

The Use of Mobile Learning Technologies for an Online Mathematics Course: Student Opinions in The Pandemic Process

<https://doi.org/10.3991/ijim.v16i23.36209>

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Abstract—This study aims to examine the opinions of university students about using mobile learning Technologies in an online mathematics course during the pandemic (COVID-19) period. The participant group of the study consists of 266 university students studying at a private university. In the study, a mixed research method, in which quantitative and qualitative research methods are used, was used. A questionnaire form which was "Student Opinions Regarding Using Mobile Learning Technologies in an Online Mathematics Lesson During the Pandemic Process" created by the researchers and open-ended questions were used to reveal the opinions of the students about the online mathematics lesson. According to the results of the study, one can be seen that the majority of the students make an effort and spare time to understand mathematics in online lessons who use mobile learning technologies during the Covid-19 pandemic process. In addition, they argued that the majority of the students believe that they will be successful in the exam at the end of the online mathematics lesson by using mobile learning technologies and that it is easy to follow the mathematics lesson online using mobile learning technologies during the Covid-19 pandemic process, depending on the teacher giving the lesson. In addition, they stated the inadequacy of knowledge in the field of numeracy and the lack of technical infrastructure in distance education among the difficulties experienced by the students in the online mathematics course. As learning strategies in the virtual environment, the students stated that they did it again and again, watched the live lesson videos over and over, prepared an individual study program for themselves, took notes, attended regular classes, and watched educational videos by using mobile learning technologies.

Keywords—Covid-19, pandemic, mathematics lesson, online learning, learning strategies

1 Introduction

The coronavirus (COVID-19) emerged in Wuhan and then turned into a pandemic that affected the whole world and did not differentiate between people [1]. As it is

known, the Coronavirus (Covid-19) has affected the whole world, and we have gone through a difficult process around the world. There are some changes in this process, one of which is that education has started to be continued with distance education [2].

When we look at what's going on in this period, the long-term science and education that we all have to review our fields of work and perspective take its toll [3]. On top of that, closer relations can be established between such fields. In this context, it may be necessary to control emotions such as deep anxiety and hopelessness in processes such as the pandemic process [4].

There is a large literature on the closure of educational institutions to reduce the spread during the pandemic process. To prevent the emergence of infectious diseases in society by breaking this meeting chain, the transition to distance education was made without a break. Universities quickly switched to the mode of transferring many courses and programs to students as face-to-face online courses [5].

The distance education method has been integrated into the education system to eliminate the problems experienced in traditional education to some extent. This model, which is supported by the state in many countries as a solution to the disruptions in education, has recently been supported for purposes such as reducing the costs of education, lifelong education, and equal opportunity in education. Distance education is an education system that was born as an alternative to formal education without the limitation of time and place and in which technology is integrated today [6] - [8].

A fast and strong sustainable modern education approach has been adopted for the creation of online learning modules in the education process of university students of this pandemic [9] [23]. During the pandemic process, when distance education systems were used effectively, information was transferred to students quickly. Differences may occur in students' learning of mathematics. Therefore, this study aimed to reveal the opinions of university students about the online mathematics course during the pandemic process.

Early definitions of mobile learning are Palm, Windows CE machines, and digital as electronic learning (e-learning) with mobile digital devices such as mobile phones defined. In Keegan's technology-centered definition, limits mobile devices to those that are portable by users, and mobility emphasizes the concept. That mobile learning is mobile learning that women can easily carry in their bags and men in their pockets. learning from devices while the user is on the go. Today, the mobile Scope of learning by researchers an expanded and distinct paradigm shift is defined as. mobile in general learning, education without a specific place content, benefit from dynamically generated services and interact with others. allowing the user to communicate Immediate response to individual needs through mobile technologies that increase productivity and work performance efficiency by its educational method [10] – [11].

2 Method

In the research, university students' views on an online mathematics course who use mobile learning technologies were examined. In this study, the mixed method was used by using the survey method, which is one of the quantitative research methods, and the

interview method, which is one of the qualitative research methods. According to Büyüköztürk [12], studies aiming to collect data to determine certain characteristics of a group are called survey research. Mixed methods research is research in which the researcher collects and analyzes data, incorporates findings, and draws conclusions using qualitative and quantitative approaches or methods in a single study or research program [13].

2.1 Participants

Regarding the characteristics of a mixed research study, the number of participants was limited. Since the aim was not to generalize the findings, the study was conducted in a private school. The present study was carried out at the school where the researchers worked. This school was chosen because of its easy accessibility. 35.4% of the participants are female and 64.6% are male students.

2.2 Data collection tools

As a data collection tool in the study, the first part consists of the "Student Opinions Regarding Using Mobile Learning Technologies in an Online Mathematics Lesson During the Pandemic Process" questionnaire and the second part consists of open-ended questions. While preparing the questionnaire, the literature was used and the opinions of two experts in the field were taken and examined in terms of face validity. To apply the questionnaire form, necessary permissions were obtained via e-mail and the questionnaires were applied after obtaining permission. The first part of the questionnaire consists of 21 items and is in a 5-point Likert type. For each of the 21 items, it was asked to choose one of the states of strongly disagree, disagree, undecided, agree, and strongly agree. While calculating the questionnaire form score, 1, 2, 3, 4, and 5 points were given to the answers, respectively. In the study, the reliability test was applied to the scale and the Cronbach Alpha value was determined as 0.89 (good reliability). In the second part of the questionnaire, open-ended questions were included. Again, expert opinion was taken for the validity and reliability of the open-ended questions. Content analysis was carried out for the analysis of the obtained data.

Open-Ended Questions:

1. What kind of difficulties did you experience in learning mathematics online by using mobile learning technologies during the pandemic? (a) What prevented you from learning mathematics? (b)
2. What kind of study strategies have you identified for learning online mathematics by using mobile learning technologies during the pandemic?
3. What are your general views on learning mathematics online by using mobile learning technologies during the pandemic?

2.3 Data analysis

The collected data was transferred to the computer environment and the questionnaire was analyzed with the SPSS 24.00 program. To collect the data, a survey form was created via the survey Google Forms. First of all, frequency distribution was made for the survey results, and then the mean and standard deviation values of each item were calculated. For open-ended questions, content analysis was performed and frequency values were tabulated.

3 Findings

The findings obtained from the analysis of the data were presented in tables and comments were made according to the tables. The descriptive statistical findings of the "Student Opinions Regarding Using Mobile Learning Technologies in an Online Mathematics Lesson During the Pandemic Process" questionnaire form were given in Table 1 and the answers to open-ended questions were given in the other tables by making content analysis.

Table 1. "Student Opinions Regarding Using Mobile Learning Technologies in an Online Mathematics Lesson During the Pandemic Process" questionnaire form

UNITS	Arithmetic Mean	Standard Deviation
	X	Sd
During the pandemic, I make an effort to understand mathematics in online classes by using mobile learning technologies.	4.48	0.761
During the pandemic, I believe that I will be successful in the exam at the end of the online math lesson by using mobile learning technologies.	3.95	1.012
During the pandemic, I enjoy studying mathematics online by using mobile learning technologies.	3.84	0.942
During the pandemic, I try to learn more in online math classes by using mobile learning technologies.	4.16	0.895
During the pandemic, I often repeat my notes by using mobile learning technologies before the online class.	3.63	1.016
During the time of the pandemic, it is easy to follow the math lesson online by using mobile learning technologies.	4.01	1.145
During the pandemic, the online math course is easy to understand by using mobile learning technologies.	3.72	1.113
During the pandemic, the materials presented for the math lesson are useful for me to learn by using mobile learning technologies.	4.29	0.900
During the pandemic, I make time for an online math lesson by using mobile learning technologies.	4.44	0.773
During the pandemic, the online math lesson is more interesting to me by using mobile learning technologies.	3.42	1.261
During the pandemic, I often watch the content presented in the online mathematics course by using mobile learning technologies.	4.03	0.986
During the pandemic, I determined my study method for the online math lesson by using mobile learning technologies.	3.96	1.021

During the pandemic, I made a study plan by using mobile learning technologies for my online math lesson.	3.72	1.142
During the pandemic, I can not afford to fail an online math class by using mobile learning technologies.	4.77	0.687
During the pandemic, I have no motivation for an online math class if I do not use mobile technologies.	2.79	1.380
During the pandemic, I am worried that I will fail the online math class by using mobile learning technologies.	3.17	1.489
During the pandemic, I will not be successful even if I study for an online math lesson by using mobile learning technologies.	2.27	1.273
During the pandemic period, I do the homework and assignments given in the online mathematics course by using appropriate strategies and methods.	4.31	0.828
During the pandemic, I do not allow other activities to disrupt my study schedule in the online math class by using mobile learning technologies.	4.10	0.967
During the pandemic, I have a suitable home/dormitory environment to study the online math course by using mobile learning technologies.	4.02	1.173
During the pandemic, I try to stay away from the stimuli to study the online math course by using mobile learning technologies.	3.48	1.284
During the pandemic, I have difficulties using the system (UZEM) by using mobile learning technologies where the online mathematics course is located (connecting to the course, downloading videos, uploading files).	2.42	1.295
During the pandemic, I have difficulty expressing myself to my teacher by using mobile learning technologies in the online mathematics lesson compared to the normal classroom environment.	2.37	1.369
During the pandemic, my anxiety about the math lesson increased even more by using mobile learning technologies.	2.80	1.458
During the pandemic, I have difficulty learning math concepts and formulas by using mobile learning technologies.	2.76	1.317
During the pandemic, I contact other students by using mobile learning technologies who are taking math lessons to get help via social media.	3.26	1.338

According to Table 1, during the Covid-19 pandemic, the students stated that they answered "I absolutely agree" for the topics of making an effort to understand mathematics in online lessons by using mobile learning technologies and allocating time for an online mathematics lesson and that their conscience would not allow them to fail the lesson. In addition, during the pandemic period, the students' used appropriate strategies and methods in the assignments given in the online mathematics lesson by using mobile learning technologies, the materials presented for the mathematics lesson were useful for their learning, and they tried to learn more in the mathematics lessons by using mobile learning technologies, they did not allow other activities in the lesson to disrupt their study order, the students presented in the online mathematics lesson. They stated that they frequently watch the content by using mobile learning technologies and that they have a suitable home/dormitory environment to study the online mathematics course.

In addition to all these, it is easy to follow the online mathematics lesson by using mobile learning technologies, the students choose their study method for the online mathematics lesson, they believe that they will be successful in the exam at the end of the mathematics lesson by using mobile learning technologies, and they enjoy studying

the online mathematics lesson by using mobile learning technologies, it is easy to understand the lesson, they make a study plan for themselves by using mobile learning technologies, they stated that they often repeated their notes before the lesson, tried to stay away from stimuli to study the lesson, and stated that the lesson was more interesting for them by using mobile learning technologies.

During the pandemic, the students who took mathematics lessons did not always communicate to get help from other students on social media, they were undecided about their motivation, learning formulas, and being anxious by using mobile learning technologies. During the pandemic, the students stated that they had no difficulty in using the distance education system where the online mathematics course was available, that they had no difficulty in expressing themselves to the instructor in the online mathematics lesson compared to the normal classroom environment, and that they did not think that they would fail in the mathematics lesson by using mobile learning technologies.

In Table 2, it is seen that 33% of the students in the first place have difficulties in online mathematics lessons due to inadequacy in the numerical field. In other words, the students also stated that before they came to the university, their lack of mathematics background prevented them from learning the course. In the second place, there are expressions such as technical problems, pandemic anxiety, inability to adapt to online lessons at home, not being motivated, and unable to express themselves by using mobile learning technologies.

Table 2. Student views on what kind of difficulties they experienced in learning mathematics during the pandemic by using mobile learning technologies

Opinions	f	%
No difficulty	9	3
Having a lesson conflict	12	5
Intensive program	14	5.5
Inability to Express oneself	15	6
Inability to concentrate	18	7
Inability to adapt to the home environment	25	9
Pandemic anxiety	32	12
Technical issues	52	19.5
Lack of background in maths	89	33
Total	266	100

Table 3 contains the students' opinions regarding the difficulties mentioned. According to these opinions, although 5% state that there is no difficulty, virtual environment problems and power outages are among the biggest reasons. In addition, among the technical problems, problems in the internet infrastructure and COVID-19 follow other problems.

Table 3. Student views on the reasons that prevent learning mathematics

Reasons	f	%
Giving more homework and projects	12	5
Why not	12	5
Covid-19	35	13
Internet infrastructure problems	48	18
Power cut	65	24
Virtual environment	94	35
Total	266	100

Table 4 shows the study strategies developed by students for learning online mathematics by using mobile learning technologies. Considering the frequency values in the table, it was seen that the students preferred strategies such as doing a lot of repetition and watching the live lesson videos over and over by using mobile learning technologies. In addition, it is among the findings that they developed strategies by preparing an individual study program, taking notes, attending regular classes, and watching educational videos by using mobile learning technologies.

Table 4. Study strategies for learning mathematics online during the pandemic

Opinions	f	%
I couldn't determine the strategy	13	5
Watching educational videos	17	6
Take notes	19	7
Attend regular classes	23	9
Studying regularly	28	11
Note down the lectures in the notebook	33	12
Preparing an individual study program	38	14
Watching live lecture videos recorded over and over	45	17
Do a lot of repetition	50	19
Total	266	100

Table 5 shows the general views of students on learning online mathematics during the pandemic by using mobile learning technologies. Among these opinions, it has been revealed that the most important factor facilitating online mathematics lessons with a frequency value of 17% is the lesson teacher. In addition, it has been argued that since the mathematics course is a numerical course, it cannot be efficient in distance education and it can be beneficial by watching the course videos again and again by using mobile learning technologies.

Table 5. Student views on learning online mathematics during the pandemic by using mobile learning technologies

Opinions	f	%
All courses except applied courses should be given by distance education.	2	0.8
Not disrupting education even in difficult times.	8	3
Mathematics lessons should not be in the form of distance education.	12	5
Too much workload.	14	5.2
Being a process that drains all energy.	16	6
Be a difficult process.	21	8
Not like face-to-face training.	24	9
Distance Education is efficient, but its application in mathematics lags.	26	9.5
It is difficult in the distance education stage because it is a numerical course.	28	10.5
Listening to lectures over and over is very productive.	30	11
The most important factor facilitating distance education is the course.	40	15
It is necessary to have sufficient experience to adapt to distance education.	45	17
Total	266	100

4 Discussion

According to the results of the study, by Başar et al. [14] similarly, we see that students have different perceptions. These perceptions include both positive and negative statements. These findings were performed by Bayram et al. [15] showing parallelism with the study. We see that the majority of students are undecided about making an effort and taking time to understand mathematics in online classes during the Covid-19 pandemic process by using mobile learning technologies. In addition, it was concluded that the majority of the students were undecided about believing that they would be successful in the exam at the end of the online mathematics course by using mobile learning technologies.

Genç et al. [16]'s findings show that we have obtained the same results. In addition, we see in the results of the study that they developed a strategy of listening to the live lesson videos again and again. In line with the opinions of the students, the opinion that online mathematics lessons are difficult in the virtual environment by using mobile learning technologies Karatepe et al. [17] was found to be the same as the findings. In addition, Karakuş et al. [18], it was concluded that technical problems (internet and power outages, etc.) were among the difficulties experienced by the students in the first place.

The same conclusion was reached with the study of Cumhuri and Tezer [19], emphasizing that the most important factor in students' online mathematics lessons, as in face-to-face education, is the teacher (educator) factor and that the ease of the lesson depends on this factor. In addition, pandemic anxiety has a negative effect on learning mathematics and this causes online mathematics lessons to be a non-positive cause of the difficulty. This result, on the other hand, is in parallel with the study of Cumhuri and Tezer, and it is seen that anxiety has negative effects on students in

learning mathematics. To eliminate this inequality, which is defined as the digital divide by the OECD (2021), it is necessary to strengthen the internet and mobile technologies infrastructure, expand access to information and communication technologies, and develop individuals in this regard (Öztürk, 2005)[20].

Korucu and Biçer (2019)[21] and Koparan and Yılmaz (2020)[22] stated that the mobile learning environment is beneficial and motivating since it contributes positively to the development of a positive attitude towards the maths lesson, increasing the motivation towards the lesson, and facilitating the student-student and student-teacher communication. As a result, it has been determined that students have positive opinions about the mobile learning environment created by online mathematics lessons.

5 Conclusion and recommendations

In the online mathematics lessons of the students, as in the face-to-face lessons, the students are making an effort to understand mathematics in the online lessons by using mobile learning technologies during the “COVID-19 pandemic process. They stated that they took time to study for the mathematics lesson and they used their study strategies to understand the lesson by using mobile learning technologies. They stated that the materials presented for the mathematics lesson were useful for their learning, and they tried to learn more in mathematics lessons by using mobile learning technologies. In addition to all these, it is easy to follow the mathematics lesson online, but the students who take the lesson stated that they do not always communicate with other students to get help via social media by using mobile learning technologies, they are a little worried about their motivation, about learning the formulas, worrying about failing the mathematics lesson.

Before coming to the university, students stated that their lack of mathematics background prevented them from learning the course, technical problems, pandemic anxiety, inability to adapt to online courses at home, virtual environment problems, and power cuts were other obstacles to learning the course. Despite all these problems, students used appropriate study strategies during the pandemic. It was seen that the students used the strategies of doing a lot of repetition and watching live lesson videos over and over, preparing an individual study program for themselves, taking notes, attending regular classes, and watching educational videos by using mobile learning technologies. Teachers and students should be made aware of the efficient use of mobile technology in education. Studies should be conducted to examine the difficulties faced by teachers and students who teach online mathematics lessons. In their studies, very productive results can be obtained by preparing a suitable lesson plan and making the necessary planning.

Thanks to the widespread use of mobile learning technologies in education, students did not have difficulty in using lecture notes, videos, and course materials related to online education, but still, a significant number of students expressed their concerns about staying in the mathematics course. More detailed research is needed to reveal the difficulty of online mathematics lessons and what other difficulties students in the pandemic process are experiencing and their reasons for concern. To reveal these

difficulties with other research, very productive results can be obtained by taking measures to reduce the difficulties faced by students who use mobile learning technologies in online mathematics courses at the university and reduce their anxiety, and by making the necessary planning.

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Article submitted 2022-09-12. Resubmitted 2022-10-27. Final acceptance 2022-10-30. Final version published as submitted by the authors.