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Research

# Effect of Mobile Instructional Design on Student Perception of Distance Learning [1]

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**Abstract:**

*Learning through mobile applications has become more relevant as mobile tools have evolved. The COVID-19 outbreak that spread across the globe in 2019 promoted to a brief period of distance learning. The purpose of the study was to investigate how the students' perceptions of distance learning were affected by the use of a mobile application designed for a seventh-grade mathematics course. The research was performed using quasi-experimental design. The study was conducted in the distance education process with 7th grade students studying in a secondary school in the 2020-2021 academic year. The mobile application was used to deliver the instruction to the students in the experimental group, whereas the control group received instruction based on the textbook. To collect the data for the study, Yıldırım et al. (2014) designed the "Student Opinions Scale for Distance Education". T-tests were used to assess the data for dependent and independent samples, respectively. The study revealed a substantial difference in the post-test results of the students in the experimental and control groups. It was discovered that there was no significant difference between the pre and posttest scores of the control group students' opinions on distance education and that there was a substantial increase in the experimental group students' attitudes on distance education between the two assessments. According to the findings, it has been suggested that by creating mobile applications in various ways and including them into the distance learning process, the impacts of using them for mathematics classes on distance learning can be studied.*

**Keywords:** distance education, instructional design models, mathematics education, mobile learning

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## INTRODUCTION

Schools are venues where educational activities are carried out with intention, planning, regularity, and control within the framework of a pre-planned curriculum. Teaching is defined as learning-teaching activities carried out in schools. In other words, teaching includes both teaching and learning. In this regard, while educational activities are carried out, they are prepared with a specific goal in mind. While instruction is delivered in schools, relevant face-to-face education activities are prepared. Face- to-face instruction may need to be interrupted in specific instances. In these circumstances, education can be supplemented with a variety of techniques to avoid interruptions. With the worldwide expansion of the COVID-19 outbreak in 2019, it has been assured that schooling continues remotely. It is intended to design and implement education across various platforms to accomplish the targeted benefits of face-to-face education in the remote education process.

The impacts of technology on the educational environment very depend on the development of technology. Web pages, instructional software, mobile applications, web 2.0 tools, and other such technologies demonstrate the effects of technology. Given the kids' ages and time period, they can utilize mobile devices, laptops, and other smart devices easily and acquire the information they seek via online sites. In terms of the generation they belong to, they are willing to employ technology instruments. Depending on this situation, it was requested to create a learning environment according to the ADDIE design model for the teaching of mathematics course Geometry and Measurement sub-learning subjects. Instructional design; It is stated as a systematic development process that proceeds by using learning and teaching theories to ensure the quality of teaching. In this process, there is an analysis of the needs and goals of the learners and the development of systems suitable for the aforementioned requirements. Within these systems, the development of instructional materials and activities and the evaluation of instruction and learners are also included in the instructional design process (Berger & Kam, 1996). In this study, the ADDIE instructional design model, which is the most well-known example of instructional design models, was used. It is stated that when the steps of the ADDIE model are followed, it can be easily applied in online or face-to-face environments (Aldoobie, 2015). For this reason, the learning environment was designed using the ADDIE model in the study. One of the systematic models with five steps is the ADDIE design model. The initials of the steps that make up this model are combined to create the name of the design model. The following steps: analysis, design, development, implementation, and evaluation. The material of the GeoHepta mobile application was organized according to the 5E learning paradigm during the design stage, and a learning environment was established for students to learn by discovery as the topics were taught. While the material of each topic is provided in the GeoHepta application using the 5E learning methodology, it is arranged so that the subjects are found using GeoGebra 6.0 exercises. After the subjects have been comprehended, GeoHepta has been designed in such a manner that they may conduct online assessments

using the evaluation questions on the mobile application and web 2.0 capabilities through the application. The GeoHepta mobile application was thoughtfully set up during the development stage so that it could be used as a web page. The usage of mobile application technologies during mathematics sessions will have a variety of outcomes depending on the age at which the pupils find them appealing. In this regard, the outcomes of the implementation of education using the GeoHepta mobile application, which was created using the ADDIE design model, were examined and reviewed.

The ADDIE instructional design model was first introduced as a general model. When research on the frequency of usage of instructional designs (Göksu et al., 2014; Khodabandeloua & Abu Samah, 2012; Royal, 2007) is analyzed, the ADDIE model ranks among the most commonly used instructional design models. The study was conducted at various levels of education based on the applicability of the ADDIE design model (Albalawi, 2018; Cihan, 2019; Durak & Ataizi, 2016; Fitrani & Ekawati, 2018; Muruganantham, 2015; Yıldırım, 2019).

According to research in the literature, the ADDIE method promotes academic success, motivation, the permanence of learning, and the student's self-confidence, and has a favorable influence on the student's attitudes and approaches (Arkün et al., 2009; Göksu et al., 2014; Mamolo, 2019). The following discussions with academicians that are specialists in the subject, it was determined to adopt the ADDIE technique to perform instructional design in a learning area. In this approach, research has begun in the first semester of the 2019—2020 academic year, following the ADDIE design model phases for educational design. As a consequence of the research conducted during the analysis stage using the ADDIE design model phases, it was determined to create a mobile application for use in the field of studying geometry and measurement in the 7th grade mathematics course. Mobile learning allows for quick communication without regard to time or location, as well as the capacity to carry digital data in the individual's pocket. Mobile technology enables learning to occur outside the traditional classroom setting as well. Because of enabling students to learn outside the classroom, mobile learning encourages informal learning (Crompton, 2013).

Studies on the use of mobile learning-based research in the teaching and application phases have been conducted in many educational sciences domains (Almelhi, 2021; Berberoğlu, 2020; Sönmez, 2018), as well as other scientific fields (Kestel, 2020). However, among the studies on mobile-assisted education, there have been few studies on mathematics instruction. One of these studies, Koparan and Kaleli Yılmaz (2020), investigated pre-service mathematics instructors' perceptions of the learning environment facilitated by mobile learning. Yılmaz, Ustun, and Guler (2021) conducted research on secondary school students who received distant education during the pandemic to assess how they felt about the usage of mobile learning in their mathematics sessions. The study findings showed that secondary school pupils had a modest attitude toward mobile

learning. There is no significant difference in the views of students toward mobile learning according to the variables relating to internet connection type, grade level, gender, and internet usage time. When studies abroad are examined, Franklin and Peng (2008) provided a case study with middle school students in which algebraic equations, slope and absolute value were learned using a smart phone. Because of this research, some difficult concepts in mathematics lessons are learned better with mathematics videos. In their research, Wijers et al. (2010) examined students' participation in mathematics activities by developing a mobile game about geometry. In the research game, it was discovered that the pupils were motivated and had fun. Students stated that they learned quadrilaterals, using GPS and reading maps.

The way that students learn and the way that learning environments are set up may change based on shifting circumstances in daily life. Mobile phones are a helpful tool for individualized learning because they offer several applications. In this research, unlike other research, it is aimed to use in the teaching process by developing a mobile application according to an instructional design model. Studies based on mobile learning are typically conducted using applications on mobile devices, according to the literature (Baya'a & Daher, 2009; Franklin & Peng, 2008; White & Martin, 2014).

The research found that a learning environment should be constructed using technology based on the perspectives gathered from the requirement analysis using the ADDIE design model. In order to communicate with the instructor, the course material, and other students, learners often turn to employing a variety of wireless devices and networks (Sönmez, 2010). According to the needs analysis findings, it was requested that a mobile application be created and used in a fashion that would allow the students to learn the 7th grade Geometry and Measurement learning field subjects using the 5E learning paradigm. The development and use of technology such as mobile applications is anticipated to enhance the distance education process and make studying more engaging. Students have an easier time using technology tools because of their generation. According to research based on mobile applications, using mobile applications increased students' academic performance and attitude toward lessons (Calder & Campbell, 2016; Franklin & Peng, 2008; Taleb et al., 2015). A mobile application for math lessons was employed in the distance learning process due to the COVID-19 outbreak; however research, on its impacts was hampered. To better understand how a mobile learning-based instructional design affects students' perceptions of remote learning, research is being conducted.

### Sub-Problems of the Investigation

The main aim of this study is to present the themes to the students using the GeoHepta mobile application created for the math lesson and to assess the degree to which it has an impact on how the students perceive distance learning. In this situation, two groups—control and experimental—were created to compare how students' opinions of distance learning changed when they used the GeoHepta mobile application (Experimental Group)

versus when they did not (Control Group). The participants in the control group do not use the GeoHepta mobile application, whereas the experimental group participants do. Within the parameters of the investigation, the following issues were looked:

i) Is there a significant difference in the teaching of 7th grade geometry and measurement subjects between the experimental group of students studying in the learning environment designed according to the ADDIE instructional design model and the control group of students where textbook-based teaching occurs takes place according to the Student Views on Distance Education Scale pre-application scores?

ii) Is there a significant difference in final application scores between experimental group students studying in the learning environment designed according to the ADDIE instructional design model and control group students studying in the textbook-based teaching of 7th-grade geometry and measurement subjects?

iii) Is there a statistically significant difference between the pre-test and post-test measurement scores of experimental group students studying in the learning environment developed according to the ADDIE instructional design paradigm in the teaching of 7th-grade geometry and measurement subjects?

iv) Is there a statistically significant difference in the pre-test and post-test measurement scores of the control group pupils who were taught textbook-based education in the field of 7th-grade geometry and measurement?

## Literature

The aim of the study was to investigate the impact of using the GeoHepta mobile application, which was created using the ADDIE instructional design approach, during the distance learning phase. Under this title, the ADDIE design model and distance learning, respectively, are explained.

### *ADDIE Design Model*

If instructional design is considered as a process, it means systematically improving instruction by using learning and instructional theories to increase the quality of instruction (Brown & Green, 2016). One of the instructional design models, the ADDIE model, has been proposed as a general model. When the different variants of the ADDIE model are examined, it is seen that the basic components are the same, only the processes between the steps can differ. Initially to drive the development of military education at Florida State University The ADDIE instructional design model developed by Branson et al. (1975) steps are indicated in Figure 1.

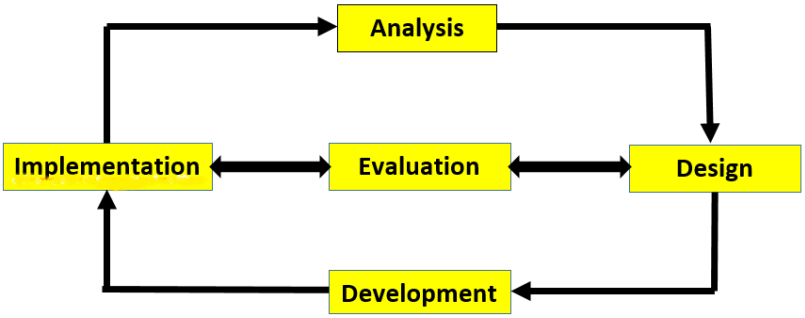


***Figure 1.*** Components of the ADDIE model (Seel et al., 2017)

The ADDIE model is shaped within the framework of five steps. These steps are, respectively; analysis, design, development, implementation and evaluation. In the Analysis step, which is the first step of ADDIE; possible causes of the existing problem are investigated. In order to understand the characteristics of the students who will participate in the teaching, it is possible to look at the unique characteristics of the students, what information they bring from the past and what they see as a need (Peterson, 2003). At the design stage; measurement and evaluation strategies are determined by using learning objectives and learning objectives. At the development stage; content teaching, strategy, and materials to be used in teaching is determined and prepared. During the development phase, the learning process created by making a pilot application is tested. At the application stage, students; and trainers are informed about the application process and the developed design is implemented. In the last stage, Evaluation, tools are determined to measure the quality of teaching and teaching is evaluated. Evaluation can occur not only after the application, but also throughout the instructional design process (Branch, 2009). Research has been conducted at many levels of education in accordance with the applicability of the ADDIE model (Albalawi, 2018; Arisetyawan et al., 2021; Arkün & Akkoyunlu, 2008; Wahab et al., 2017). There are studies based on the ADDIE model at various levels, to simply review these studies. Albalawi (2018) aimed to investigate the effectiveness of using the flipped classroom method, which was prepared in accordance with the ADDIE design, in teaching Math2 to preparatory class students at a university. Because of the research, it has been found that teaching is effective in increasing the performance of students. In their research, Arkün and Akkoyunlu (2008) aimed to determine the effects of the interactive multi-learning environment developed according to the ADDIE instructional design model on academic success and students' views on the fourth grade mathematics lesson column chart. Because of the research, it was found that the developed learning environment increased academic success and students found the software enjoyable.

### *Distance Education*

Individuals who cannot attend in-person education due to time, place, age, geographic distances, working a full-time job, financial hardships, health issues, or family

obligations can still receive an equal education through distance learning. Distance learning has created a wonderful opportunity to improve educational performance as the educational environment has confronted the need for adjustments (Ball & Crook, 1997). It benefits people in a variety of ways, including flexibility with the advantages of technical advancements, individualism in the learning environment, and having the freedom to choose their own participation time and place (Odabaş, 2003). Literature analysis on distant learning has revealed that there are many alternative definitions of distance learning. Alkan (2005) described distance education as a teaching strategy in which the interaction and communication between the instructor and the student are controlled by a system when traditional learning-teaching methods cannot be used. According to Moore and Kearsley (2011), distance education is a method of teaching and learning that was developed via the development of educational activities that allowed students to communicate in a variety of settings while using some instructional technologies. Distance education provides different opportunities in the learning environment. There are different studies in the literature on the effects of distance education in mathematics education (Lowrie & Jorgensen, 2012; Maltempi & Malheiros, 2010; Xu & Jaggars, 2011; Yates & Beaudrie; 2009).

While there was no teacher-student interaction in the early instances of distant learning, there are now numerous ways to establish it. Distance learning had to be moved to 2019 because of the COVID-19 pandemic. Depending on the efficient use of instructional technologies, distance education occurs in virtual environments, of time and location. Schools in Turkey have been shuttered because of the pandemic, as they have done everywhere else. During this procedure, the EBA underwent the necessary adjustments, and online and broadcast television were used to continue education. Live courses delivered by EBA were also used to provide the instruction during the remote learning era. Numerous researches have been conducted on the COVID-19 pandemic, both internationally (Cassibba et al., 2021; El Refae et al., 2021; Lavidas et al., 2022) and nationally (Durak et al., 2020; Korkmaz, 2021; Özdemir Baki & Çelik; 2021). According to Cassibba et al. (2021), in their work; carried out how Sicilian state university mathematics professors faced the challenge of teaching via distance education during the first wave of the COVID-19 pandemic. A new teaching modality has begun to be adjusted as a result of this research. It is feasible to apply brand-new instructional strategies and resources. In her study, Korkmaz (2021) investigated how teacher candidates felt about the Google Classroom digital platform and distance education that were used in the 2019–2020 distance learning process because of the COVID-19 epidemic. The findings concluded that gender and the device used for the lesson had a statistically significant impact on respondents' attitudes about distance education. On the other hand, it has been discovered that factors like working status, the setting in which they take the course, or the family's monthly income level have no statistically significant impact on the attitude scale for distance education.

The GeoHepta mobile application was created in accordance with an instructional design based on studies from the literature. The created mobile application was put to use during the distance learning session to determine what the students thought about it.

## METHOD

### *Research Model*

The research is designed as a quasi-experimental design with a pre-test and post-test control group to investigate the effect of instructional design steps on the views of students toward distance education in the quantitative research design of the 7th-grade mathematics course, as an experiment and a control group.

**Table 1**

*Research Design*

| Groups | Pre-Measurements | Activities | Post-Measurements |
|---|---|---|---|
| **Experimental** | Student Views on Distance Education Scale | Mobile App-Based Education | Student Views on Distance Education Scale |
| **Control** | Student Views on Distance Education Scale | Based on instruction from textbooks | Student Views on Distance Education Scale |

### *Participants*

This study's universe comprises 7th grade secondary school students from all areas of Turkey. The study group of this research consisted of 7th grade students studying in two groups in a public secondary school in the Central Anatolia region in the second semester of the 2020–2021 academic year. The experimental and control groups were selected using an impartial assignment procedure among the designated 7th grade branches. There were 47 students in the study group, with 21 in the control group and 26 in the experimental group. In Table 2, the demographic characteristics of the experimental and control groups students participating in the research are indicated.

**Table 2**

*Demographic Information on the Sample Group*

| Gender | Experimental Group | | Control Group | |
|---|---|---|---|---|
| | Number of Students in the Group | % | Number of Students in the Group | % |
| **Female** | 14 | 54 | 9 | 43 |
| **Male** | 12 | 46 | 12 | 57 |
| **Total** | 26 | 100 | 21 | 100 |

### *Data Collection Tools*

The data of the study were obtained by using "Student Views on Distance Education Scale". Yıldırım et al. (2014) developed the "Student Views on Distance Education Scale" to ascertain how people who are enrolled in distance education feel about these environments and to better design those environments. Students were given access to the 42-item measure online, which was designed based on surveys comprising comments on distant education services. Participants in the study were 1040 undergraduate nursing students at Atatürk University. The provided items were scored on a 5-point Likert scale. Principal Component Analysis was used to examine the data and create the final scale. The study findings created a scale that had 18 elements and 4 variables. According to Yıldırım et al. (2014), the Cronbach's Alpha coefficient of the internal consistency analysis of the entire scale was found to be 0,864. With permission, the scale created to assess how individuals participating in distance education feel about these settings, to improve the settings, and to implement the required interventions was used in the study.

### *Process*

Final preparations were made for teaching to be done with the students in the experimental and control groups one week before the start of the experimental process. One week before the start of the experimental procedure, the experimental group's students who had been chosen following the pre-test application were emailed the link necessary for installing the GeoHepta mobile application on their phones via the WhatsApp group set up for the group's distance learning. Students were taught that a web page could also be used to access the GeoHepta program. An individual user name and password for the GeoHepta student login were issued to each student in the experimental group. The researcher explained how to install the mobile application and how to access it during the live lesson to the experimental group's students before the trial began. The subjects, activities, and evaluation sections in the mobile application were explained to the pupils after it had been

installed. Live lessons were conducted individually during the experimental process in the experimental and control groups, adhering to the lesson plans created for each group, and were initiated by the researcher in each group. During the live classes, the students in the experimental group launched the GeoHepta application on their phones or tablets, while the researcher presented GeoHepta to the class as a web page. By examining the videos and exercises associated with each subject from the mobile application, the students were able to understand the relevant concepts while being guided by the researcher. After understanding the ideas, the students completed evaluation and sample questions. The researcher taught the pupils in the control group using the mathematics textbook for the seventh grade. The researcher assisted in this process by keeping an eye on and directing the students in the experimental group. The researcher used each of the quantitative data gathering instruments in the study at the designated time. The "Student Views on Distance Education Scale", developed by Yıldırım et al. in 2014, has 18 items and a 5-point likert-type scale. Students can complete several questions in around 20 minutes. To collect the data, the "Student Views on Distance Education Scale" was applied as a pre-test before the quasi-experimental research and as a post-test following the research.

### *Data Analysis*

The results of the pre and posttest administered to the experimental and control groups of students were evaluated using the SPSS program. The dependent sample t-test was used to evaluate data within the same group, while the independent sample t-test was used to study data between groups. Because the pre-test and post-test results from the applied scales suggested a normal distribution, the analysis was carried out using parametric testing. Therefore, the opinion scores on distance education between the experimental and control groups were compared using the independent samples t-test (also known as the t-test for unrelated samples). As a result, the scores of the students in the two groups' pre-test and post-test were compared to determine if there was a statistically significant difference. The association between the pre-test and post-test scores of experimental and control groups students was examined using the dependent sample t-test (t-test for related samples).

### *Ethical considerations*

In this study, all rules stated to be followed within the scope of "Higher Education Institutions Scientific Research and Publication Ethics Directive" were followed. None of the actions stated under the title "Actions Against Scientific Research and Publication Ethics", which is the second part of the directive, were not taken.

Ethical review board name: Necmettin Erbakan University

Socıal and Humanıtıes Scıentıfıc Research Ethics Board

Date of ethics review decision: 19.02.2021

Ethics assessment document issue numbers: 2021/50

## RESULTS

In the first sub-problem of the study, first, it was determined how the distribution of scores in the groups was in order to determine the test to be used to determine whether there was a significant difference between the groups of students according to the pre-application scores of the "Student Views on Distance Education Scale". The normality distribution of the pre-application scores of students in the "Student Views on Distance Education Scale" groups was investigated using the normality test. The distribution of the scale mean scores for the experimental (p=,343>,05) and control (p=,225>.05) groups of students was normal. The parametric test was used because the group averages had a normal distribution.

From the parametric tests, it was determined if all of the t-test assumptions were satisfied for unrelated samples due to assumptions, the relationship between the experimental and control group students' pre-application measures was investigated.

**Table 3.**

*Results of the t-test for Unrelated Samples Based on the Students' Views on Distance Education Scale Pretest Data*

| Test Name | Measurement | n | Arithmetic Average | Ss | Sd | t | p |
|---|---|---|---|---|---|---|---|
| Scale of Opinions on Distance Education | Experiment group pre-test | 26 | 51,92 | 8,84 | 45 | -1,708 | ,094 |
| | Control group post-test | 21 | 56,48 | 9,38 | | | |

Table 3 shows that there is no significant difference in pre-application ratings on the "Student Views on Distance Education Scale" between experimental and control groups students.

In the second sub-problem of the study, first of all, it was determined how the distribution of scores in the groups was in order to determine the test to be used to determine whether there was a significant difference between the groups of students according to the post-application scores of the "Student Views on Distance Education Scale". The normality distribution of the post-application scores of students in the "Student Views on Distance Education Scale" groups was investigated using the normality test. Students' scale mean scores in the experimental (p=,629>,05) and control (p=,442>,05) groups had a normal distribution. The parametric test was used because the group averages had a normal distribution.

From the parametric tests, it was determined if all of the t-test assumptions were satisfied for unrelated samples due to these assumptions, the relationship between the experimental and control group students' post-application measures was investigated.

The t-test results for unrelated samples based on post-application data from experimental and control groups are shown in Table 4.

**Table 4.**

*Results of the t-test for Unrelated Samples Based on the Students' Views on Distance Education Scale Post-test Data*

| Test Name | Measurement | n | Aritmetic Mean | Ss | Sd | t | p |
|---|---|---|---|---|---|---|---|
| Scale of Opinions on Distance Education | Experimental group post-test | 26 | 59,23 | 5,61 | 45 | 3,074 | ,004 |
| | Control group post-test | 21 | 53,10 | 8,05 | | | |

The t-test findings for the unrelated samples regarding the post-test data in Table 4 show a significant difference in the students' perspectives on distance education. The effectiveness of the independent variable or factor on the dependent variable is demonstrated by eta-square, a statistic that does not require the assumption of linearity between the variables (Büyüköztürk, 2014, p. 44). The effect size, which ranges from 0 to 1, describes how much of the overall variance in the dependent variable is explained by the independent variable or factor. According to Büyüköztürk (2014); it has a tiny impact size of 0,01, a medium effect size of 0,06 and a big effect size of 0,14.

The effect size was determined to be 0,173 in Table 4. As a result, it may be claimed that the effect size is large because it is near 0,14.

In the third sub-problem of the research, first the pre-test and post-test score distributions were determined in order to determine the test to be used to determine whether there is a significant difference between the "Student Views on Distance Education Scale" pre-test and post-test measurement scores of the experimental group students. Because the pre-test and post-test score distributions were regularly distributed, the parametric test was chosen. Because the measurements were on linked samples, it was determined whether all the t-test assumptions were satisfied for the associated samples due to these assumptions, the link between the experimental group students' pre-test and post-test measures was investigated. Table 5 shows the t-test results for the relevant samples based on the experimental group's pre-test and post-test application data.

**Table 5.**

*The Results of the t-tests for Related Samples Based on the Pre-test and Post-test Application Data of the Experimental Group's Student Views on Distance Education Scale*

| Name of the Test | Measurement | n | Arithmetic Mean | Ss | Sd | t | p |
|---|---|---|---|---|---|---|---|
| Scale of Opinions on Distance Education | Experimental group pre-test | 26 | 51,92 | 8,84 | 25 | -3,643 | ,001 |
| | Experimental group post-test | 26 | 59,23 | 5,61 | | | |

According to Table 5, there is a substantial difference between the experimental group students' pre-test and post-test scores on the "Student Views on Distance Education Scale". The effect size is listed as 0,346 in Table 5. As a result, it may be claimed that the effect size is large because it is near 0,14.

In the fourth sub-problem of the study, first it was determined how the pre-test and post-test score distributions of the control group students were in order to determine the test to be used to determine whether there was a significant difference between the pre-test and post-test measurement scores of the control group students.

Because the pre-test and post-test score distributions were regularly distributed, the parametric test was chosen. Because the measurements were on linked samples, it was determined whether all the t-test assumptions were satisfied for the associated samples. The association between the pre-test and post-test measures of the control group students was investigated due to making the assumptions.

Table 6 presents the t-test results for the associated samples for the control group students' pre-test and post-test application data.

**Table 6.**

*Results of the t-tests for Related Samples Based on Pre-test Post-test Application Data of the Control Group's Student Views on Distance Education Scale*

| Name of the Test | Measurement | n | Arithmetic Mean | Ss | Sd | t | p |
|---|---|---|---|---|---|---|---|
| Scale of Opinions on Distance Education | Control group pre-test | 21 | 56,48 | 9,38 | 20 | 1,499 | ,150 |
| | Control group post-test | 21 | 53,10 | 8,05 | | | |

According to Table 6, there was no significant difference in the control group students' pre-test and post-test scores on the "Students' Opinions About Distance Education Scale".

The effect size is listed in Table 6 as 0,101. As a result, it can be claimed that the effect size is medium because it ranges between 0,06 and 0,14.

## DISCUSSION AND CONCLUSION

Before beginning the applications within the scope of the experimental process, the scale of perspectives on distant education was applied to the students in the experimental and control groups throughout the research phase. The purpose of this pre-application was to determine the opinions of experimental and control groups students on remote education before the application in accordance with the experimental method. The t-test findings for independent samples revealed that there was no statistically significant difference between the two groups' mean scores. Following the completion of the lectures, the "Students' Opinions About Distance Education Scale" was administered to the groups as a post-test. The significance of the students' post-test results in the groups was investigated using the t-test on unrelated samples. The results of the t-test for independent samples showed that there was no statistically significant difference between the mean scores of the two groups. In other words, before the experimental method, the students in the experimental and control groups were equivalent in terms of their scale scores for their opinions on distant education. Following this, the scores of the students' perspectives on distant education were compared using the scale used before and after the experimental process. It was discovered that the scores of the pupils in the experimental group increased. The results of the children in the control group did not improve. A t-test was employed for related samples during the experimental phase to examine if the change in the scores of the experimental group students' perspectives on remote education was significant or not. Similarly, whether or not the difference in the control group students' ratings of distant education is substantial.

The t-test was used to determine the t-test for related samples. According to the findings, only the experimental group of students had a statistically significant shift in their scale scores regarding remote education. There was no statistically significant difference in the changes in scores obtained from the control group. Based on these findings, it can be concluded that the average scores of students who had the learning process assisted by the GeoHepta mobile application improved more than the average scores of students who had the textbook-based learning process. In other words, whereas a textbook-based learning environment had no effect on students' perceptions of remote education, a learning environment that employed a mobile application had a favorable impact on students' perceptions of distance education. As a result, it was discovered that the statistically significant rise in attitudes toward distant education happened solely in the experimental group. Because of the research, it can be thought that the positive increase in the opinions of the experimental group students toward distance education is due to a learning environment based on a mobile application. Similar research results supporting these findings have been reported in the literature (Ergüney, 2017; Sönmez, 2010).

Studies evaluating students' perspectives on remote education based on the usage of mobile applications during teaching are uncommon in the literature. Gökbulut (2021) conducted research to investigate the views and preparedness of distant education students toward distance education and mobile learning in terms of several aspects. According to the findings of the study, while university students' perceptions of remote education were modest, their willingness for mobile learning was high. In the study, there was also no significant difference in students' perceptions of remote education and readiness for mobile learning based on gender, age or education level. On the other hand, the study discovered a marginally favorable association between university students' impressions of remote education and their willingness for mobile learning. The students who used the GeoHepta mobile application in the study had a good development in their attitudes toward distance education, which supports the positive relationship achieved here.

It is the goal of the study by Yousuf (2007) to better understand and measure students' attitudes and beliefs regarding the significance of mobile learning in remote education. The survey findings obviously show that by permitting mobile learning, remote learners, tutors, and support personnel can communicate more effectively, which benefits the overall distance education system. The main benefit of this technology is that it can be used at any time and anywhere, making it accessible to more distance learners.

Fuegen (2012), addressed the increasing research on the use of mobile technologies in education. Because of the research, it has been concluded that traditional learning theories in both traditional and distance education environments are applicable to mobile learning and that mobile devices can be brought into pedagogy in distance education in a suitable way. The development of mobile application-based education throughout the distance education era aids the improvement of students' perceptions of distance learning in this approach.

The following aspects are regarded to be responsible for GeoHepta's beneficial impact on attitudes toward remote education:

1. Based on the findings, the usage of a mobile application called GeoHepta in the teaching process during the distant learning process using COVID-19 is an application that they may benefit from both during and after teaching. Students' good attitudes about distant education may have been influenced by the fact that they benefitted from a different application in distance education with this application.

2. The study was conducted in a remote education setting with student groups during the COVID-19 epidemic. The experimental group received exercises using dynamic mathematics software via the mobile learning environment, and formative evaluations via web 2.0 technologies. Students' perceptions of distant education may have shifted after witnessing how different technology tools are employed.

3. The learning process may be improved by switching from the GeoHepta mobile application to the dynamic mathematics software GeoGebra. This could benefit the experimental group. In particular, the ability to view objects made using unit cube structures from various angles enables students to grasp the subjects more quickly and clearly. According to research, dynamic mathematics software such as GeoGebra 6.0 enhances students' spatial ability and helps the mathematics instruction. It was assured that the structures whose appearances were presented in the course book were imagined in their thoughts in the desired directions in the control group, where textbook-based instruction was carried out in the distant education process. It is discussed how pupils construct based on their responses. In the experimental group, individuals could see the structures provided in the program in an interactive environment and sketch their appearance on the software in any manner they chose. This setting may have allowed them to form a spatial link and influence the success of the experimental group of pupils. As a result, it may be inferred that they have a beneficial impact on their perceptions of remote education.

4. Future research can examine how to employ mobile learning more frequently in classroom settings.

## LIMITATIONS AND RECOMMENDATIONS

Based on the findings of the research with 7th-grade students, the following recommendations were made:

• The GeoHepta mobile application created in this study is restricted to geometry and measurement learning areas in 7th-grade mathematics sessions. In the future, mobile applications with a Turkish interface for other subjects of the mathematics course can be developed, and students' perspectives on distant education can be investigated.

• The experimental duration of this study was restricted to 9 weeks. Students of various achievement levels were able to attend the class throughout the lesson using mobile application technologies. The influence of using mobile applications at different times on students' attitudes on distant education may be examined in future research among students with varying degrees of achievement.

• In order for technology tools to be used effectively in the teaching process, it should be attempted to guarantee that the tools produced follow teaching principles and are used by instructors by paying attention to the learning-teaching process. A mobile application intended for any topic may be claimed to aid in meaningful learning provided it is based on a solid pedagogical foundation. It is critical to examine relevant research in the literature and current mathematics curriculum from the start of the design process in future mobile application development studies.

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