, 2020). UNESCO recommended countries to continue education remotely and to observe groups with negative situations in this process (Can, 2020: 14). In this context, each country has made arrangements in education in line with its own education system and opportunities and has switched to distance education.

At the 2021 UNECSO meeting, participating countries shared their pandemic education policies. Romania prioritized emotional support for students while increasing the number of remedial classes. Canada invested heavily in online learning tools, which led to an increase in remedial classes. The Lao People's Democratic Republic adjusted academic programs and placements to promote educational equity for remote students and ensured that they received the necessary materials. The Maldives also implemented special programs for students with special needs and a revised academic calendar for six months. As the COVID-19 pandemic disrupted education around the world, governments implemented a range of policies to mitigate its impact. At the same meeting, Canada, Romania, Portugal, Italy and China pledged to double their investment in education to reduce dropout rates. Malta plans to digitize education by distributing free digital devices, while Iran is focused on creating printed materials and teaching content to provide equitable education to students and refugees without access to distance learning (UNECSO, 2021).

With the closure of schools in Turkey, it has become important to continue education on alternative platforms. Distance education is the key element to sustain MNE's services and to deliver these services to all education stakeholders (Özer, 2020: 1126). Due to the Covid-19 pandemic in Turkey, education and training activities were carried out remotely during the second semester of the 2019-2020 academic year and the 2020-2021 academic year. Television, websites and video call programs played a major role in this process. In Turkey, distance education was first conducted via television or radio. Recently, with the development of technology and the widespread use of the internet, it can be said that education has moved to the online environment (Doğan & Koçak, 2020: 112; Bakırcı, Tunç, & Cengiz, 2022: 175).

To facilitate distance education, the Ministry of National Education has chosen to use the online platform EBA (Education Information Network) and the national television channel TRT (Turkish Radio and Television Corporation) for course delivery. The Ministry is working in collaboration with TRT to quickly

produce learning materials for distance education through national broadcasting. MNE has chosen EBA as the main platform for distance education. EBA is a digital education portal developed by MoNE and has been in service since the 2011-2012 academic year. This portal offers various learning materials such as curriculum-based videos, documents, e-books, e-books, tests, activities, etc.to education stakeholders from pre-school to high school level. Students, teachers and parents can access more than 5000 books, hundreds of thousands of documentaries, cartoons and documentaries on the EBA portal. EBA is also a dynamic portal and offers various opportunities for students and teachers. Teachers can assign students to assessment tasks through the EBA portal. In addition, the portal is a tool for analyzing the academic needs of the students using the data based on their responses to the tasks. In this way, students can access materials according to their personal academic needs (Özer, 2020: 1126).

During the pandemic, free access to EBA up to 8 GB was provided via mobile networks to ensure uninterrupted access to distance education. 14267 EBA support points and 164 mobile EBA support points were established for students in rural areas and with access to transportation problems. More than 500,000 tablets were distributed to disadvantaged students who were entitled to free internet access up to 25 GB. 80,000 webcams for schools were distributed and started to be used in live classrooms. EBA TV, 3 separate channels were established for students who do not have access to the internet to continue their education. During the distance education process, EBA assistant was assigned to answer user questions immediately, solve problems and ensure the most effective use of EBA. EBA Control and Monitoring Center was established to ensure uninterrupted live lessons. Reaching 400,000 students, TRT EBA TV Primary and Secondary Schools offered academic courses for students and informative broadcasts for families. Students on the EBA platform provided materials for those who wanted to focus and find relevant lessons and online notes. Video recordings of the lessons were also available on EBA and students could repeat the lessons as many times as they wanted. The courses on the EBA portal are structured according to school levels. All lessons were shown to students in primary and secondary schools between 09.00-14.00 hours, and lesson repetitions were shown to students in the same order between 14.30-19.30 (Özer, 2020: 1126

According to MNE's distance education data for the period of 23 Nart 19 June 2020, EBA became the 10th most visited website in Turkey and the 3rd most visited education website in the world with approximately 3.1 billion hits. During the distance education process, 7,383,213 students benefited. During this period, 5,954,174 live lessons were held on EBA TV. For students who will take the YKS and LGS exams, programs including the subjects they are responsible for in the exam were included. In addition, EBA support points were opened in neighborhoods by MNE for students to access the internet more easily. At the same time, online professional development trainings were provided for teachers to adapt to the process (MNE, 2020).

The pandemic has dealt a heavy blow to the education system, causing widespread disruption and unpredictability. Uncertainty and chaos became the norm as educators struggled to adapt to the new reality. School closures necessitated the implementation of radical changes that led to both innovation and inequality. The shift to distance learning has exposed inequalities in students' access to technology and home resources, highlighting the importance of physical facilities in the learning process. As a result, the pandemic has led to a reassessment of traditional teaching methods and the role of technology in education (Önal, et al., 2022: 80).

## 3 METHOD

### 3.1 Research Model

In the study, case study design, one of the qualitative research designs, was used to examine the effectiveness of science education in the emergency distance education process in line with the views of middle school students. Qualitative research is research that follows the process of real and complete emergence of perceptions and events in natural spaces by using qualitative data collection tools such as observation, interview, literature review. (Yıldırım and Şimşek 2011). Qualitative research is conducted due to the need for a complex and detailed understanding of a topic (Creswell 2013).

The most important feature of the case study model is that the situations, individuals or communities addressed in the study are selected due to their unique characteristics and handled within their own contexts. Based on this background, the case study reveals the attitudes or behaviors of the participants identified as the subject of the study towards the study of a particular person, community or event and systematically explains these characteristics or behaviors (Johnson & Christensen, 2004).

### 3.2 Working Group

The sample of the study consisted of 46 middle school students (5th, 6th, 7th, 8th grade) from an official middle school (5th, 6th, 7th, 8th grade) affiliated to the Directorate of National Education in Uşak in the 2021-2022 academic year.

**Table 1.** Distribution of the Students Participating in the Study According to Their Gender and Grades

| Student | Gender | Grade | Student | Gender | Grade |
|---------|--------|-------|---------|--------|-------|
| S1 | Girl | 6 | S24 | Girl | 7 |
| S2 | Girl | 6 | S25 | Boy | 7 |
| S3 | Girl | 6 | S26 | Girl | 7 |
| S4 | Boy | 6 | S27 | Girl | 7 |
| S5 | Boy | 6 | S28 | Girl | 7 |
| S6 | Boy | 6 | S29 | Boy | 7 |
| S7 | Boy | 6 | S30 | Boy | 7 |
| S8 | Boy | 6 | S31 | Boy | 7 |
| S9 | Boy | 6 | S32 | Boy | 7 |
| S10 | Boy | 6 | S33 | Boy | 7 |
| S11 | Boy | 5 | S34 | Boy | 8 |
| S12 | Boy | 5 | S35 | Girl | 8 |
| S13 | Boy | 5 | S36 | Girl | 8 |
| S14 | Boy | 5 | S37 | Girl | 8 |
| S15 | Girl | 5 | S38 | Girl | 8 |
| S16 | Girl | 5 | S39 | Girl | 8 |
| S17 | Girl | 5 | S40 | Girl | 8 |
| S18 | Girl | 5 | S41 | Boy | 8 |
| S19 | Girl | 5 | S42 | Boy | 8 |
| S20 | Boy | 5 | S43 | Boy | 8 |
| S21 | Girl | 5 | S44 | Boy | 8 |
| S22 | Girl | 7 | S45 | Boy | 8 |
| S23 | Girl | 7 | S46 | Boy | 8 |

In the study, since the interview was started with the 6th graders, the 6th grade students were first included in the code order of the students and then the 5th grade students.

Of the students participating in the study, 11 were in Grade 5, 10 in Grade 6, 12 in Grade 7 and 13 in Grade 8. 21 of them are girls and 25 of them are boys.

### 3.3 Data Collection Tools

The data were obtained through a semi-structured interview form prepared by the researchers. Semi-structured interview is a type of interview in which questions are prepared in advance in a specific format to determine the types of questions to be asked to the interviewee. These prepared questions are intended to reveal the thoughts, feelings, attitudes and suggestions of the interviewees. Asking the same questions to different people in interviews allows comparisons to be made between the answers of the interviewees (Bogdan and Biklen, 2007). During the preparation of the interview form, a detailed literature review was conducted and then three expert opinions were taken and the final version of the interview form was created.

Interviews with students were conducted face-to-face. The interviews were audio recorded, then listened to and transcribed. The interviews lasted approximately 10-15 minutes. Students were informed before the interview and the interviews were conducted at the school outside of class hours.

### 3.4 Data Analysis

The data obtained from the interviews were subjected to content analysis. Content analysis is a technique in which inferences are made to understand the existence, meanings and relationships of certain concepts

and words within the set of data obtained by allowing close examination of human behavior in non-direct ways (Büyüköztürk et al., 2013). The basic process of content analysis is to collect similar data within the framework of certain concepts and themes and interpret them in a way that the reader can understand (Yıldırım & Şimşek, 2011).

In the content analysis, personal information of the students was not included, and students were coded as S1, S2, S3, … S46. In the data analysis study, the notes were analyzed after the interviews with the students and the data were first grouped according to the answers received, and then themes were formed.

## 3.5 Validity and Reliability

The concepts of validity and reliability are as important in qualitative research as in quantitative research, only in qualitative research, they are used in relation to the observations made and the answers received by the researchers in response to the interview questions (Büyüköztürk et al., 2013).

Care was taken to ensure that the semi-structured interview form prepared for the research was suitable for the purpose of the research, consisted of questions that could fully reveal the purpose of the research and overlapped with the subject of the research. The opinions of three experts were taken in finalizing the interview form.

In order to increase the reliability of the study, quotations were made from the participants in the findings section. In terms of reliability, care was taken to be objective during the data collection and analysis phase.

Interviews were recorded and stored in digital media in case they might be needed at any time.

## 4  FINDINGS

### 4.1  Findings on What Students Do to Adapt to Emergency Distance Science Education

In the study, students were asked the question "What did you do to easily adapt to emergency distance science education?". The responses were analyzed under the themes of arrangements made for the environment and preparations made to understand the lessons better. These themes and the sub-themes that emerged in this context are given in Table 2.

**Table 2.** Actions Taken to Adapt to Urgent Distance Science Education

| Theme | Subtheme | f | % |
|---|---|---|---|
| Adjustments to the environment | Creating the classroom-like environment | 16 | 21.05 |
| | Organizing the environment | 15 | 19.74 |
| Preparations to understand the Lessons better | Ensuring attendance to classes | 27 | 35.53 |
| | Taking Notes, Solving tests | 18 | 23.68 |

As seen in Table 2, in order to adapt to emergency distance education, students made arrangements for the learning environment and preparations for better understanding the lessons. The arrangements made for the environment were divided into the sub-themes of creating the classroom-like environment and organizing the environment. 21.05% of the students stated that they made arrangements for creating the classroom-like environment. Some of the answers given by the students for the theme of creating the classroom-like environment are as follows:

"I bought new things related to the lesson, pens, cameras, etc. It was fun to start the lesson" (S7).

"I was trying to feel like I was in the classroom. I was trying to participate in the lessons" (S8).

"I organized my room as if I was at school for adaptation. Thus, I made myself mentally happy" (S17).

19.74% of the students stated that they made arrangements for organizing the classroom-like environment in order to adapt.

"I adapted easily; I prepared my water, my books, I listened to music sometimes to feel psychologically good" (S46).

"I could not adapt easily. I physically prepared notebooks and books. Psychologically, I was not very good because of the virus. I could not motivate myself" (S39).

The preparations made for the preparation of the lessons were divided into the sub-themes of attending the lessons, taking notes and solving tests. 35.53% of the students stated that they attended the courses to adapt to distance education. Some of the answers given by the students for the theme of "attending the lessons" are as follows:

I attended the lessons as much as possible (S2).

I adapted easily. I tried to attend class all the time. I had no sleep pattern. I did homework. I turned on the camera (S4).

23.68% of the students stated that they kept notes and solved tests to adapt. Some of the answers given by the students regarding the theme of taking notes and solving tests are as follows:

For harmony, I took the notes of the subjects more organized and drew more carefully (S18).

"I could not adapt easily. I took a lot of notes, but I could not understand the 6th grade subjects" (S23).

In order to adapt to the urgent distance education process and not to fall behind in their lessons, the students organized their environments by making efforts in their own way and participated in the education process by trying to create a classroom environment as if the face-to-face education process was continuing.

### 4.2 Findings on the Effects of Emergency Distance Science Education

The students who participated in the study were asked the following questions**: "**What are your opinions about the effects of emergency distance science education?", "What difficulties did you encounter in the distance science education process? What did you do to overcome these difficulties?", "What are the beneficial aspects of the distance science education process for you?" and "Was there any factor that hindered you in the home environment in the distance science education course?". Since the answers received were close to each other and similar answers were given, the answers received to these questions were combined and evaluated. In this context, the responses received from the students were evaluated under two main themes: positive aspects and negative aspects of emergency distance education. These themes and the sub-themes that emerged in this context are given in Table 3.

**Table 3.** Positive and Negative Effects of Emergency Distance Science Education

| Theme | Subtheme | f | % |
|---|---|---|---|
| Positive effects of emergency distance science education | − Somehow accessing the lessons | 10 | 7.41 |
| | − Contribution to learning | 8 | 5.93 |
| | − Not falling behind in lessons | 6 | 4.44 |
| | − The comfort of a home environment | 5 | 3.70 |
| | − Replay of lessons | 3 | 2.22 |
| | − No absenteeism of students | 3 | 2.22 |
| | − No fear of being late | 3 | 2.22 |
| | − Covid-19 prevention | 2 | 1.48 |
| Negative impacts of emergency distance science education | − Incomplete understanding of the subjects | 30 | 22.22 |
| | − Connection problems | 25 | 18.52 |
| | − Failure to learn the subjects | 15 | 11.11 |
| | − Problems arising from the home environment | 15 | 11.11 |
| | − Forgetting class times | 5 | 3.70 |
| | − Not waking up on time | 5 | 3.70 |

The students evaluated the positive effects of emergency distance science education as; being able to teach the lessons (7.41%), contributing to learning (5.93%), not falling behind in the lessons (4.4%), comfort of home environment (3.70%), being able to watch the lessons again (2.22%), not writing students absent (2.22%), not being afraid of being late (2.22%) and protection from covid-19 (1.49%).

"At least we were able to learn our lessons, otherwise we would not have been able to learn at all. We would definitely fall behind the curriculum" (S12).

"I woke up and went to class immediately; it was not difficult. It was comfortable, we could attend and listen to the lesson even lying down" (S29).

"It was not as useful as face to face, but by not coming to the school, we protected ourselves from Covid 19" (S10)

The main negative effects of emergency distance education are not fully understanding the subjects (22.22%), connection problems (18.52%), not being able to learn the subjects (11.11%), problems arising from the home environment (11.11%), forgetting the class hours (3.70%) and not being able to wake up on time (3.70%). Some of the responses received from the students are given below.

"Distance science education affected me badly; even if we didn't learn the lessons, we were getting 100 as mark, it was like a loss. We could not learn curriculum of Grade 6." (S23)

"Disconnections, my brother making noise when entering the room. I closed the door to prevent it. We could mute our voices from Zoom" (S16).

"There were not many difficulties. Waking up from sleep; turning on the PC was the only difficult thing. Sometimes if we fell asleep, my brother and I would wake each other up" (S2).

### 4.3 Findings on the Differences of Emergency Distance Science Education from Face-to-Face Education

In the study, the students were asked the question "What do you think are the differences between emergency distance science education process and face-to-face science education process?". The responses are given in Table 4.

**Table 4.** Differences between Emergency Distance Science Education and Face-to-Face Education

| Theme | Sub-themes | f | % |
|---|---|---|---|
| Differences between emergency distance science education process and face-to-face science education process | − Limited interaction in distance education | 33 | 50.00 |
| | − The problem of dropping out of the course in distance education | 14 | 21.21 |
| | − Better concentration in face-to-face education | 12 | 18.18 |
| | − Teachers can be more effective in face-to-face education | 4 | 6.06 |
| | − Unsupervised student in distance education | 3 | 4.55 |

As can be seen in Table 5, according to the students, the differences between distance education and face-to-face education are, in order of priority, the sub-themes of limited interaction in distance education (50%), the problem of breaking away from the lesson in distance education (21.21), better attention in face-to-face education (18.18), the teacher can be more effective in face-to-face education (6.06) and the student is unsupervised in distance education (4.55). The fact that the responses of the data were close to each other and that there was information on more than one theme in one response caused the responses not to be separated according to the themes. Some of the responses received from the students are given below:

"Differences: Online, there were disconnections, audio dropouts. There are no such problems face to face. The lesson is easy at school. Not seeing my friends was also negative" (S16).

"Differences; sometimes the lecturer did not open the class. He only played a video. He was explaining a little bit. Now face to face everything is better; the teacher is more active, video, experiment everything is more fun" (S2).

"The difference with the face-to-face education process: the two have nothing to do with each other. Face-to-face is very very good, interaction with the teacher is better face-to-face" (S24)

### 4.4 Findings Regarding the Activities of Teachers in the Emergency Distance Science Education Process

In the study, in order to understand what kind of activities teachers did in science education in the distance education process and what they did to increase students' interest in the lesson, the questions "What did the teacher do to increase your interest in the lesson in distance science education?", **"**What activities or applications did your teacher use in the lessons in the distance science education process?", **"**What were the materials used in the distance science education course?) Experiments, slides, animations, etc.)" were asked.

Teachers' practices in the emergency distance science education process were analyzed under the themes of what was done to attract interest in the lesson and lesson activities. These themes and the sub-themes that emerged in this context are given in Table 5.

**Table 5.** Teacher's Activities in the Distance Science Education Process

| Theme | Subtheme | f | % |
|---|---|---|---|
| Activities to attract interest in the lesson | – Animations | 25 | 25.00 |
| | – Videos | 19 | 19.00 |
| | – Jokes | 9 | 9.00 |
| | – Experiments | 8 | 8.00 |
| | – Texting students before class | 4 | 4.00 |
| | – Competitions | 3 | 3.00 |
| | – Drawing graphs and figures | 2 | 2.00 |
| Lesson activities | – Use of distance education platforms (EBA and different platforms) | 39 | 39.00 |
| | – Doing the activities in thetextbook | 35 | 35.00 |
| | – Reading a book | 10 | 10.00 |
| | – Experiments | 8 | 8.00 |
| | – Solving unit evaluation questions | 8 | 8.00 |

When Table 5 is analyzed, it is seen that teachers used animations (25%), videos (19%), jokes (9%), experiments (8%), sending messages to students before the lesson (4%), contests (3%), drawing graphs and figures (2%) to attract students' attention to the lessons in the emergency distance science education process. Some of the responses received in this regard are given below.

"The teacher used animations, competitions and experiments to increase interest in the lesson" (S8).

"In order to increase interest in the lesson, he played games and made jokes about science" (S15).

"The teacher used to send the class time in order to increase the interest in the lesson. He used to tell us to enter the class" (S5).

During the lesson, teachers carried out the lesson activities by utilizing different educational platforms in distance education (39%), doing the activities in the textbooks (35%), having students read the lesson books (10%), conducting experiments (8%) and solving unit evaluation questions (8%). Some of the responses received on this subject are given below.

"The teacher was playing the videos and reading the books. Teacher was using EBA and Zoom" (S16).

"We solved tests from the book; we did reading. The teacher was sending photos of questions from the books so that you could solve them" (S40).

When the responses received from the students are analyzed, it can be said that in the distance education process, teachers do whatever can be done to attract students' attention in line with their possibilities and try to process science education with the activities that distance education allows.

### 4.5 Findings Regarding What Students Do During the Emergency Distance Education Process

"What kind of preparations did you make before the lesson in the distance science education process?", "How did you use the textbooks in the distance science education process?", "Did the teacher take notes in

the distance science education course?" and "Did you keep proper notebooks in the distance science education course?" and "How did you study your lessons in the distance science education process? What did you do?"

What the students did for science education in the emergency distance education process was analyzed under two themes: what was done before the lesson and what was done during the lesson. These themes and the sub-themes that emerged in this context are given in Table 6.

**Table 6.** What Students Do in the Emergency Distance Science Education Process

| Theme | Subtheme | f | % |
|---|---|---|---|
| Pre-lesson activities | − Preparation of course materials | 35 | 21.08 |
| | − Preparation of the environment | 30 | 18.07 |
| | − Repetition | 9 | 5.42 |
| What happens during the lesson | − Taking notes | 47 | 28.31 |
| | − Organized bookkeeping | 35 | 21.08 |
| | − Doing the activities in the textbook and solving the questions | 10 | 6.02 |

As seen in Table 6, in the emergency distance education process, students prepared their course materials (21.8%), prepared their environment (18.07%) and practiced (5.42%) before the course. Some of the answers given by the students regarding what was done before the lesson are as follows:

"Preparations before the lesson: I was preparing my stationery and charging my phone" (S6).

"As a preparation, I had my breakfast; I warned my family; then I prepared the notebooks for whatever lesson I had. I read my notes" (S14).

"Preparations before the lesson: I prepared my science notebooks and books, testbooks and pencils. I did repetitions before the lesson. I solved tests" (S15).

During the lesson, teachers asked students to take notes and keep a notebook. At the same time, they also asked them to participate in solving the questions during the activities while explaining the lesson. 28.31% of the students took notes during the lesson, 21.08% of them solved the questions by doing the activities in the textbook and 6.02% of them kept a notebook regularly. Some of the answers given by the students about the extent to which their teachers fulfilled these demands are as follows:

"I could not keep a proper notebook; the teacher was telling me to take notes; although I did not take screenshots, I was not keeping a notebook" (S37).

"We solved tests from the book; we did reading. The teacher was sending photos of questions from the book so that you could solve them" (S40).

### 4.6 Findings on Assessment Activities in the Emergency Distance Science Education Process

In order to understand how students were evaluated during the emergency distance education process, we asked the question "Were homework assignments given in distance science education? If yes, were your homework checks done? If yes, how?", "How were your written exams administered in the distance science education course?", "How were your oral exams administered in the distance science education course?", "What were the differences between the exams administered at a distance and the exams administered in face-to-face education?" and "In distance science education, was there an environment where you and your friends could evaluate each other?".

How students were assessed in the distance science education process was evaluated under the themes of homework, written exams, oral exams, peer assessment and differences of exams from traditional teaching.

**Table 7**. Opinions on Assessment Activities in Distance Science Education Process

| Theme | Subtheme | f | % |
|---|---|---|---|
| Assignments | – Homework checked | 15 | 8.33 |
| | – Control of homework left to parents | 5 | 2.78 |
| Written exams | – Face-to-face at school | 21 | 11.67 |
| | – Not done | 17 | 9.44 |
| | – Made remotely | 6 | 3.33 |
| Oral exams | – It was done as well as in person | 31 | 17.22 |
| | – Evaluated according to class attendance | 12 | 6.67 |
| | – Not done | 9 | 5.00 |
| | – Everyone was given 100/100 | 5 | 2.78 |
| Peer review | – No evaluation environment | 22 | 12.22 |
| | – WhatsApp conversations outside class | 5 | 2.78 |
| Differences with assessment in traditional teaching | – Cheating on exam | 25 | 13.89 |
| | – Face-to-face exams are more understandable | 7 | 3.89 |

As seen in Table 7, homework assignments were also given by teachers during the emergency distance science education process. Homework assignments were sometimes checked by the teachers (8.33%), and sometimes parents were asked to check the assignments (2.78%). Some of the responses received from students in this regard are as follows:

"Homework was sometimes checked by using the camera" (S5)

"Homework was given from EBA, and they also gave homework from test books and asked our parents to confirm via WhatsApp" (S36).

Homework was assigned but there was no strict control. The teacher told parents to check their children's homework but this did not work well (S28)

In the first semester of the emergency distance education process, written exams were not held (9.44%), while in the second semester they were held as face-to-face at school (11.67%). Some teachers also attempted written exams remotely (3.33%). Some of the responses received from students on this subject are as follows:

"The 1st semester written exam was not applied (S21).

"We came to school for the written exam; everyone was given 100/100 (it was the 2nd semester). There were always masks, distance disinfectant, temperature measurement, and we had the written exam by sitting on each desk alone" (S45).

"Sometimes in our written exams we send our answers via internet. Although we did not answers correct teacher gave us 100/100" (S16).

There were students who stated that oral exams were not conducted during the emergency distance education process (5.00%), as well as students who stated that they were tried to be conducted as in face-to-face education (17.22%), and that oral grades were given according to class participation (6.67%). There were also students who stated that all students were given 100/100 written grades (2.78%). Some of the responses received from students on this subject are as follows:

"Oral exams were more valuable than written exams; the teacher would have the cameras turned on and we would have oral exams as if we were face to face" (S30).

"The online oral exam was done like this, the teacher asked a question; we raised our fingers (as digital). He gave the floor to someone. The teacher gave exaggerated marks in the oral exams" (S15).

There were students who stated that there was no environment for emergency distance education (12.22%) and that they evaluated each other via WhatsApp (2.78%). Some of the responses received from students on this subject are as follows:

"There was no enough chance to evaluate each other with our friends" (S26).

"Evaluating each other with friends was in the form of sending questions to each other on WhatsApp" (S44).

According to the students, the main differences between the exams in the distance education process and the exams in the face-to-face education process are that cheating can be done in different ways easier (13.89%) and that the face-to-face exams are more understandable (3.89%). Some of the responses received from students on this issue are as follows:

"I could cheat a lot in distance exams, but I cannot cheat face to face" (S42)

"Face-to-face exams are more understandable and of better quality. Online exams are not good, everyone can cheat. In face-to-face exams, we are under control" (S24).

From the responses received from the students, it can be said that although homework assignments were given during the distance education process, their control could not be realized in a healthy way. It can be said that written evaluations were not made in the first period of the pandemic, and oral evaluations were not carried out in a healthy way due to the negativities experienced, especially connection problems. In the second semester, it can be stated that written exams were held in the school environment, written evaluations could be made more objectively and the cheating situation enabled by the remote environment was prevented. A healthy peer evaluation was not realized during the distance education process.

## 5    CONCLUSION, DISCUSSION AND RECOMMENDATIONS

In the research, which was carried out to examine the effectiveness of science education given in the emergency distance education process implemented during the COVID-19 pandemic process according to student opinions, 46 students attending the 5th, 6th, 7th and 8th grades of an official secondary school affiliated to the Directorate of National Education in Uşak province in the 2021-2022 academic year voluntarily participated.

In the study, first of all, what the students did to adapt to emergency distance science education was questioned. In this context, it was determined that the students made arrangements for the environment and understanding the lessons in order to adapt. In order to adapt to the environment, they tried to adapt their home environment to the classroom-like environment and to organize the environment to participate in the lesson. In this context, they checked the internet connection status and prepared the materials they would need in the lesson. In order to understand the lessons, they paid attention to the lessons, took notes and solved test questions related to the lessons.

According to the students, emergency distance science education had positive and negative effects. The main positive effects were that they were able to process their lessons, that it contributed to their learning and that they did not miss any lessons. Among the negative effects, they stated that the subjects were not fully understood, connection problems, difficulties to learn the subjects and problems arising from the home environment.

When the studies in the literature are examined, it is seen that they mostly focus on the negative aspects. A limited number of studies have also looked at the positive aspects of emergency distance education. In a study examining the opinions of teachers and school administrators regarding the emergency distance education process given during the pandemic, the opinions of "Obtaining certain gains with distance education, even if partially, rather than not receiving any education at all", "Continuing education regardless of the conditions", "Students do not miss the lessons and not completely break away from the lessons" came to the fore in line with the research finding (Han, Demirbilek, & Demirtaş, 2021).

According to the students who participated in this study, the main negative effects of urgent distance science education are not fully understanding the subjects, connection problems, difficulties to learn the subjects and problems arising from the home environment. In Koçak's (2022) study, it was observed that students

in the distance science education process had problems in understanding and focusing on distance education courses. In the study by Benli Özdemir (2021), in which the opinions of the students on the Science Course in the emergency distance education process were examined, the students, especially the students who had problems due to technical problems, stated that they had serious problems in online education. Türkmen and Öntürk (2021) conducted a study on science teachers and found that the biggest obstacles to distance education were internet connection, infrastructure-hardware problems, and to control the students. It was observed that students who attended online classes with their cameras turned off and noise from home environment caused problems. Ünal and Bulunuz (2020), in their study on science teachers, stated that there were technical problems in the system at the beginning of the pandemic, but some of them decreased later. Looking at the studies conducted in the literature, it is seen that the negativities experienced in the emergency distance science education process are similar. In particular, internet connection and the problems brought by the home environment cause negativities, while the biggest problem in terms of education is that the subjects are not understood.

Students were asked about the main differences between emergency distance science education and face-to-face science education. The main responses were limited interaction in distance education and the problem of disengagement in distance education. Distance education is a model that differs from standard education models in terms of its implementation. It is an educational activity in which students, teachers and educational tools in different places are brought together through communication technologies (Aslantaş, 2014). In the distance education process, students' communication with each other and teachers is very limited (Battal & Koşar, 2021). The limited interaction was caused by the intense infrastructure problems in the first phase of the pandemic and the insufficient internet connection. Students who received education in that process expressed these problems as the main difference.

According to the students, during the emergency distance education process, teachers made serious efforts both to attract interest in the lesson and to ensure participation in the lesson. While teachers used animations and videos to attract attention to the lesson, they also made jokes and conducted experiments. During the lesson, in addition to using distance education platforms, they had students do activities in the textbook and read the books. When the studies in the literature are examined; science teachers participating in Koçak's (2022) study stated that they had the most problems with student participation and low motivation in this process. Science teachers tried to do different activities in line with the possibilities in order to gather students' attention. However, since the possibilities and opportunities were limited, experiments, which are important in science lessons, could not be fully realized. Bostan Sarıoğlan, Altaş, and Şen (2020) expressed this problem in their study on science teachers and stated that it was difficult to conduct experiments in distance education due to material and technical inadequacies, that teachers made efforts to motivate students by making use of different activities, and that visuals were especially likely to attract students' attention.

What the students did during the emergency distance education process was analyzed before and during the course. Before the lesson, they prepared the course materials and the environment and repeated what they had learned before, and during the lesson, they tried to participate in the lessons by taking notes and keeping notebooks. When we look at the researches in the literature; it shows that students do not have enough self-regulated learning skills and cannot transfer their listening and watching habits in face-to-face environment to online environment (Eken et al., 2020; Karaca & Kelam, 2020; Sezgin, 2021).

In the emergency distance science education process, assessment activities were also carried out in line with the possibilities. Students were given homework assignments, written and oral exams, and peer assessment was very limited. Although the control of the homework assignments was tried to be ensured, it could not be fully realized, written exams were tried to be held in the classical way at school, and oral exams were tried to be carried out as in face-to-face education. According to the students, assessment activities in the emergency distance education process differ from face-to-face assessment activities in two aspects. The first is that cheating is done in different ways, and the second is that face-to-face exams are more understandable. When the studies conducted in the literature are examined, it is seen that results supporting the findings of the research are reached. Türkmen and Öntürk (2021), in their research on science teachers, stated that different student-centered education techniques and assessment and evaluation activities could not be integrated with technology. Deli (2021), again in his study on science teachers, stated that in the second phase of the pandemic, lessons were taught and evaluation activities were carried out by exhibiting a more planned education process compared to the first phase. Science

teachers who participated in Birhan and Doğru's (2022) study stated that science lessons given through distance education were less effective than face-to-face education.

As a result, emergency distance science education caused students to stay connected to school and education, and although the interaction was limited, they did not break away from their school, teachers and friends. Since the emergency distance education process was started unprepared, significant connection problems were experienced during the process. Nevertheless, students tried to feel as if they were in the classroom during the distance education process, and even though they had motivation and attention problems, they did not forget that they were students and tried to participate in the lesson.

In the event of a transition to distance education or a hybrid education system in the coming periods due to different reasons such as epidemics, crises, etc. or changes in educational policies, the experiences of students in the emergency distance education process should be taken into consideration and since the future is uncertain, the fact that those who shape educational policies take into account the views of students will enable a possible distance education process to be organized more effectively and designed in a way that will not lead to learning losses.

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