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THE EFFICIENCY OF COMPUTER-ASSISTED GAME-BASED LEARNING APPLICATIONS IN TEACHING VERBS AND VERB-RELATED SUBJECTS

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Abstract

The aim of this research is to determine students' attitudes toward and success in Turkish lessons and grammar with the use of computer-assisted game-based learning applications. There are many opinions in the literature of the problems faced in grammar teaching. One of these problems is that students take a negative approach toward grammar lessons. A further problem is that students' academic achievement is not at the expected level. Games have many functions appropriate to the modern understanding of education. They make lessons enjoyable and maintain students' motivation to learn. In this study, educational computer games were used to reveal the effects on students' attitudes toward and their academic achievement in Turkish lessons and grammar. The pretest-posttest unequalized group quasi-experimental design based on quantitative research methods was used. The educational games, developed by the researcher, were used over ten weeks by the experimental group and with curriculum-related activities in the control group. Apart from these variables, the study kept all other conditions equal. The study group consisted of two different classes of 7th grade students studying in a secondary school. Examination of the attitudes and academic achievement scores of the experimental and control groups toward Turkish lessons and grammar shows that there was a significant difference in favor of the experimental group. The results suggest that computer-assisted game-based learning applications for grammar teaching have a positive effect on students' attitudes and achievement.

Keywords: Game based learning, grammar teaching, computer assisted teaching.

INTRODUCTION

Language is a tool for communication and thought that people use to share their feelings, thoughts, and observations using signs or words and it is used effectively between people (Güneş, 2017; Demirel & Şahinel, 2006). Grammar, on the other hand, is a system that deals with language in all its aspects and examines the sound, form, sentence and text structure revealing meanings and functions (Ergin, 2013; Güneş, 2013). Individuals become part of society through the use of their mother tongue and through socializing strengthen their relationship with society. The 2005 Turkish Curriculum in Turkey intruduced some changes to grammar teaching following the latest scientific developments. These changes are important for enabling individuals to better express themselves. Today's technology can be used to achieve this and one way is by using educational computer games. In general, students use these games in their free time (Buchman & Funk, 1996).

Games are activities that develop individuals' physical and mental skills, with or without tools (Bilen, 1999; Koçyiğit, Tuğluk & Kök, 2007), and they have very different effects when used in education. Games increase students' motivation, get them interested in the content, and help the student to relax

(Yağız, 2007). Games, which also have an interesting feature (Karabacak, 1996), allow students to learn by doing and experiencing (Aslan Akın & Atıcı, 2015). When used in accordance with their purpose, games are an educational and instructive activity as well as entertaining (Taşpınar, 2012). Since today's children spend most of their time in front of the computer using technological tools and playing video games, researchers have become interested in how computer games can be used in the classroom as an educational tool (Prensky, 2001b).

Background of the Study

The use of computers in the field of education has increased recently. Studies show that the use of computers in education positively affects both students' attitudes toward lessons and their achievement (Çankaya & Karamete, 2008). In addition, including games in the education process encourages students to become more active in the process, leading to the development of a computer-assisted game-based learning method, also referred to as educational computer games (Karamete & Çankaya, 2008).

The use of games in education is not new. Educational games, defined as all games used in line with the objectives of education (Tural, 2005). Computer games are defined as software that helps students learn the subjects in the curriculum and improves their problem-solving skills (Demirel, Seferoğlu & Yağcı, 2003). According to Taşpınar (2012:241), it is necessary to follow a certain order to use educational games:

- The teacher chooses a game according to lesson outcomes.
- The purpose and rules of the game are explained and the materials, roles, and functions of the game are determined.
- The awards and possible achievements at the end of the game are indicated.
- The game is demonstrated.
- At the end of the game, a feedback activity is carried out with student participation and discussion-evaluation activities are carried out in accordance with the purpose of the subject.

Typical gamification applications are Nike+ for sports, ClassDojo for classroom management, and Duolingo for foreign language learning (Özkan & Samur, 2017). The purpose of gamification is to make the learning process more attractive (Güler & Güler, 2015).

Games are used in game-based learning environments, defined as game-framed problem-based learning environments embedded in specific problem scenarios (Bayırtepe & Tüzün, 2017). Here, students come up with solutions to achieve goals (Malta, 2010). The digital game-based learning approach, defined by Prensky (2001a) as educational games supported by digital environments, has been developed based on game-based learning environments. This study applies computer-assisted game-based learning applications to the computer-assısted game-based learning method.

The success of computer games, especially after the 1980s and1990s, has led educators to see these games as a tool in education (Mayer, Schustack & Blanton, 1999). According to Devary (2008: 39), for a computer game to be educational, it must contain particular features:

- It must have elements of interaction and feedback.
- It should allow players to research and review and contribute to their productivity.
- There must be different ways to reach goals.
- Educational content should be placed in the game in such a way that the player does not notice it.
- Players should have the option to choose the character they want.

In addition, participation, challenge, competition, exploration, and motivation are natural elements of educational games. This is because a game with a challenge and that encourages competition between students can motivate and involve them in playing and exploring the game (Zin & Wong, 2009). Educational computer games are used in fields such as mathematics, science, medicine, and engineering, as well as in the field of language teaching (Yağız, 2007). Game-based learning environments create a new social and cultural environment, and contribute to the individual's learning by combining technology through thinking and communication (Shaffer et. al, 2005).

Several studies examining the effects of educational games in Turkish teaching suggest that educational games have positive effects on students' academic achievement (Aşçı, 2019; Kayan & Aydın, 2020). Similar results have been obtained in research into teaching Turkish as a foreign language, which conclude that educational games have a positive affect on learning (Kara, 2010; Gürsoy & Arslan, 2011; Kalfa, 2014).

Problem Situation

Traditional approaches used in grammar teaching fail to meet the expectations of students and have a negative affect on their attitudes toward the subject and their academic achievement. The effective use of computers in education may affect students' attitudes toward and academic achievement in their course. However, the increased use of computers in recent years does not mean that computers are being used more efficiently. The widespread use of computers in many fields such as medicine, engineering, geography, and mathematics has made computers an indispensable element of our lives, particularly in education. During the Covid-19 pandemic, the importance of distance education increased considerably, and computer-based training gained momentum. Some studies, especially those in which educational computer games were used as a method, conclude that student attitudes and academic achievement increased and their anxiety about lessons decreased (Aşçı, 2019; Kayan & Aydın, 2020; Can, 2003; Chen et al., 2012; Kebritchi, Hirumi & Bai, 2010).

The use of educational computer games helps to reveal students' emotions and imagination, such as competition, pleasure, and anxiety, and improve their learning performance as they take more risks in the learning environment (Lo et al., 2008; Whitehall & McDonald, 1993). Students are motivated, focusing more on their education leading to an increase in performance (Ricci et al., 1996). Such games are not only used to entertain students but also to reinforce knowledge (Bayırtepe & Tüzün, 2007). Students learn while playing (Siang & Rao, 2003) and learning improves by doing and experiencing (Kirriemur & McFarlane, 2004).

There are gaps in the current literature on computer-assisted game-based learning studies in Turkish teaching. This study was conducted to close this gap and to investigate the effectiveness of computer-assisted game-based learning applications on students' attitudes and academic achievement.

The purpose of the study

The aim of this research is to determine the effects of computer-assisted game-based learning applications and computer-assisted educational games on students' attitudes toward Turkish lessons and grammar, and their academic success in Turkish grammar.

Research Question

The research question is "Do computer-assisted game-based grammar teaching applications have an effect on 7th grade students' attitudes toward grammar and Turkish lessons and their grammar achievement before and after process-based applications?"

Sub-questions

1) Is there a significant difference between 7th grade experiemental group students' attitudes toward Turkish lessons and grammar and their achievement in Turkish grammar before and after the process-based applications?

2) Is there a significant difference between 7th grade control group students' attitudes toward Turkish lessons and grammar and their achievement in Turkish grammar before and after the process-based applications?

3) Is there a statisically significant difference between the experimental and control groups' attitudes toward Turkish lessons and grammar and their achievement in Turkish grammar with the use of computer-assisted game-based grammar teaching?

4) Is there a statistiacally significatn difference between attitudes toward Turkish lessons and grammar and their achievement in Turkish grammar with the use of computer-assisted game-based grammar teaching according to gender?

METHOD

This section describes the research process and procedures, the method used, the sample group, and the data collection tools used before and after the research process. In addition, the design and sample of the research are explained and the development process of the tools used for data collection (validity and reliability analysis) is explained, and details of the methods used and the data analysis process are illustrated.

The quantitative research method was used in this study. The research is a quasi-experimental model in terms of revealing the effects of independent variables on dependent variables. This model was carried out using a quasi-experimental design with pretest-posttest comparison group. The pretest-posttest comparison group design measures the dependent variables before and after the experimental research (Karasar, 1999). In this model, the participants are divided into two groups as the experimental group and the control group. During the research process, validity and reliability studies were conducted and Cronbach Alpha = 0.987 and KMO value was found to be .612 for the Verb Structure Achievement Test. The Barlett integrity test was found to be .00. Cronbach Alpha=0.98 and the KMO value was 721 in the scale of attitude toward grammar. The Barlett integrity test was found to be .00.

The study group consisted of 7th grade students, from two branches, in a secondary school affiliated to the Ministry of National Education. Fıfty-seven students participated in the research, 28 students (12 girls and 16 boys) were in the experimental group and 29 students (14 girls and 15 boys) were in the control group.

The Verb Achievement Test, developed by Gündoğdu and Dönmez (2018), was used as the pretest and posttest achievement test; the scale developed by Ünal and Köse (2014) was used to measure the students' attitude toward the Turkish lessons and a scale, developed by Pehlivan, Aydın and Uyumaz (2018), was used to measure the attitude toward grammar. The Structure in Act Achievement Test, developed by Gündoğdu and Dönmez (30), consists of 26 questions. The item discrimination indexes of this test range from 0.33 to 0.73 and the item difficulty indexes range from 0.23 to 0.76. The reliability of the test results was calculated as 0.83 and the difficulty as 44%, and it was determined that the achievement test was a medium difficulty level.

The scale of Ünal and Köse (2014), consisting of 27 items, was used to measure the students' attitude toward the Turkish lessons. The Cronbach Alpha reliability coefficient of the scale was determined as 0.914 and its content validity was ensured by taking expert opinions. These findings determined that the scale was valid and reliable. The Kaiser-Meyer-Olkin value of the study was determined to be

0.909. This result can be considered excellent as it is above 0.90. The Barlett Test of Sphericity value is (χ2=4046.967; df=595, p<0.00) and was found to be significant. Thus, it was concluded that this study is suitable for exploratory factor analysis. In addition, a significant difference was found between the 27% subgroup and the upper group across all factors and the entire scale. This suggests that these factors and the scale were able to distinguish between the lower and upper groups.

The attitude toward grammar scale, developed by Pehlivan, Aydın and Uyumaz (2018), consists of 25 items with 3 factors and is a 5-point Likert-type type including "I strongly disagree", "I do not agree", "I agree moderately", "I agree" and "I completely agree". The Kaiser-Meyer-Olkin value of the scale was found to be 0.908 and the Barlett's Test of Sphericity value was determined as χ2=3444.794, df=300, p<.000. The Cronbach Alpha reliability coefficient of the scale was calculated as 0.887. As a result of the analysis, it was concluded that the scale is a valid and reliable scale.

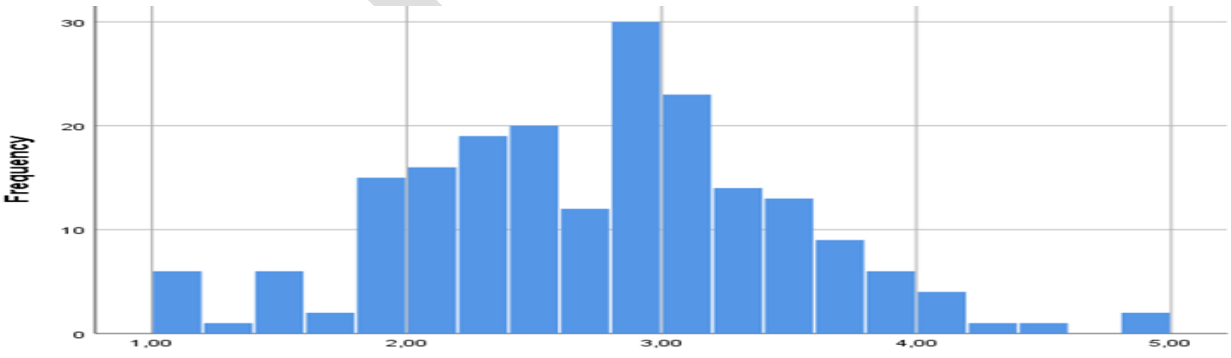
The computer-assisted game-based learning applications used in this study were developed by the researcher for the experimental group and the lessons were taught following the current curriculum in the control group. Apart from the method used, the same teacher participated in the lessons of both classes to ensure equal conditions. The research started in December 2018 and ended in March 2019.

There were two stages to the research. In the first stage, computer-assisted game-based learning applications were developed by the researcher. In the second stage, the effectiveness of these applications was investigated. It was decided to teach the subject of verb structure. Before the research, the Grammar Achievement Test, Attitude Scale Toward Turkish lessons, and the Attitude Toward Grammar Scale were applied to the experimental and control groups as a pretest. For the experimental group, computer-supported game-based learning applications were developed by taking expert opinions, and a ten-week plan was prepared in line with the curriculum.

For the experiemental group, the lessons began with interesting material, the course content was determined, and both the book and the applications, prepared by the researcher, were used with the help of smart board and projection. Students participated in these educational games in groups of 4-6. In the control group, the intuition method was used, following the current curriculum, and the activities in the Turkish book were also used. This application lasted ten weeks. After the research, posttests were applied to the experimental and control groups in order to determine academic achievement in the Turkish course and the differences in their attitudes toward the Turkish course and grammar. The findings are explained in the following section.

FINDINGS

The following Graph 1 shows the Skewness (skewness) and Kurtosis (kurtosis) values are distributed between +1.0 and -1.0 values, which is a normal distribution (Tabachnick and Fidell, 2013).



Graph 1

The first sub-question of the study is "Is there a significant difference between 7th grade experiemental group students' attitudes toward Turkish lessons and grammar and their achievement in Turkish grammar before and after the process-based applications?"

In order to answer this question, the Kruskal Wallis H test was conducted. The grammar achievement pretest and posttest scores (Z=-4.156, p<0.05), grammar attitude pretest and posttest scores (Z=-4.025, p<0.05) of the students in the experimental group studying with computer-assisted game-based learning applications and Turkish attitude pretest and posttest scores (Z=-4,320, p<0.05) were found to be statistically significant. The results show that the students in the experimental group showed a more positive attitude toward Turkish lessons in their posttest scores than pretest scores and achieved higher grammar scores. The computer-assisted game-based learning applications improved the students' attitudes toward Turkish lessons and increased their grammar success.

In the analysis of the data obtained in the study, independent groups t-test was used in cases where two groups were compared, and one-way analysis of variance was used for three or more groups. In cases where analysis of variance was found to be significant, the LSD test was applied for pairwise comparisons. However, for analysis of variance and t test, Levene's Test was applied first and the homogeneity of variances was tested. If p<0.05 was found in Levene's test (in cases where variances were not homogeneous), non-parametric tests such as Kruskal Wallis Test and Mann Whitney-U Test were applied instead of analysis of variance.

The second sub-question of the study is, "Is there a significant difference between 7th grade control group students' attitudes toward Turkish lessons and grammar and their achievement in Turkish grammar before and after the process-based applications?" The results of Kruskal Wallis H tests, which were conducted to answer this question, are as follows.

There is a statistically significant difference between the pretest and posttest scores of the students in the control group (Z=-4.654, p<0.05). The posttest scores of the students in the control group were found to be higher than the pretest scores. It was concluded that there was no statistically significant difference between the grammar attitude pretest and posttest scores of the students in the control group (Z=-2,415, p>0.05) and the Turkish attitude pretest and posttest scores (Z=-0.412, p>0.05).

The third sub-question of the study is, "Is there a statisically significant difference between the experimental and control groups' attitudes toward Turkish lessons and grammar and their achievement in Turkish grammar with the use of computer-assisted game-based grammar teaching?" The results of Mann Whitney U tests conducted to answer this question are given below.

Grammar achievement scores (U=486,000, p>0.05), grammar attitude scores (U=465,000, p>0.05), and Turkish attitude scores (U=486,000) of the students in the experimental and control groups before computer-assisted game-based learning applications were 603,000, p>0.05). There was no statistically significant difference. After the computer-assisted game-based learning applications, the grammar achievement scores (U=483,000, p<0.05), grammar attitude scores (U=460,000, p<0.05), and Turkish attitude scores (U) of the students in the experimental and control groups =592,000, p<0.05) were found to significantly statistically different.

The fourth sub-question of the study is "Is there a statistiacally significatn difference between attitudes toward Turkish lessons and grammar and their achievement in Turkish grammar with the use of computer-assisted game-based grammar teaching according to gender?" The grammar achievement scores (U=134,000, p>0.05), grammar attitude scores (U=102,000, p>0.05), and Turkish attitude scores (U=118.500, p>0.05) show there was no statistically significant difference according to gender.

After the computer-assisted game-based learning applications, the students in the experimental group's grammar achievement scores (U=144.000, p>0.05), grammar attitude scores (U=122.500, p>0.05), and Turkish attitude scores (U=137.000, p> 0.05) did not show a statistically significant difference according to gender. The pretest and posttest grammar attitude scores (U=128.000, p>0.05) and

Turkish attitude scores (U=152.500, p>0.05) of the students in the control group where the current curriculum practices were followed show no statistically significant difference according to gender. However, the pretest grammar achievement scores of the students in the control group (U=83.0000, p<0.05) do show a statistically significant difference according to gender in favor of female students. In other words, the pretest grammar achievement scores of the female students in the control group are higher than the grammar achievement scores of the male students. Likewise, the posttest grammar achievement scores of the students in the control group (U=71,000, p<0.05) show a significant difference in favor of female students.

When the results of all students participating in the study were examined according to the gender variable, a statistically significant difference was found between the grammar achievements of the students in the experimental and control groups (p<0.05), and it was determined that female students were more successful. A statistically significant difference was found between the grammar attitudes of the students in the experimental and control groups in terms of gender (p<0.05), and it was determined that the attitudes of the female students were more positive, but there was no statistically significant difference between the Turkish lessons attitudes of the students in the experimental and control groups in terms of gender (p>0.05).

DISCUSSION

Success

The first and second sub-questions of this study sought to answer whether there is a significant difference in the success of computer-assisted game-based grammar teaching in Turkish grammar before and after the process-based applications in secondary school 7th grade students in the experimental and control groups. A significant difference was found in terms of Turkish grammar achievement in the experimental and control groups. There are studies with similar and dissimilar results to this study in the literature.

A study conducted on learning grammar in a foreign language determined that the effect of computer-assisted learning method on student success was higher in the posttest scores of both the experimental and control groups than the scores in the pretest, and that this difference was significant (Odabaşı, 1994). A study examining the effect of computer-assisted teaching on eliminating misconceptions in social studies teaching concludes that the experimental and control groups were more successful at the end of the process (Toros & Yeşiltaş, 2015). Keser (2012) examined the effect of computer-assisted instruction on success and permanence in the social studies course and concludes that the experimental and control groups were more successful in the posttest application. Polat and Varol (2012) examined the effect of educational computer games on academic achievement in a social studies course and concludes that the pretest-posttest scores of the experimental and control groups increased in favor of the posttest and that both groups were more successful at the end of the process. In Bayturan's (2011) study in which he examined the effects of computer-assisted instruction on students' achievement, attitudes, and computer self-efficacy perceptions in mathematics teaching, it was found that the posttest scores of the experimental and control group students were higher between the pretest-posttest achievement scores and both groups were successful at the end of the process.

Studies on Turkish teaching show similar results to the current study. Kayan and Aydın's (2020) study in which the effects of computer-assisted educational games on the teaching of noun and name-related subjects on students' grammatical success, their attitudes toward grammar and their attitudes toward Turkish lessons applied pretest and posttest achievement tests to both the experimental and control groups. A significant difference was found between the pretest-posttest scores, and a significant difference was found between the pretest-posttest success scores in the control group. They conclude that both groups were successful at the end of the process. Durukan (2011) examined the success of computer-assisted grammar teaching on students and found a significant difference between the pretest-posttest achievement scores of the experimental group. There was a significant difference

between the pretest-posttest success scores in the control group, and both groups were found to be successful at the end of the application. In Aşçı's (2019) study, in which the use of educational digital games in teaching the subject of structure in words examined the academic achievement of the students in Turkish lessons, a significant difference was found between the pretest-posttest success scores of the experimental group, with the posttest success scores being found to be higher. A significant difference was found between the pretest-posttest success scores in the control group, and it was concluded that both groups were more successful at the end of the study.

There are studies whose findings are not in line with the findings obtained in the current study. One study using educational computer games determined there was no statistically significant difference between pretest and posttest mean scores of the control group in English teaching (Donmuş, 2012). Some studies in science teaching concluded that there was no significant difference between the pretest and posttest scores of the control group (Ural, 2009; Hançer & Yalçın, 2009).

The third sub-question of the current study sought to determine whether there is a significant difference between the experimental and control groups in the success of computer-assisted game-based grammar teaching in 7th grade students in Turkish grammar. It was determined that the experimental group was more successful in terms of grammar academic achievement and that computer-assisted game-based learning applications give more effective results than the existing curriculum applications.

There are studies showing similar results inn the literature. Studies conducted in social studies teaching show that the experimental group in which educational computer games and computer-assisted teaching were applied was more successful than the control group who followed the current curriculum applications (Polat & Varol, 2012; Keser, 2012; Toros & Yeşiltaş 2015). In studies conducted in science teaching, an experimental group in which computer-assisted instruction was applied was more successful than the control group (Hançer & Yalçın, 2009; Yenice, Sümer, Oktaylar, & Erbil, 2003; Güven & Sülün, 2012). A study on the effect of computer-assisted instruction on students' success in mathematics teaching determined that the experimental group in which computer-assisted instruction was applied was more successful than the control group (Bayturan, 2011). Kayan and Aydın (2020) examined the effects of computer-assisted educational games on students' grammatical success, attitudes toward grammar and attitudes toward Turkish lessons in teaching noun and name-related subjects. They concluded that the experimental group in which educational games were used was more successful than the control group. Durukan (2011) concluded that the computer-assisted grammar teaching applied in the experimental group was more effective than the traditional approach applied in the control group. What is more, the experimental group achieved more successful results than the control group at the end of the process.

There are, however, studies that are not in line with the findings of the current study in the literature. A study conducted on teaching Turkish determined that there was no significant difference in terms of success between the experimental group in which educational digital games were applied and the control group in which the current curriculum applications were used (Aşçı, 2019). Similar results have been shown in different fields. A study conducted in science teaching concluded that there was no significant difference between the experimental group in which educational computer games were applied and the control group in terms of success. A study conducted in English language teaching determined that there was no significant difference in terms of success between the experimental group in which computer assisted learning method was used and the control group in which current curriculum applications were used (Odabaşı, 1994).

The fourth sub-question of the current study sought to determine whether there is a significant difference between the pretest and posttest results of computer-assisted game-based grammar teaching in secondary school 7th grade students in Turkish grammar achievement according to gender. There was no significant gender difference between the grammar achievement scores of the students in the

experimental group before and after the computer-assisted game-based learning applications. However, a significant difference was found between the grammar achievement scores of the students in the control group before and after the computer-assisted game-based learning applications, and it was determined that the pretest grammar achievement scores of the female students were higher than the male students.

Female students were the most successful of all students participating in the application. There are studies in the literature that came up with similar results. A study in which computer-aided teaching applications and computer games were used in mathematics teaching determined that the success of female students was higher than that of male students (Kula & Erdem, 2005; Uygun, 2008).

There are also studies in the literature that are not in line with the results of the current study. One study examined the success of computer-assisted teaching in English teaching compared to traditional teaching and determined that male students were more successful (Naba'h, Hussain, Al-Omari & Shdeifat, 2009). Another study examined the effect of educational computer games on academic achievement in science lessons and concluded that male students were more successful (Obut, 2005).

Attitude

The first and second sub-questions of the current study sought to determine whether there was a significant difference in the attitudes of computer-assisted game-based grammar teaching toward Turkish lessons and grammar in secondary school 7th grade students in the experimental and control groups before and after the process-based applications. The findings show that the experimental group's attitudes toward Turkish lessons and grammar increased between the pretest and posttest results before and after the process, while there was no significant difference between the pretest and posttest results of the control group before and after the process.

A review of the literature reveals similar results. Studies conducted in mathematics teaching determined that the computer assisted teaching and game-based learning environments applied in the experimental group improved the students' attitudes toward mathematics lessons (Bayturan, 2011; Akın & Atıcı, 2015). Similar results were obtained in a study on physics teaching which determined that there was an increase in the attitude scores of the experimental group in which computer-assisted activities were used in the pretest and posttests (Yiğit & Akdeniz, 2003). A study examining the effects of using educational computer games in English teaching on achievement, permanence, and motivation determined that the posttest scores in the experimental group were higher than the pretest scores, and there was no significant difference between the pretest and posttest scores in the control group (Donmuş, 2012).

Kayan and Aydın's (2020) study on Turkish teaching which examined the effects of computer aided educational games on students' grammar achievement, attitudes toward grammar, and attitudes toward Turkish lessons in teaching nouns and subjects related to nouns, grammar pretest and posttests were administered to the experimental and control groups. Pre- and posttests were applied for Turkish lessons. The findings show that the experimental group's attitude scores toward grammar and Turkish lessons increased whereas there was no significant difference in the scores of grammar and attitude toward Turkish lessons in the control group. In a study by Durukan (2011) in which the effect of computer-assisted grammar teaching on achievement and attitude was investigated, pretest-posttest was applied to the experimental and control groups to measure the attitudes of the participants.

The third sub-question of the current study sought to determine whether there is a significant difference between the experimental and control groups in the attitudes of 7th grade secondary school students in computer-assisted game-based grammar teaching toward Turkish lessons and grammar. The findings show that while there was no significant difference between the experimental and control groups in the attitude scales for Turkish lessons and grammar before the process, there was a significant difference in favor of the experimental group at the end of the process.

In a study conducted in mathematics teaching examining the effects of technology-supported teaching on students' achievement level, attitudes, and permanence in algebra teaching, the attitudes of the experimental and control groups toward mathematics lessons were determined and concluded that there was no significant difference according to the pretest results made before the process. In the posttest, a significant difference was reached in favor of the experimental group, and it was concluded that technology-supported instruction increased attitudes positively (Öner, 2009). A study by Hançer and Yalçın (2009) in which the effect of computer-assisted learning based on the constructivist approach in science education on problem solving skills was measured concluded that there was no significant difference between the pretest scores of the experimental and control groups' attitudes. However, at the end of the process, a significant difference was found between the posttest scores applied to both groups in favor of the experimental group.

There are also studies that are not in line with the result of the current study. A study conducted in science teaching determined that computer-assisted teaching did not have any effect on attitude (Guven & Sülün, 2012). Uygun (2009) concluded that the computer-assisted teaching software applied in mathematics teaching did not have any effect on the attitudes of the experimental group students.

The fourth sub-question of the current study sought to determine whether there is a significant difference between the pretest and posttest results of the computer-assisted game-based grammar teaching of secondary school 7th grade students toward Turkish lessons and grammar. The experimental group students' attitude scores toward grammar and attitude scores toward Turkish lessons before and after computer-assisted game-based learning applications do not show a statistically significant difference according to gender. It was determined that there was no statistically significant difference according to gender in the attitude scores of the control group students towards grammar before and after the process and their attitude scores towards the Turkish lessons. In addition, a statistically significant difference was found between the attitudes of the students in the experimental and control groups toward grammar in terms of gender, and it was determined that the attitudes of female students were higher. However, it has been determined that there is no statistically significant difference between the attitudes of the experimental and control group students to the Turkish lessons in terms of gender. Studies on mathematics teaching concluded that computer-assisted teaching and educational computer games do not have an effect on gender, and there is no significant difference according to the pretest and posttest results (Öztürk, 2007).

Conclusion and Suggestions

This research was carried out in order to reveal the academic success of students, their attitudes toward Turkish lessons and grammar in the teaching of verbs and verb-related subjects through computer-assisted game-based learning applications. A quasi-experimental method suitable for the pretest-posttest model with a control group was used. The experimental group of the research consisted of 28 students and the control group consisted of 29 students. The study continued for ten weeks and educational games were prepared within the framework of expert opinion.

Examination of the success scores found significant differences in the pretest and posttest applications for Turkish grammar achievement between the experimental group, in which educational games were used, and the control group, in which curriculum-based applications were used. The posttest scores of both groups were higher than the pretest scores, suggesting that they were more successful after the process than before the process. However, comparison of the posttest scores applied at the end of the process in the experimental and control groups showed that the experimental group was more successful. Analysis of the achievement scores according to gender determined that while there was no significant difference in the experimental group before and after the process, the female students in the control group were more successful in the pretest and posttest.

Examination of attitude scores suggests that there was an increase in the attitudes of the experimental group toward Turkish lessons and grammar at the end of the process, but there was no change in the control group. Analysis of the attitude scores according to gender suggests that there was no statistically significant difference between the pretest and posttest scores of male and female students in both the experimental and control groups.

Considering the results of all students according to gender suggests that there was a significant difference in the grammar achievement of female students. In addition, it was determined that the attitudes of female students toward grammar increased, but it was concluded that there was no significant difference between the attitude scores toward Turkish lessons according to gender.

Suggestions considering the results of the study are as follows:

- The games used in the research were designed simply as a technical infrastructure. These games can be developed with the support of software experts and computer supported games can be prepared at a higher level.
- By creating a multi-player environment in the games, they can be integrated into the education system of a school or country, not just a classroom. In this way, the points to be taken from the central exams can be replaced by points collected from the games. Thus, students can evaluate themselves not only according to the success ranking of the class or school they are in but also on an average of success in which the whole country participates.
- Student opinions can be consulted while the games are being prepared.
- In terms of compatibility with the operating system, not only computer games but also games that can work on phones, tablets, and game consoles can be developed.
- Sexism should be avoided during the preparation process of the games.
- Information about game technology, game-based learning, and educational games can be transferred to teachers at the level of undergraduate education and to trainee teachers.
- Researches on the computer-assisted game-based learning method can be carried out at different grade levels, thus contributing to the literature by measuring the achievement and attitudes of students in other disciplines.

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