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The Effects of Digital Educational Games on Secondary School Students' Attitudes Towards Elective English Class and on Increasing Their English Listening Skills and Vocabulary

Kevser TEVETOĞLU
Department of Instructional Technology, Institute of Science and Technology, Amasya University, Türkiye
ORCID: 0009-0000-0237-7133

Özgen KORKMAZ*
Department of Computer Engineering, Faculty of Engineering, Amasya University, Türkiye
ORCID: 0000-0003-4359-5692

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The purpose of this study was to investigate the impact of digital educational games on secondary school students' attitudes towards elective English lessons, as well as the influence of digital educational games on the development of EFL listening skills and vocabulary learning. The study group included 40 students in two classes of 6th grade elective English course from a secondary school in Samsun province of Türkiye during the academic year 2022-2023. A quasi-experimental model with a pretest-posttest control group was used in the study. A total of six weeks, namely two hours of instruction each week, made up the trial period. Digital instructional games meeting certain criteria set by the study were used to teach the experimental group. In the control group, no digital educational games were employed, and the same teaching strategies as before the experiment were used. An academic achievement exam covering vocabulary and listening and the "Middle School English Course attitude scale" were utilized as data gathering tools. The study revealed that digital educational games had a favourable impact on secondary school students' views about the elective English class. Additionally, it was noted that the pupils in the experimental group improved their vocabulary and listening skills more than those in the control group. In conclusion, considering the positive outcomes of using digital educational games in both foreign languages and other disciplines, we can say that their integration into education will have positive effects on academic achievement and may positively affect students' attitudes towards that course by providing them with a fun learning environment. This makes the case for the potential use of digital educational games as a tool for learning-reinforcing activities in elective English and other elective classes.

* Correspondency: ozgenkorkmaz@gmail.com

Introduction

The debate over whether or not to use digital games in the classroom is long over; games are now a widespread cultural phenomenon, so schools and teachers should look for ways to incorporate not only those games, but all emerging technologies into the classroom (Royle, 2009). In this context, countries are investing heavily in the integration of technology into education. Digital educational games have already started to take their place in classrooms (Schrier, 2016). Due to technological shortcomings and unfavorable perceptions of game-based learning, some educators are against making use of digital games in the classroom (Shrier, 2016). However, contrary to these views, there have long been approaches that advocate using games in classroom settings. Game-based learning is the educational strategy for bringing games into the classroom (Prensky, 2005). Digital game-based learning is a method of teaching and learning that puts the needs of the learner first (Perotta, Featherstone, Aston, & Houghton, 2013). A meta-analysis study on the impact of game-based learning on academic achievement, which was conducted by choosing 23 studies published in some databases between 2010 and 2015, came to the conclusion that digital games used in teaching environments can be a helpful tool that increases the efficiency of teaching at different levels by diversifying teaching at different levels with effective use (Toraman &Çelik, 2018). Traditional games have been replaced by digital games in the age of technology, and schools must keep up with the time. It has been observed that using of digital games in language teaching is far more effective than traditional methods (Hazar, 2020). The use of digital instructional games in classroom settings has been the subject of several national and international research. The majority of these research have found that playing digital instructional games has benefits. Digital educational games provide students the chance to study while having fun, manage their information, receive feedback, make corrections, and reinforce their learning, as well as actively engage in the class and become more motivated (Eroğlu & Yuksel, 2020). In another meta-analysis study conducted between 2010 and 2019, 112 studies on digital games were analyzed and it was stated that the studies were more intense in science disciplines and for this reason, it was recommended to conduct research on educational games in different disciplines (Karamustafaoğlu & Kılıç, 2020). This is an intriguing topic that deserves additional research on educational games, and our work is important since it will help increase public awareness.

It is widely accepted that the methods, techniques, and materials used by the instructor in the classroom are extremely important in foreign language instruction, and the fact that the selected methods and techniques are appropriate for the students' age and needs will boost success (İnal, Korkmaz, 2019; Gömleksiz, 2005). Games are one of the methods that are interesting and exciting for children, increase enthusiasm and ensure participation in the lesson (Gömleksiz, 2010). Especially in foreign language learning, learning by doing makes learning permanent by making the student a part of the learning process, so educational games are ideal reinforcing elements (Engin, Seven, & Turhan, 2010). As multimedia technology has become easily accessible, it has become a practical option preferred by both students and teachers (Meskill, 1996). Digital educational games are defined as video games and interactive games that are produced not only to entertain but also to provide education in many areas, and digitally supported educational games are an excellent tool to achieve educational goals (Noemi & Maximo, 2014). By integrating games into teaching environments, many language skills and sub-skills that are boring or difficult for both teachers and students in language learning can become fun, interesting, and motivating.

The linguist Wilkins (1972) summed up the significance of vocabulary in language acquisition by saying, "Without vocabulary nothing can be conveyed, without grammar very

little can be conveyed." Due to the significance of vocabulary in language acquisition, there is a constant demand for efficient vocabulary learning methods. Digital game-based learning with growing technology offers considerable promise for vocabulary learning (Argıt, Demirel & Köksal, 2022). Digital games help vocabulary learning with their structures at different levels and speeds accompanied by visuals and sounds, increasing difficulties, interactive environment, fast feedback, motivating and encouraging effect on students (Lorenset & Piazza, 2019). Using games in vocabulary teaching provides students with a fun learning environment without stress and anxiety and contributes to increasing students' vocabulary (Akdoğan, 2017). Educational games have long been used to build vocabulary to boost students' desire to study vocabulary (Klopfer, Osterweil, Groff, & Haas, 2009). If the games are well organized with appropriate content and pedagogically, they encourage students to acquire and remember new terminology more easily (Tebeweka,2021). After reviewing the research from 1996 to 2020 on the employing of digital games in vocabulary teaching, seven themes were identified; motivation, freedom, feedback, repetition, sampling, binary coding, and interaction, are factors that will contribute to improving vocabulary acquisition in digital games (Amin, 2021). Digital educational games can also be utilized to improve listening skills. The fact that listening is a passive skill and that it does not attract much attention of the teacher and the learner has caused the development of listening skills to be neglected, but with the use of digital games, more effective results have been obtained thanks to more diverse teaching methods in developing listening skills (Syafii, Kusnawan, & Syukroni, 2020). Ağaoğlu and Şad (2020) found that as students spend more time playing digital games, their listening skills improve significantly.

Digital educational games provide many advantages, including boosting students' self-confidence, giving them the chance to interact with outsiders, and helping them learn other languages (Korkmaz & İnal, 2019). In this context, it is expected that the usage of digital instructional games in learning environments will both improve learning and positively affect attitudes towards learning. In this context, the research aimed to determine the effect of digital educational games on secondary school students' attitudes towards the Elective English course, increasing their English listening skills and vocabulary. The following sub-problems were addressed within the scope of the research:

- Does the usage of digital educational games in Elective English class contribute affect to students ' attitudes towards Elective English course?
- Does the usage of Digital Educational Games in Elective English class lead to a development in students' listening skills?
- Does the usage of Digital Educational Game in Elective English class lead to a development in students' vocabulary knowledge?

Method

Research Design

A quasi-experimental model, one of the methods used in quantitative studies approaches, was employed in this work using a pretest-posttest control group. In a quasi-experimental design with a pretest-posttest control group, participants are measured using scales that reflect the dependent variable before and after the experimental process (Karasar, 1999, p.86).

Study Group

The study group of the research was determined using the convenient sampling method. This sampling method provides significant convenience in terms of access to the study group (Büyüköztürk, 2020). Considering that the fact that the first author currently teaches an elective English course at the school where she works provides significant convenience both in terms of practice and in terms of access to students, it was decided to use the convenient sampling method. The research group comprises sixth graders who are enrolled in an elective English course at a secondary school in Vezirköprü district center of Samsun province during the 2022–2023 school year. In this study, participants were from 2 intact classes (Class D, F) as experimental and control groups. The distribution of the groups by gender is as follows.

Table 1. Distribution of Gender in the Study Group

Class / Gender	**Male**		**Female**	
Control Group (Class 1)	13	65 %	7	35 %
Experimental Group (Class 2)	10	50 %	10	50 %
Total	23	100 %	17	100 %

Experimental Process

In this experimental study, a six-week program of two class hours per week, prepared in line with the sixth grade Unit 6 and Unit 7 objectives in the English curriculum, was implemented. The groups were composed of two classes of twenty students each, the experimental group, and the control group. The same teacher was in charge of both classes. The control group, Class 1, and the experimental group, Class 2, were both chosen at random.

Experimental group

In the experimental group, a six-week program prepared with digital educational games was implemented in line with the sixth- and seventh-unit achievements in the sixth-grade elective English class annual plan in the English curriculum. Before the research began, both groups were administered a pre-test vocabulary and listening academic achievement test, as well as a pre-test attitude assessment. The games were chosen in line with the vocabulary and listening abilities in the unit acquired and the curriculum's content as prescribed by the Ministry of National Education. This program is described in detail in Table-2

Table 2. Experimental Group 6-Week Study Plan

		Weekly Content	**Tasks**
WEEK 1		Discussing prior jobs Personal inquiries Keeping track of time, days, and dates Unit 6: Occupations	Pre-test Academic Achievement test and Pre-test English Lesson Attitude Scale. Introduction of Digital Educational Games and presentation of professions.
WEEK 2	2 HOURS	Discussing prior jobs Personal inquiries Keeping track of time, days, and dates Unit 6: Occupations	A short topic summary on how to say hours, days, and dates. Playing games to increase vocabulary knowledge Jewels of wisdom, Milyonaire, Wheel of Fortune Playing games designed to improve listening skillsWord Hunter, Memory, Voscreen. (Students chose to play their favorite game)

WEEK 3	Discussing prior jobs Personal inquiries Keeping track of time, days, and dates Unit 6: Occupations	Holding in-class (individual/group) tournaments with games designed to increase vocabulary knowledge Playing games to increase vocabulary knowledge Jewels of wisdom Millionaire, Wheel of Fortune. Holding in-class (individual/group) tournaments with games determined to increase listening skills Word Hunter, Memory, Voscreen
WEEK 4	Making simple questions about past events Unit 7: Holidays	Presentation of Unit 6 vocabulary. Playing selected games to increase vocabulary knowledge Jewels of wisdom, Milyonaire, Wheel of Fortune Playing games selected to improve listening skillsWord Hunter, Memory, Voscreen
WEEK 5	Making simple questions about past events Unit 7: Holidays	Review of the past tense and reminding of regular and irregular verbs. Holding in-class (individual/group) tournaments with games designed to increase vocabulary knowledge Jewels of wisdom, Milyonaire, Wheel of Fortune Holding in-class (individual/group) tournaments with games determined to increase listening skills Word Hunter, Memory, Voscreen Word Hunter ve Voscreen
WEEK 6	Making simple questions about past events Unit 7: Holidays	Holding a tournament between the tournament winners of each unit Implementation of Post-test Academic Achievement Test and Post-test English Language Attitude Scale.

For the academic achievement test, only the objectives related to vocabulary and listening skills from the sub-objectives of Occupations (Unit 6) and Holidays (Unit 7) in the annual plan of the Elective English class prepared according to the sixth grade English curriculum of the secondary school were taken into consideration. 2.*3.2. Control Group*

In the control group, the same unit were carried out without using any digital supported educational game. In the last week, the post-test academic achievement exam and post-test attitude scale were administered to this group and the experimental process was ended.

Digital Educational Games of the Experimental Group

- **Jewels of Wisdom:** It is a word game prepared for each grade level and each unit in accordance with the English words in the Ministry of National Education curriculum. Before starting the game, players choose the grade level and the unit to be studied (more than one can be selected). The aim of the game is to match the given English words with their Turkish equivalents and explode the boxes. The more points are scored if at least three boxes of the same color are popped together and the less time it takes to complete the game, the more points are scored.
- **Millionaire**: It is a vocabulary game prepared for each grade level and each unit in accordance with the English words in the Ministry of National Education curriculum. Before beginning the game, players select the grade level and units to be studied (more than one can be selected). The game is similar to the question system in the Who Wants to be a Millionaire TV program and as the player knows the questions, he/she is symbolically entitled to answer the question of the next amount. There are three wildcards in the game and the student who answers all the questions becomes a millionaire.

- **Wheel of Fortune:** It is a vocabulary game prepared for each grade level and each unit in accordance with the English words in the Ministry of National Education curriculum. Players select the grade level and units to be studied before to beginning the game (more than one can be selected) and the number of questions to be answered. The game can be played by two or one person. Players take turns spinning the wheel and answering the questions, the one with more points wins at the end of the game.
- **Word Hunter:** It is a listening skills game designed for each grade level and unit in line with the Ministry of National Education's English course curriculum. The grade level and units to be studied are selected by the participants before the game begins (more than one can be selected). The game can be played by two or one person. Players mark the word they hear by choosing one of the 4 visuals given, the faster they know it within 1 minute, the more words they come up with and the faster one wins.
- **Memory:** It is a listening skills game designed for each grade level and unit that fits with the Ministry of National Education's English course material. Players select their grade level and the units they will study before the game begins. (more than one can be selected). The game is a one-person game. Players understand the word they hear and point to the correct visual, one word more is said each time, the one who completes the marking within the given time by understanding and keeping all the words in mind wins the game. The game develops both comprehension of what you hear in English and auditory memory by keeping it in mind and marking the correct sequence.
- **Voscreen:** The game is an application developed to improve listening skills. In the game, you must choose the level (beginner, elementary, intermediate, upper intermediate, advanced) and kids, content (present tense, past tense, questions...), number of words (1-3, 4-6, 7-9...) and you have to mark the correct option with or without subtitles within 10 seconds from the animation or movie excerpts. Answering in the shortest time and without subtitles brings more points, while wrong answers take away points.

Data Collection Tools

English Language Attitude Scale

The 'Middle School English Course Attitude Scale' created by Aydomuş and Kurnaz (2017) was used to gauge students' attitudes about English class. There are a total of 14 items on the Likert-type scale. It became clear from the investigation using exploratory factor analysis that the scale was one-dimensional. The existence of a single factor in the scale demonstrates that the variance ratio explained for the entire scale and the factor validity are same. Kaiser-MeyerOlkin (KMO) and Bartlett's tests were originally used to assess the scale's validity. The tests revealed that the English attitude scale's KMO value was 0.90 and Bartlett's value was 1801.42 (p 0.01). These findings demonstrated that the scale was appropriate for factor analysis. The scale has a unidimensional structure with an Eigen value of 1, according to the component factor analysis that was used to determine its results. This unidimensional scale was found to provide a high validity measurement by measuring the variable it was intended to measure with a rate of approximately 58%. Consisting of 14 items, the factor loading of each item of this one-factor scale was between 0.90 and 0.69. In this respect, it is a scale with high validity and reliability. Correlation coefficients for the scale's items range from 0.41 to 0.62, which shows that it has a high ability to distinguish between students who have positive and negative opinions towards English lesson. The Cronbach's alpha

method was utilized to assess the scale's dependability. The reliability coefficient was calculated as 0.875.

Academic Achievement Test (for sub-problems 2 and 3)

An academic success exam with two sections, vocabulary and listening, was used to assess the influence of digital educational games on the development of students' listening skills and vocabulary in the elective English class. While preparing the academic achievement test questions, only the objectives related to vocabulary and listening skills among the sub-objectives of Occupations (Unit 6) and Holidays (Unit 7) in the annual plan of the elective English course in the sixth grade English were taken into consideration. The phase of Bloom's cognitive domain was carefully evaluated to make sure that they were aligned and are presented in Table 3.

Table 3. Specification Table

Units		Achievements	Items	Learning Level
Unit.6 Occupations	Vocabulary	Students will be able to comprehend well-known vocabulary and basic phrases referring to people's jobs in plainly written texts,	1 2 3 4	Comprehension Analysis Synthesis Application
		Students will be able to comprehend the time, days, and dates in written materials.	5 6 7	Knowledge Application Application
	Listening	Students will be able to grasp the time, days, and dates in clear spoken texts.	16 17 18 20	Application Knowledge Application Application
		In plain oral texts about people's jobs, students will be able to comprehend well-known vocabulary and straightforward phrases.	19	Knowledge
Unit.7 Holidays	Vocabulary	In plainly written texts about holidays, students will be able to recognize the common phrases and activities.	8 9 10 11	Comprehension Analysis Knowledge Application
		Short, uncomplicated words and statements that refer to previous activities will be understood by the students.	12 13 14 15	Knowledge Application Analysis Synthesis
	Listening	In plain oral texts about holidays, students will be able to identify well-known terms and activities. Short, uncomplicated words and idioms in spoken texts that refer to previous actions will be understandable to students.	21 22 23 24 25	Comprehension Analysis Knowledge Application Comprehension

In order to ensure content validity, 30 four-choice questions with listening skills and vocabulary content were prepared by taking the specification table (Table 5) into consideration. The 30 questions were administered to 100 7th grade students and item analysis and reliability studies were conducted. The item difficulty (Pij) and item discrimination (Rj) indices of each item in the test are listed in Table 4.

Table 4. Academic Achievement Test Item Difficulty Index and Item Discrimination Power Table

Item No	Item Difficulty Index(Pij)	Item Discrimination Power(Rj)
1	0,9	0,33333
2	0,81	0,51852
3	0,79	0,44444
4	0,8	0,37037
5	0,65	0,33333
6	0,56	0,48148
7	0,55	0,59259
8	0,81	0,37037
9	0,68	0,51852
10	0,67	0,7037
11	0,83	0,33333
12	0,8	0,44444
13	0,73	0,59259
14	0,78	0,51852
15	0,58	0,55556
16	0,79	0,37037
17	0,94	0,18519
18	0,78	0,33333
19	0,83	0,44444
20	0,79	0,59259
21	0,75	0,62963
22	0,69	0,59259
23	0,84	0,33333
24	0,64	0,7037
25	0,69	0,51852

Item discrimination is related to the validity of the test and takes a value between 0 and 1. It is used to distinguish the items in the test that have the desired feature from those that do not (Büyköztürk, Şener, Çakmak, Akgün, Erkan, Karadeniz and Demirel 2020). Following the 100-person pilot test, 5 items with poor item discrimination were deleted from the test as a result of item analysis research, and the test with 25 items was considered suitable to use. Item difficulty index is the correct answer rate of an item in a test, item difficulty takes a value between 0 and 1 and items with a value close to 0 are evaluated as very difficult, while items with a value close to 1 are evaluated as easy, the best item difficulty that separates those who know from those who do not know is 0.5 (Tekin, 2000). The item difficulty index (pj) analysis of the 25-item test revealed that the item difficulty average of the test was 0.774, indicating that it was a medium to easy test that could be used in the research. The internal consistency coefficient of the academic success exam for English vocabulary and listening abilities was determined using the Kuder Richardson-20 technique. Kr-20 measures the consistency between all the items of a measurement tool that has been applied once and as a result, the internal consistency coefficient is reached, it indicates the test's dependability; wether the internal consistency coefficient is more than 0.7, the test is dependable (Büyköztürk, Şener, Çakmak, Akgün, Erkan, Karadeniz and Demirel 2020). According to the test's reliability study (Kr-20), it was seen that the Kr-20 value was 0.992 and accordingly the internal consistency was quite high.

Data Analysis

Quantitative data collecting techniques were applied in this investigation. The SPSS IBM 26 package application was used to analyze the attitude scale and academic achievement test results given to the experimental and control groups in order to get quantitative data. To

obtain error-free analyses, the first thing to be done is the normality test, and turning to non-parametric tests with a single normality test may weaken the findings of our study because parametric tests are more powerful, therefore, for a good analysis, multiple normality tests should be performed instead of turning to non-parametric tests according to a single normality test result (Ölmez, 2019). To determine if the data from the pre- and post-tests had characteristics of a normal distribution, multiple normality tests were utilized. Since the study group consisted of fewer than 50 participants, the Shapiro-Wilks results were taken into account while determining the normality distribution of the data. The normal distributions of the test scores of the experimental and control groups' data sets were initially scrutinized in order to gauge attitude.

Table 5. Central Tendency and Dispersion Measures of the Pre-Post Test Data Sets of the Scale Applied for the Effect of Digital Educational Games on Students' Attitudes

Group	The Lowest Score	The Highest Score	Mean	Median	Mode	Kurtosis	Skewness
Pre-Test (Experimental Group)	10	28	22,80	23,50	23	-1,977	3,796
Post-Test (Experimental Group)	19	28	24,20	24	24	-,499	-,279
Pre-Test (Control Group)	8	28	20,85	23	28	-,858	-,606
Post-Test (Control Group)	0	28	17,60	19	28	-,410	-,514

When the measures of central tendency in Table 5 are considered, it is seen that there is a significant differentiation for the data sets. The pre-test and post-test study data sets are analyzed using a two-way analysis of variance. The normality distribution of all data sets is a requirement for two-way analysis of variance (Can, 2019). The fact that the mode, median and mean show a close trend is an indication that it does not deviate from normal, and the fact that the skewness coefficient takes a value between -1 and +1 is considered as an interpretation that it does not deviate from the normal distribution (Büyüköztürk, 2020). Except for the pre-test of the experimental group, the other test results' skewness and kurtosis values all fall within the range of -1 and +1, proving that the test results' data sets exhibit a normal distribution. In addition, the statistically significant value of Kolmogorov-Simirnov and Shapro-Wilks normality tests were examined in order to make a definite decision on normality distribution.

Tablo 6. Pre-Post Test Data Sets Normality Test Results of the Scale Applied to the Effect of Digital Educational Games on Students' Attitudes

	Kolmogorov – Smirnov			**Shapiro – Wilks**		
Group	**Statistics**	**Df**	**Sig.**	**Statistics**	**df**	**Sig.**
Pre-Test (Experimental Group)	,316	20	,000	,737	20	,000
Post-Test (Experimental Group)	,120	20	,200	,958	20	,501
Pre-Test (Control Group)	,209	20	,022	,857	20	,007
Post-Test (Control Group)	,120	20	,200	,951	20	,378

Table 6 demonstrates that the experimental group's pre-test scores and the control group's pre-post-test scores did not exhibit a normal distribution (p 0.05) and were consistent with measures of central tendency. Shapiro-Wilk test results are taken into account for normalcy distribution when there are fewer than 50 participants (Büyüköztürk, 2020). The first condition for two-way analysis of variance, that each subgroup shows a normal distribution, was not met. For this reason, the difference score series were compared.

Table 7. Normality Test Results of the Difference Scores of the Data Sets of the Scale Applied for the Effect of Digital Educational Games on Students' Attitudes

		Kolmogorov-Simirnov			Shapiro-Wilk		
	Group	Statistics	Df	Sig.	Statistics	df	Sig.
Dif.	Experimental Group	,234	20	,006	,784	20	,001
	Control Group	,183	20	,078	,887	20	,024

As a result of the Shapiro-Wilks test, it was determined from Table 7 that the attitude scale did not exhibit features of a normal distribution so the difference between the two groups was examined with the nonparametric Mann-Whitney U Test for unrelated samples. The data sets including the test results from the experimental and control groups of the achievement test created by the researcher were evaluated for normality distributions in order to quantify academic accomplishment.

Table 8. Pre-Post Test Central Tendency and Dispersion Measures of Academic Achievement Test Data Sets

Group	**The Lowest Score**	**The Highest Score**	**Mean**	**Median**	**Mode**	**Kurtosis**	**Skewness**
Pre-Test (Experimental Group)	28	100	74,40	72	72	-,839	1,806
Post-Test (Experimental Group)	52	100	54,50	88	68	-,861	-,026
Pre-Test (Control Group)	20	100	70,10	74	100	-1,054	,688
Post-Test (Control Group)	12	100	72,40	80	80	-1,050	,436

When the measures of central tendency are taken into account, Table 8 reveals that the experimental group post-test and control group pre-test data sets differ in a fairly significant way. The fact that the mode, median and mean show a close tendency is an indication that it does not deviate from normal, and the fact that the skewness coefficient takes a value between -1 and +1 is considered as an interpretation that it does not deviate from the normal distribution (Büyüköztürk, 2020). Except for the pre-test of the experimental group, the other test results' skewness and kurtosis values range from -1 to +1, which suggests that the test results' data sets exhibit a normal distribution. In addition, the significance levels of Kolmogorov-Simirnov or Shapro-Wilks normality tests were examined in order to make a definite decision on normality distribution. Two-Way Analysis of Variance is used to examine the data sets of pre-test and post-test studies. The normality distribution of all data sets is a requirement for two-way analysis of variance (Can, 2019). For this reason, the normality of the data sets was examined. Considering that the number of participants was less than 50, Shapiro-Wilk test scores (Büyüköztürk, 2020) were taken into consideration for normality distribution.

Table 9. Normality Test Results of Academic Achievement Data Sets Pre-Post Test Data Sets

	Kolmogorov – Simirnov			Shapiro – Wilks		
Group	**Statistics**	**df**	**Sig.**	**Statistics**	**df**	**Sig.**
Pre-Test (Experimental Group)	,152	20	,200*	,931	20	,165
Post-Test (Experimental Group)	,214	20	,017	,876	20	,015
Pre-Test (Control Group)	,147	20	,200*	,894	20	,032
Post-Test (Control Group)	,221	20	,011	,891	20	,028

Table 9 demonstrates that neither the pre-test scores of the experimental group nor the pre-post-test scores of the control group had a normal distribution (p 0.05), which is consistent with the measures of central tendency. The first condition for two-way analysis of variance, that each subgroup should be normally distributed, could not be met. For this reason, the difference score averages were compared. Can (2019) considered this approach as the second approach. The difference between the post-test and pre-test scores of the data sets of both groups is taken into account in the analyses to be carried out in accordance with the second approach preferred for the analysis and progress score arrays are created. This is because the two-way analysis of variance of the pre-test and post-test statistics performed for two independent samples did not satisfy the normal distribution conditions of all subgroups separately.

Table10. Normality Test Results of Difference Scores of Academic Achievement Data Sets

		Kolmogorov-Simirnov			Shapiro-Wilk		
	Group	Statistics	Df	Sig.	Statistics	Df	Sig.
Dif.	Experimental Group	,136	20	,200*	,941	20	,254
	Control Group	,149	20	,200*	,941	20	,246

According to Table 10, the data sets' results of the Kolmogorov-Simirnov normality test reveal that they are regularly distributed (p>0.01). Shapiro-Wilk test results are considered for normalcy distribution because there were fewer than 50 participants (Büyüköztürk, 2020). The comparison of the difference score series for academic success was analyzed using the t-Test statistics for Unrelated Samples since the difference averages exhibited a normal distribution according to the Shapiro-Wilk test scores (p>0.05).

Table 11. Normality Distribution Statistics of the Academic Achievement Test for Equivalence of Groups Pre-test Data Sets

		Kolmogorov-Smirnov			Shapiro-Wilk		
	Group	Statistic	Df	Sig.	Statistic	df	Sig.
Pre-Test 2	Experimental Group	,152	20	,200	,931	20	,165
	Control Group	,214	20	,017	,876	20	,015*

*p<0,05

Pre-test academic achievement test statistics of the experimental and control groups revealed that the control group's data set did not exhibit normal distribution (p 0.05). Because of the fact that the data set for the control group did not have a statistically normal distribution,

Mann Whitney-U values from nonparametric tests were analyzed to look at independent unrelated samples.

Table 12. Academic Achievement Statistics on Equivalence of Groups

	Pre-Test 2
Mann-Whitney U	189,500
Wilcoxon W	399,500
Z	-,285
Asymp. Sig. (2-tailed)	,776
Exact Sig. [2*(1-tailed Sig.)]	,779

The Mann-Whitney U Test was used to assess if there was a statistically significant distinction between the experimental group and the control group in the academic achievement pre-test data sets. No statistically significant difference exists between the groups, according to the results of the Mann-Whitney U test shown in Table 12 (U=189.5; p=0.779>0.05). It can be said that the groups are equal to each other.

Table 13. Normality Distribution Statistics of Attitude Test Pre-test Data Sets for Equivalence of Groups

		Kolmogorov-Smirnov			Shapiro-Wilk		
	Group	Statistic	Df	Sig.	Statistic	Df	Sig.
Pre-Test2	Experimental Group	,316	20	,000	,737	20	,000*
	Control Group	,209	20	,022	,857	20	,007*

* p<0,05

Table 13 analysis revealed that the data set for the experimental and control groups' data sets failed to display a statistically normal distribution, therefore Mann Whitney-U values were looked at as one of the nonparametric tests for the analysis of independent unrelated samples.

Table 14. Attitude Statistics on Equivalence of Groups

	Pre-Test2
Mann-Whitney U	172,500
Wilcoxon W	382,500
Z	-,750
Asymp. Sig. (2-tailed)	,453
Exact Sig. [2*(1-tailed Sig.)]	,461

Table 14 shows that in a group of 40 students comprised of 20 experimental and 20 control group students, a statistically significant difference was observed between the groups (U=172.5; p=0.4530.05) based on the results of the Mann-Whitney U Test performed to determine if there was a significant difference between the experimental and control groups in attitude pre-test data sets (U=172.5; p=0.4530.05).

Table 15. Rank Means of Attitude Scores of Groups

	Group	N	Mean Rank	Sum of Ranks
Pre-Test1	Experimental Group	20	21,88	437,50
	Control Group	20	19,13	382,50
	Total	40		

According to Table 15, it was concluded that the experimental group had more positive attitude results towards English (Rank Mean=21.88>19.13). This result is predicted to strengthen our research on the effect of digital educational games on students' attitudes in the experimental group, which already has positive attitudes towards English. Additionally, it is predicted that the change in views won't have any negative effects on the research's equivalence of the groups because it will be assessed independently for each group.

The investigation to establish the groups' comparability revealed that they were comparable in terms of academic performance but not in terms of their attitudes towards English. The experimental group was found to have more positive attitudes towards English. It was an expected result that the classes randomly formed from different classes with their own attitude levels for the elective English course would not have the same attitude level. These findings demonstrated the groups' suitability for the analysis.

Findings

Analyses on the effect of digital educational games on students' attitudes towards English course are summarized in Table 16.

Table 16. The Effect of Digital Educational Games on Students' Attitudes Towards English Class

	Group	**N**	**Mean Rank**	**Sum Of Ranks**
Score	**Experimental Group**	20	25,30	506,00
	Control Group	20	15,70	314,00
	Total	40		

A shown in Table 16, based on the ranking scale's mean scores, it was determined that the experimental group's attitude score (25.30) was higher than the control group's (15.70), indicating a greater level of development. Since the attitude scale did not meet the first condition in the application of parametric tests, the difference between the two groups was examined with the nonparametric Mann-Whitney U Test for unrelated samples. Mann-Whitney U statistical data are given in the table below.

Table 17. The Effect of Digital Educational Games on Students' Attitudes Towards English Class

Groups	**N**	**Rank Mean**	**Rank Total**	**U**	**P**
Experimental Group	20	25,30	506,00	104	,009*
Control Group	20	15,70	314,00		

p<0,05

The experimental group differs from the control group, as shown in Table 18, and this

difference is in the experimental group's advantage. In light of this, it can be argued that online educational games have a big impact on how students feel about English class.

The statistical results of the sub-research problems 2 and 3 are detailed below: Pre-test scores for the experimental group and pre-post test scores for the control group did not exhibit normal distribution, according to the results of the Shapiro-Wilks and Kolmogorov-Simirnov analyses of the academic achievement test scores (p 0.05). The first condition for two-way analysis of variance was not met. For this reason, a second approach, the comparison of difference score averages, was used (Can, 2019). Since the study group was less than 50 people, Shapiro-Wilk test scores were taken into consideration for normality distribution, and the results of the normality test indicated that the distribution was normal (p>0.01) so the comparison of the difference score series for academic attainment was performed using the t-Test statistics for Unrelated Samples.

Table 18. t-Test Values for Unrelated Samples for Academic Achievement Difference Means

Groups	N	$\bar{X}$	Ss	Sd	T	P
Experimental Group	20	10	11,79	38	2,35	,024
Control Group	20	2,3	9,02			

To determine if digital educational games have a substantial impact on vocabulary knowledge and listening abilities, Table 18 presents the t-test statistics for unrelated samples, which is a t-test for unrelated samples. When the table is analyzed, it is discovered that there is a significant difference between the mean scores of the data set for the experimental group (X _D=10) and the mean scores of the control group (X _K=2,3) [t_((58))=2,35,p0,05]. Effect size (d) values range from 0.2 small effect to 0.5 medium effect to 0.8 great effect (Tekindal, 2021). It was determined that digital educational games had a modest impact on vocabulary knowledge and listening abilities [d=0.74>0.8].

Discussion and Conclusion

The effect of digital educational games on students' attitudes towards English lesson was investigated and the analysis of the attitude scale revealed that the attitude level of the experimental group improved more than the control group. This outcome is consistent with a number of earlier studies. The usage of digital instructional games in the classroom has a favorable impact on students' attitudes, motivation, and success (Çoklar & Sabırlı, 2020; Musaoğlu & Çakır, 2022). Similarly, Çokyaman and Şimşek (2022) stated that digital educational games enable students to learn by entertaining them and this positively affects their attitudes. According to Aksoy (2014), there was a considerable rise in student groups' attitudes and motivation for the course in which digital educational games were employed. Assyzhanova, Seisenbeck, Uzakbaeva, and Kapalbek (2022) found a beneficial impact in both students' academic success and attitudes toward English courses in digital aided learning settings. A study of students' attitudes toward digital games and teachers' and students' perspectives on their use in an English language classroom in Sweden found that the students'views about these games were favorable and despite the problems teachers had in implementing games they were still willing to use the games in lessons (Tiren, 2021).Another study on the effect of digital educational games in English language classes on students' performance and motivation discovered that the experimental group achieved greater success and had higher motivation than the control group, and as a result, they developed favorable perspectives toward the use of digital educational games in English classes (Wichadee &

Pattanepichet, 2018). However, there are research that do not support the findings of this study that digital instructional games improve attitude. Yeşilbağ et.all (2020) examined the academic achievement and attitudes of digital educational games towards English course and stated that while digital educational games had a favorable influence on students' academic achievement, there was no significant change in their views. Similarly, Zengin (2019) discovered that the usage of digital educational games in English language instruction did not result in a change in students' views. In a study looking at the impact of using digital educational games in mathematics lessons on students' attitudes, Çankaya and Karatepe (2013) found no notable differences, which may be due to the fact that students already have a favorable attitude toward mathematics. On the basis of this research, it can be stated that although many studies have found that the use of digital educational games in the classroom environment has beneficial benefits, such as in this study, there are other studies demonstrating that it does not significantly influence students' views. The reason for this can be said to be that attitudes are difficult to change or that students already have a high level of positive attitude towards other methods or the course. However, even if it does not always affect students' attitudes positively, we can say that it makes the lesson fun and makes students learn and motivate by having fun in the lesson.

The analysis of the academic achievement test used to look at the impact of digital educational games on middle school students' English vocabulary knowledge and listening skills, the other sub-problems of the study showed that the experimental group students' vocabulary knowledge and listening skills increased more than those of the control group's students. It is possible to find evidence supporting this finding in the literature. Vnucko and Klimova (2023) conducted a meta-analysis of 13 articles on vocabulary learning with digital educational games and concluded that digital educational games are useful in English vocabulary learning and that they believe that digital educational games will be not only an additional method but also a complete alternative to traditional English lessons in the future. Hayo and Sorada (2011) investigated the interaction of online games in second language learning, they observed that students' interaction increased, their anxiety about making mistakes while playing games decreased, they spoke more fluently, and their vocabulary knowledge increased. Liu, Vadivel, Rezvani, and Namaziandost (2021) found that students believe that usage of digital games in the school settings enhances both their linguistic and social abilities. According to Shahriarpour and Kafi (2014)'s study on the use of digital games in English vocabulary acquisition, digital games boost learners' drive to learn, allowing them to go from rote learning to meaningful learning. Anlamış and Akay (2019) investigated the effects of using technological devices in English lessons on vocabulary learning and concluded that the words are more permanent and the lesson is more fun. Can and Özyaşar (2021) found that students in learning environments supported by a digital educational game called Wordable found the lesson more fun and their attitudes towards the lesson changed positively. Digital educational games are also known to have a positive effect on listening skills. Ağaoğlu and Şad (2020), in their study investigating the effect of digital games on listening skills, argued that such games are very effective on listening skills and that such an effective tool should be integrated into education. If digital educational games are integrated into education correctly and effectively, even language skills that are considered difficult and boring become fun and success increases (Meskil, 1996; Aghlara & Tamjid, 2011). Hu and Chang (2007) also stated that digital games facilitate the development of listening skills and attract students' attention to the lesson thanks to the many features of the games. Prasetyo (2022), in his qualitative study on the development of reading skills, stated that digital games have positive and negative effects both pedagogically and psychologically.

In their meta-analysis of research on the use of digital educational games in foreign language instruction published between 2014 and 2018, Acquah and Katz (2020) found that 70% of the studies found benefits to the usage of these games in learning foreign languages. In their study of the impact of using digital educational games in science lessons on students' academic performance and attitude, Ağırgöl and Kara (2022) found that while attitudes did not significantly change, the cognitive development of the students was positively impacted. Similarly, Korkmaz and İnal (2019) investigated the effect of digital educational games on attitudes toward learning Turkish and speaking skills in the context of teaching Turkish as a foreign language and discovered that there was an improvement in students' speaking skills in the experimental group where digital games were used, but no notable difference in their attitudes. Considering these studies, it has been proven that using digital educational games in English teaching improves listening abilities, vocabulary, and other language sub-skills. It has been discovered that using digital educational games in the learning environment improves academic success not only in foreign languages but also in other subjects.

In conclusion, considering the positive outcomes of using digital educational games in both foreign languages and other disciplines, we can say that their integration into education will have positive effects on academic achievement and may positively affect students' attitudes towards that course by providing them with a fun learning environment. This makes the case for the potential use of digital educational games as a tool for learning-reinforcing activities in elective English and other elective classes.

However, this study has some limitations. The experimental process is limited to 6 weeks and two units, two hours per week. The games used in the experimental process are limited to the games determined by the teacher in accordance with the learning outcomes.

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