The Effect of Educational Digital Games on Mathematics Attitude in Primary School[1]

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ARTICLE INFO

Article History:
Received 20.05.2024
Received in revised form 09.09.2024
Accepted Available online

09.09.2024

ABSTRACT

The research on the effect of educational digital games on second-grade students' attitudes towards learning mathematics opens the doors to a new educational approach that will shape the mathematical abilities of the future. This study examines the effect of educational digital games on the attitudes of second-grade primary school students towards learning mathematics. The research study group comprised two branches of second-grade students in the same school in the 2023-2024 academic year. The research was carried out with "pre and post-test design with control group", one of the experimental design types of quantitative research method. The students were divided into 40 experimental groups and 40 control groups. During the research period, the experimental group was made to work from various digital educational programs such as Wordwall, GeoGebra, Derslig. The control group was taught with traditional methods. A 27-item, 5-point Likert-type Mathematics Attitude Scale (MAT) was used as a data collection tool. The scale was applied to both groups of students before and after the experimental application. The data obtained were analysed using the SPSS package program. The pre-test data revealed that the attitude levels of the experimental and control groups were equal. Post-test data showed no significant difference between the experimental and control groups. A positive increase was observed in the pre-test and post-test results of the experimental group. These results were interpreted in different contexts.

Keywords:
Primary school, educational digital game, mathematics, attitude.

INTRODUCTION

A game can be defined as a free action perceived as fiction and outside of everyday life, but still can entirely focus the player on itself. The game is an action that takes place at a particular time and place, in a specific order, according to the rules, and forms groups that emphasise their strangeness in the face of the ordinary world by surrounding themselves with secrets or wearing a mask of relationship (Pehlivan, 2014). The game, defined as contentious events, can result in victory, defeat or draw (Çalışandemir, 2016). The game, which starts from the moment of human birth and continues gradually throughout his life, is an educational, instructive and recreational activity that improves the cognitive development areas of the child, whose unique structure, social adaptation, social skills, language, motor and physical development enable the child to express his feelings and thoughts freely without leaving a gap (Yılmaz & Soyer, 2019). The game can take many forms. One of them is educational games. Play is essential for children. Play is the easiest way for children to express their feelings. Children grow up with games and increase their readiness with games. Many things can be taught to children through games that cannot be taught through traditional methods. Games are a great way of learning and training. This is because stable behaviours can be changed through the techniques of the preferred game (Oyunun Onemi, 2019). Using educational game methods in the transition process of students from a concrete learning period to an abstract learning period will help meaningful learning (Yıldız, Şimşek & Araz, 2016).

Educational games are designed and used today by teachers with a pedagogical interest in developing individual behaviour and the full realisation of learning. They can be designed for every age level and student level. Educational games are activities where children repeat and reinforce what they have learned. Educational games should primarily achieve children's learning goals, and behaviour patterns appropriate to the determined goals should be carried out both inside and outside the classroom (Yılmaz & Soyer, 2019).

[1] This article is derived from a thesis written by the first author under the supervision of the second author.

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Human beings need some things, among which there are compulsory needs (eating and drinking, etc.) that people must meet. In parallel with the lifestyle change, there are differences in compulsory needs according to periods. Play is one of the most critical needs of childhood, and some children meet their basic needs in the playground with the help of technology (Demir, 2022). In this context, it can be suggested that learning environments should be structured with educational games that contain the element of technology. In doing so, constructivist environments should be considered necessary. According to the constructivist approach, people construct their knowledge and understanding through the ability to interpret (Can, 2006). It emphasises that people should create knowledge, have life experience to learn, think about their ideas, research, and reach knowledge by themselves (Akpınar & Ergin, 2005; İşman, 2003). Aydın and Balım (2005) stated that the traditional teaching method, which accepts that students should be full of knowledge and transfer knowledge verbally, has been replaced by a teaching method that sees students responsible for their studies. They stated that through their research, they created the concept of acquiring new knowledge from their own experiences and participating in the learning process. Therefore, appropriate methods from constructive learning methods should be used so that people can learn better by creating their knowledge. Today, there is a relationship between the learning process and the organisation of the learning and teaching environment according to the methods used (İşman, 2003). The learning environment should include features that motivate children, motivate them to learn and enable them to participate in the lesson. Effective teaching aims to create a learning environment, to encourage and sustain the desire to learn through educational tools and to provide appropriate learning opportunities (Karaağaçlı & Mahiroğlu, 2005). In short, environments created according to the constructivist approach with educational digital games can increase the quality of learning. It is useful, especially in concretising abstract concepts such as mathematics at the primary school level (Akkuş & Gök, 2024; Poçan, 2023).

Over time, due to changes in family structure, changes specific to cities and the decrease in playgrounds and playgrounds, people spend a significant part of their free time in front of technical devices such as television, computers and mobile phones. They become inseparable from technology (Demir, 2022). As such, technology has turned into an entity that changes and improves human life in every sense. However, there is also a risk that this situation will trigger an asocial life and destructive behaviours in children (Yönet & Çalık, 2020). To turn this situation into a positive one, games on digital platforms must be well-researched from an educational perspective. Investigating how they affect students' attitudes towards mathematics by replacing traditional mathematics teaching methods and the potential effects of these games on learning motivation will reveal findings that will contribute to meeting this need.

However, with the advancing and changing times, there are differences in the behaviours expected from individuals. It is argued that individuals who value mathematics, think mathematically, and benefit from mathematics need to find solutions to the problems caused by the changes in life, especially the rapid development of technology. If the educational content is planned according to the aims of individuals, the more the participation of the individual in the process, the more the objective will be achieved. However, the individual's efficiency rate will remain unchanged if this process is unsuitable. It is necessary to diversify teaching methods for effective learning in the mathematics teaching process (Çenberci & Tol, 2019). In this study, the diversity will increase with the educational digital games applied to the mathematics course, and it is thought that the educational games used will improve students' participation in the lesson, attract their interest, and develop effective learning with a fun social environment.

Maths Achievement and Attitude

There are many factors affecting students' success in mathematics. One of the failures of students in mathematics is negative attitudes towards mathematics—most students who are afraid of making mistakes stay away from mathematics activities. According to the research, mathematics anxiety and fear decrease as children's experiences related to mathematics increase (Peker & Mirasyedioğlu, 2023). Positive changes are observed in positive attitudes towards mathematics. The attitude variable attracts the attention of educators because it is related to permanent learning and behaviours. The variable we call attitude is acquired over time and is challenging to change. Therefore, students' positive and negative attitudes towards mathematics can affect their future lives (Aşkar, 1986). Teachers have a significant role in helping students develop

positive attitudes towards mathematics. It is stated that primary school teachers are essential for students in terms of their attitudes and beliefs towards mathematics. Teachers' attitudes toward teaching techniques will significantly impact students and direct the formation of their attitudes. Students do not have a negative attitude towards mathematics before starting school. Students exhibit positive or negative attitudes towards mathematics due to their experiences (Savaş, Taş & Duru, 2010).

For this reason, since they are introduced to mathematics at the first level in school, primary school teachers and mathematics teachers have a job to do. There is a direct proportion between achievement and attitudes. In other words, achievement affects attitudes, and attitudes affect achievement. Research confirms the relationship between attitude and achievement. Students are afraid of doing wrong; they are so scared of failing. This feeling of failure and fear of making mistakes negatively affect the attitude towards mathematics.

For this reason, teachers should encourage students by asking questions according to each student's level. Thanks to this encouragement, a positive attitude will be realised as students will think I can do it too (Peker & Mirasyedioğlu, 2023). As a result of some research, although students have positive attitudes, they fail in their lessons. The basis of this is the students' maths anxiety. Math anxiety should be eliminated in terms of students' success in mathematics. According to the research, new studies should be conducted on teaching situations and increasing positive attitudes towards mathematics. In short, only the attitude variable should not be considered when addressing mathematics achievement. Attitude is a whole with other variables. In addition to attitude, method, family, and learning environment, teacher factors are also involved in mathematics achievement. It is stated that attitude is practical not only in mathematics but also in the general achievement of students (Aşkar, 1986). In his study, he showed students' positive attitude towards mathematics as one of the objectives of mathematics course.

There have been many studies on attitudes in mathematics and mathematics achievement, and different results have been obtained. Due to these differences, numerical data were collected to obtain reliable results. The numerical data in the meta-analysis studies on the relationship between mathematics achievement and mathematics attitude show a statistically positive, weak effect size. In addition, in the analyses, statistical differences were found in the levels of education, namely primary school, secondary school, high school and university levels. On the other hand, grade level was considered a variable in the relationship between mathematics achievement and attitude. In the research conducted, considering the grade level variable, it was stated that the relationship between mathematics achievement and attitude was ineffective. As can be understood in the article, many variables are analysed besides the concepts of attitude and achievement (Savaş, Taş & Duru, 2010).

METHOD

AIM AND METHODOLOGY OF THE RESEARCH

This research examines the effect of educational digital games on the attitudes of 2nd-grade primary school students towards learning mathematics. In this context.

1. Pre-test and post-test maths attitude scores of control group students,
2. Mathematics attitude pre-test and post-test scores of the experimental group students and,
3. Mean post-test scores of experimental and control group students, whether there is a significant difference between the two groups, will be analysed.

In the research, a quasi-experimental study was conducted to evaluate the effects of educational digital mathematics games created according to digital learning on students' attitudes in the second-grade mathematics course covering all subject areas. "quasi-experimental design with pre-test and post-test control group" was preferred as a type of experimental design. In a quasi-experimental design with a pre-post-test control group, the dependent variables of the participants were measured before and after the post-test questionnaire (Karasar, 2009). Before the application, the experimental and control groups were randomly assigned.

In the experimental group, mathematics subjects were played with more than one digital platform through educational games and practice practice was provided. The control group taught mathematics lessons according to the current programme. It was carried out by the class teacher for eight weeks (24 hours) using traditional subject-based methods. Before the application with the control group, the class teacher of the control group was consulted and informed that the activities in the book should be used in a way that the lessons would be based on the current programme and textbook studies. The study with both the control and experimental groups started in the same process and ended in the same process at the end of 8 weeks.

Pre-test data were collected by administering the "Mathematics Attitude Scale" to both groups before and after the interventions. Table 1 shows a representative example of a quasi-experimental setting using a pretest and posttest control group.

Table 1. Representative representation of the quasi-experimental model with pretest-posttest control group used in the research

Groups	Pre-test	Process	Post-test
EG	E.G.1.1	X	EG.1.2
CG	CG.1.1		CG.1.2

EG: Experimental Group
CG: Control Group
EG.1.1: Experimental Group Pre-test Result
CG.1.1: Control Group Pre-test Result
X: Mathematics Teaching with Educational Digital Game
EG.1.2: Experimental Group Post-test Result
CG.1.2: Control Group Post-test Result

SAMPLE OF THE STUDY

The research group consisted of 80 second-grade students (40 experimental group and 40 control group) studying in a public primary school in the Sultangazi district of Istanbul province. Second graders were selected to form this study's sample; one class was used as the experimental group, and the other was used as the control group. The classes were determined by a simple random sampling method. This sampling method was chosen because each item in the group had the right to be selected equally.

DATA COLLECTION PROCESS

Mathematics Attitude Scale

The "Mathematics Attitude Scale" developed by Gülburnu and Yıldırım (2015) was used in the data collection process of this study, which was applied in two stages as pre-test and post-test. The first measurements were recorded as pre-test and applied to the experimental and control groups in the post-test phase. In the development phase of the scale, the researchers aimed to develop a scale to determine the mathematics attitudes of primary and secondary school students. The relationship between various variables and mathematics attitude was examined. A five-point Likert-type scale to measure students' attitudes towards mathematics was prepared and applied to achieve this aim. The scale, which had 29 items at the beginning of the scale development, was reduced to 27 due to the analyses. It was stated that 3 of these selected items were negative items for attitude. During the development process, the study group consisted of 170 female and 158 male students, totalling 328 students, who were studying in primary and secondary school classes in the 2013-2014 academic year. The Cronbach Alpha internal consistency coefficient was calculated to measure the scale's reliability. Cronbach Alpha coefficient was determined to be .880 for all items. Since the reliability coefficient was more significant than 0.7, it was explained that the scale was

reliable (Nullany, 1978). According to the data obtained as a result of the scale, it was explained that the mathematics attitudes of the students showed a positive tendency in the whole scale. On the other hand, according to the research, there was no significant difference in gender variables in students' attitudes towards mathematics.

Data Collection

This study was conducted in the Sultangazi district of Istanbul province in the 2023-2024 academic year. The data was collected with second-grade students in the same primary school. These students were randomly divided into experimental and control groups. Our data collection tool, a 27-item 5-point Likert-type scale, was reproduced in 80 copies before and after the study and distributed to both groups of students during the same class hour. The students were warned at the beginning of the process not to write their names on the scale as it was aimed to be answered objectively. They were only asked to indicate their gender. The difference between "Strongly Agree", "Agree", "No Opinion", "Disagree", and "Strongly Disagree" options in the scale was explained, and they were told to mark only one option. Throughout the process, the practitioner made the necessary controls. Thanks to the controls, immediate intervention was made in cases of incorrect or incomplete marking, and the objectivity of these data was ensured. The scales were collected from the completed students and examined in detail for analysis. The data obtained from the students played an essential role in organising the research results. This method helped collect and analyse the data in an orderly manner.

Application Process

In the implementation process, new educational games were not designed, but existing games in digital applications were used. To briefly mention the applications used, firstly:

Wordwall is a game-learning software. Members can create game templates to make words or expressions they want to learn and do original work to track their learning, or they can use existing game templates created by other members with original content. Wordwall can be used to develop both interactive and printable activities. Most of the templates are available in both interactive and printable versions. These templates include familiar game setups such as Quiz, Crossword Puzzle, Maze Tracker and Airplane.

In our research, this digital platform was used for evaluation and homework activities for the experimental group at the end of the lesson. It provided us with quick feedback and reinforcement.

Another application is Geogebra, a mathematics software that combines geometry, algebra and analysis. International software experts developed this software under the leadership of Markus Hohenwarterm to improve the teaching and learning of mathematics in schools. This platform allows you to see maths objects in 3 different ways: graphical, algebraic and chart cells. Thus, the various representations of the same object are dynamically combined and systematically adapted for all three organisations.

We have benefited from this digital platform in the development part of the course, especially in the subjects that require 3D vision, measuring and weighing length, and concretising the subjects. We stated that students can find devices they can use independently, prepared by local or foreign educators, on every topic.

Analysis of Data

A statistical package programme was used to analyse the data. Descriptive statistics were presented. The suitability of the data to normal distribution was checked. Since the appropriate sample size was not reached for the experimental and control groups (EG=40, CG=40), Shapiro-Wilks results were first analysed (Büyüköztürk, 2011). It was seen that the value obtained was not significant ($p>.05$). In addition, skewness and kurtosis values were examined for each scale (Table 2). It was seen that they met the normality

assumptions for parametric data analysis. Accordingly, descriptive analyses, independent samples t-tests, and dependent samples t-tests were used in the study.

Table 2. Skewness and kurtosis coefficients for the data

Maths Attitude	S	Skewness	kurtosis
Pre-Test	40	,183	,456
Final Test	40	0,265	-,264

Reliability Analysis

Cronbach's Alpha is a value that takes a value between 0 and 1 and enables the investigation of whether the questions in the scale express a homogenous whole. It can also be explained as the coefficient that reveals the similarity and closeness between the questions. In other words, it indicates the degree to which the measurement tool can give similar results in repeated measurements (Eymen, 2007). If the alpha coefficient is less than 0.40, the scale is not reliable; if it is between 0.40 and 0.60, the reliability is low; between 0.60 and 0.80, the scale is highly reliable, and if it is more significant than 0.80, it is interpreted as having a high-reliability value (Akgül & Çevik, 2003). As a result of the reliability analysis of the data collected in this study, Cronbach's Alpha value was calculated as 0.812. According to this result, the data were interpreted as highly reliable.

FINDINGS

Findings Related to the First Sub-Problem

Is there a significant difference between the pre-test and post-test mean scores of the control group?

A dependent samples t-test was applied to determine whether there was a significant difference between the mathematics attitudes of the students in the control group, which was taught using the methods given in the current program, before and after the lesson was taught. The results obtained are presented in Table 3.

Table 3. Pre-test and post-test mathematics attitude score comparison of the control group

Maths Attitude	N	X	S	SD	T	P*
Pre-Test	40	2,47	2,64	39	2,182	
Final Test	40	0,77				0,035

**p<.05*

According to Table 3, the pre-test score of the control group on the mathematics attitude scale was 2.47, and the post-test mean score was 0.77. This difference between pre-test and post-test is statistically significant (t (39) =2,182, p<.05). Accordingly, it is seen that it is influential on the maths attitudes of the students in the control group.

Findings Related to the Second Sub-Problem

Is there a significant difference between the experimental group's pre-test and post-test mean scores?

A dependent samples t-test was applied to determine whether there was a significant difference between the mathematics attitudes of the students before and after the lesson in the experimental group in which the lesson was taught with the Digital Educational Games method. The results obtained are presented in Table 4.

Table 4. Comparison of the experimental group's mathematics attitude pre-test and post-test scores

Maths Attitude	N	X	S	SD	T	P*
Pre-Test	40	1,24	2,64	39	2,134	0,039
Final Test	40	1,73				

**p<.05*

According to Table 4, the experimental group's mathematics attitude scale pre-test score was 1.24, and the post-test mean score was 1.73. This difference between pre-test and post-test is statistically significant (t (39) =2,134, p<.05).

Accordingly, it is seen that the educational digital game was influential on the mathematics attitudes of the students in the experimental group.

Findings Related to the Third Sub-Problem

Is there a significant difference between the experimental and control groups regarding students' attitudes towards mathematics at the end of the application?

To find an answer to this sub-problem in the research, an independent samples t-test was applied. The results obtained are presented in Table 5.

Table 5. Groups' mathematics attitude pre-test and post-test score comparison

Groups	N	X	S	SD	T	P*
Control Group	40	0,77	1,46	78	-,512	0,610
Experimental Group	40	1,73				

**p<.05*

According to Table 5, a result of the analyses conducted to determine whether there was a significant difference in the mathematics attitude scores of the students in the experimental group (teaching mathematics courses with educational digital games) and the control group (teaching mathematics courses with traditional methods), it was found that the difference between the mathematics attitude post-test scores was statistically reduced in the control group. In contrast, the values of the experimental group were preserved. (t (78) =-,512, p>.05).

RESULTS, DISCUSSION, and SUGGESTIONS

This study aimed to determine the change in the attitudes of primary school students in mathematics lessons taught with educational digital games. Based on the research results, an increase was observed in the experimental group when the attitudes of primary school students compared to traditional mathematics lessons were examined regarding the use of educational digital games in mathematics lessons. In contrast, a decrease was observed in the control group. Although the educational digital game did not significantly

increase attitude values, it was observed that the experimental group maintained its attitudes when the attitude values of both groups were examined.

Firstly, the study's sample size, demographic characteristics, and students' experiences should be considered, as these may impact the results. Similar studies with larger sample groups or different demographic groups can increase the generalizability of the results (Keskin, 2020). These findings provide important clues for a deeper understanding of the effect of educational digital games in mathematics lessons. Kayan's (2023) study was conducted with similar physical facilities but with different demographic groups; there is an essential difference at this point. This situation emphasises that the demographic characteristics and experiences of the students should be taken into consideration in the process of evaluating the effect of educational games. The fact that our study selected a sample from a school with similar facilities shows that this factor reflects our results more accurately. However, compared with the results of other studies, it indicates that there may be significant differences in the effect of educational games on student attitudes. At this point, in addition to the demographic characteristics and experiences of the students, factors such as the content of the educational games and the duration of the application are likely adequate. Therefore, future research should address these factors more comprehensively and analyse the results more thoroughly. In this way, more robust and generalizable conclusions about the effectiveness of educational digital games in mathematics courses can be reached.

In addition, the duration and content of the study are also necessary. A more extended period or different game content is needed for the effect of digital games to be felt. More in-depth analyses should be conducted on the role and effectiveness of games in mathematics learning (Creswell, 2017). In a similar study, Hew et al. (2016) extended the duration of the experimental application. They examined the effect of digital games in mathematics lessons on student achievement. This study reveals that time is essential for effectively integrating digital games into learning. In addition, the importance of game content was also emphasised. For example, games designed to teach maths concepts may engage students more and encourage learning. Therefore, future research needs to consider game design, duration, and content when evaluating the impact of digital games. In this way, a more comprehensive understanding of the role and effectiveness of digital games in mathematics learning can be developed.

However, factors such as students' characteristics, teachers' teaching methods and classroom environment may also influence the results. Further research is needed to understand how these factors affect. Literature trends in education on this topic show that students' characteristics, teachers' teaching methods and classroom environment significantly impact the learning process and outcomes. For example, students' learning styles and motivation levels can influence their reactions to learning materials and methods (Hattie, 2012). In addition, teachers' teaching strategies and classroom management techniques can affect students' understanding of course materials and their engagement in the learning process (Marzano, 2007). The classroom environment can also shape students' learning experiences and influence their attitudes (Pianta, 2006). Therefore, factors such as students' characteristics, teachers' teaching methods and the classroom environment must be considered when assessing the impact of digital games. Further research is needed to understand how these factors can make educational practices more effective and increase student achievement.

Finally, the effect of educational digital games on student attitudes can be complex and perhaps does not make a significant difference when used alone. They may be more effective when combined with other teaching methods. These aspects must be further explored and analysed. The literature suggests that the impact of educational digital games is complex and may make little difference when used alone (Clark et al., 2016). However, when combined with other teaching methods, the effectiveness of digital games can increase (Gee, 2007). For example, digital games integrated with traditional teaching methods can attract students' attention and improve their learning motivation (Prensky, 2001). Furthermore, it has been shown that digital games can improve problem-solving skills and critical thinking abilities and, therefore, be more effective when combined with other teaching methods (Squire & Jenkins, 2003). Thus, further research is essential to understand better the potential of combining educational digital games with different teaching

methods. This research can help educators identify the most effective teaching strategies and increase student achievement.

In addition, according to the results of the data obtained in the study on attitude change with educational games applied in primary school second-grade mathematics courses, the "Mathematics Attitude Scale for Primary and Secondary School Students" is a valid and reliable measurement tool. According to the results of this research, when the pre-test and post-test scores of the experimental group students were examined, it was seen that the educational digital game positively affected student attitudes.

Similar results are also noteworthy in the analyses conducted in the context of research results. The results of the study conducted by Rençber (2023) with groups of 48 students in the second grades of primary school gave findings on students' attitudes towards mathematics. In this study, one group was analysed by playing educational games, while the other group was analysed by applying different methods. In this study, which is quite similar in data collection, the experimental group was taught an educational digital game, while the control group was taught using traditional methods. Unlike our study, in this study, the control group was taught using methods other than educational digital games. Thus, it was seen that mathematics lessons using methods other than educational games positively affected students' mathematics motivation. When the magnitude of the effect was considered, it was stated that there was no significant difference as in the post-test data of our study.

In the study conducted by Can (2022), 32 students of two seventh-grade classes of a secondary school were selected as a sample. One of these classes was chosen as the experimental group and the other as the control group. When the pre-test results of the groups were examined, no statistically significant difference was observed. When the post-test results of the experimental group, which was taught with educational games, and the control group, which was not trained with games, were examined, the achievement level of the experimental group was higher than that of the control group. Considering the attitude change of these two groups, the test results taken before the application were found to be close to each other. Unlike the achievement test, there was no significant difference between the two groups when the post-test data of the attitude test were analysed. As in our research, samples were determined, appropriate data collection tools were used, and no significant difference was observed in attitude change according to the results obtained.

Based on the research results, it was observed that the use of educational digital games in mathematics lessons did not change the attitudes of primary school students compared to traditional mathematics lessons but preserved the existing attitudinal values. This finding is an important point that educators and decision-makers should consider when considering using digital games. However, these results only partially reject the potential of digital games. Similar studies with larger sample groups or different demographic groups may reveal different results and clarify this issue. Furthermore, other contents and implementation times should also be considered to evaluate the effectiveness of educational digital games in mathematics lessons. In this way, the potential of digital games can be better understood, and their role in mathematics teaching can be optimised more effectively.

In this context, our recommendations are as follows.

-In this part of the study, some suggestions are given to teachers and researchers based on the findings and results obtained.

-The desired results were maintained in the studies conducted on student attitude while teaching mathematics with educational games, although the values did not increase. In this regard, looking for a direct connection will not add positive meaning to the study. For this reason, indirect links should be included in the study.

-Wordwall, Geogebra" digital game programs were used in this study. Students should be informed that they can use some of these applications in different lessons. They should be told they can even create digital games in these applications.

Teachers can use educational digital games in every lesson and prepare work for multiple lessons on the same set-up.

-They can include students with interests and abilities in preparing the games.

In-service training can be given to teachers to design and diversify educational digital games.

-The fact that the experimental and control groups selected in the study were in the same school and had similar social facilities was thought to be effective in the study results. For this reason, the sample group can be selected from two different schools with different facilities.

-Teachers can easily find activities for almost all subjects of mathematics courses from these digital platforms.

-The educational platforms used in this study can be diversified with newer programmes.

-It can be studied with larger groups in terms of sample group.

Declarations

Conflict of Interest

No potential conflicts of interest were disclosed by the author(s) concerning this article's research, authorship, or publication.

Ethics Approval

The Social and Human Sciences Research and Publication Ethics Committee of Necmettin Erbakan University granted the formal ethics approval. We conducted the study using the Helsinki Declaration in 1975.

Funding

No specific grant was given to this research by funding organisations in the public, commercial, or not-for-profit sectors.

Research and Publication Ethics Statement

At this moment, we as the authors consciously assure that for the manuscript "The Effect of Educational Digital Games on Mathematics Attitude in Primary School", the following is fulfilled:

- This material is the author's original work, which has not been previously published elsewhere.
- The paper reflects the author's research and analysis wholly and truthfully.
- The results are appropriately placed in a prior and existing research context.
- All sources used are adequately disclosed.

Contribution Rates of Authors to the Article

The authors provide equal contributions to this work.

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