

# The Effect of Computer-Assisted Educational Games on Teaching Grammar

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## Abstract

Discussions on how grammar should be taught have continued for decades. Previous studies have reported that today's students called as Generation Z have shown negative attitudes toward grammar teaching with traditional methods and techniques, and that their academic achievements have failed to meet expectations. Not using methods and techniques that are consistent with the adopted philosophy of education hinders the success of this process. The study investigated the impact of computer-assisted instruction and correspondingly computer-assisted educational games on grammar academic achievement and attitudes toward grammar and Turkish course of students. In this study, a quasi-experimental design based on a quantitative study with a pretest-posttest nonequivalent group was applied. Participants of the study consisted of two classes of 6<sup>th</sup> grade students studying at a middle school. Computer-assisted educational games were designed and practiced in the experimental group within a 12-week period. For the control group, activities in the curriculum were followed during lessons. Results showed that grammar academic achievement of students between the experimental group in which computer-assisted educational games were practiced and the control group in which the existing curriculum was followed showed a significant difference in attitudes toward Turkish course and grammar on the behalf of the experimental group. Findings demonstrated that this kind of practice in teaching grammar made a significant difference on achievement and attitude of students. In addition, there was a positive, moderate and statistically significant relationship between attitudes toward grammar and Turkish course. Attitudes toward grammar of students determine attitudes toward Turkish course of students.

**Keywords:** teaching grammar, educational games, computer-assisted educational games, computer-assisted instruction, language teaching

## 1. Introduction

Learning to learn has been viewed as one of the primary goals of education in the 21st century. It has been considered that this goal could be achieved through activities and practices performed in the classroom (Ural, 2009, p. 1). For this reason, according to earlier studies (Altunbay & Bıçak, 2018), traditional approaches and methods have been insufficient to interpret meanings of concepts and bring about learning for students. Prensky (2001) points out that one of the significant reasons of this problem in learning environments is a conflict in language and understanding between educators called as "digital immigrant" and learners named as "digital native". That's to say, trying to make digital natives, who are able to reach the technology in every step of their lives, achieve the goals through teaching methods and techniques used for the previous generation has failed to provide powerful results.

For new generation students who are on the computer for hours and lose track of the time, even short courses in used traditional methods could be boring (Ural, 2009, p. 46). It is owing to the fact that students called as "Generation Z" are exposed to technological tools and materials since their childhood. Therefore, they use technological tools and materials rather than traditional methods to know and learn an object (Prensky, 2001). Academic achievement and motivation of students being exposed to traditional teaching methods in their classroom are decreasing (Sarı & Altun, 2016, p. 554). Nonetheless, motivation and therefore improving attitude are among indispensable factors for effective

learning. Teachers have had problems in developing these factors in the classrooms that are getting crowded (Ural, 2009, p. 2).

In today's crowded classrooms, it is required to learn much more knowledge in a short time. In order that time in class is managed effectively and efficiently, it is a key concern to possess new methods and techniques. Among technological tools and materials, computers have been identified as one of the most effective tools which serve those purposes in a classroom environment (Alkan, 2005, p. 4-5). For that purpose, an attempt to find an alternative method to practices that make students passive and an observer in the classroom has been made and it has been started to tend to computer-assisted instruction within the scope of technological developments (Demirci, 2008, p. 4-5). Together with computer-assisted instruction, computer games have also become one of the primary materials used to improve the quality of education. Computer games are essential in interpreting knowledge and making learning long lasting (Alessi & Trollip, 2001). It has been recognized as crucial that the computer games consist of entertaining and motivating factors (Squire, 2003). It is a widely held view that using educational computer games in the classroom could solve several problems concerning learning (Ural, 2009). With reference to those ideas, educational computer games have commonly been assumed to use for problems in teaching grammar.

Teaching grammar plays a vital role in creating language awareness of students (Sever, 2015, p. 29). It has been reported that even if grammar has been taught from the primary school to the college, students have difficulty in using the language and therefore they do not use the language effectively and efficiently (Alyılmaz, 2010, p. 729). Previous studies regarding this field (Alyılmaz, 2010; Daloğlu, 2005; Demir & Yapıcı, 2007; Demirkol, 2007; Durukan, 2010; Erdem, 2007; Erdem & Başaran, 2010; Gülsevin & Boz, 2006; Sağır, 2002; Şahinci, 2011; Yalçın, 2002; Yaman, 2011; Yapıcı, 2004) have identified that the desired success in schools with regard to teaching grammar has not been achieved yet.

Some underlying reasons for the failure of teaching grammar in schools are listed:

- Viewing teaching grammar as making students memorize certain rules of grammar
- Word-oriented rules of grammar
- Insufficient tools and materials used
- Conflict of term and definition
- Not having an understanding of functional grammar
- Teachers who could not follow recent developments
- Non-functional practices
- Not transforming knowledge into skills
- Not drawing on current approaches of linguistics
- Not raising awareness of students on teaching grammar
- Insisting on using traditional methods and techniques
- Not adopting an approach developing perceptual and productive skills
- Teaching grammar as an independent course
- Not viewing grammar as a whole in terms of form and meaning
- Using knowledge-oriented testing and evaluation methods
- Curriculum issues
- Insufficient course books and etc. (Akkaya, 2011, p. 10; Çiftçi, 2006, p. 120-121; Demir, 2009, p. 60-65; Güneş, 2013, p. 174; İşcan & Koluksa, 2005, p. 300-305; Karadüz, 2007, p. 282; Kerimoğlu, 2016, p. 196; Sağır, 2002, p. 31; Sever, 2015, p. 31; Şimşek, 1997, p. 60; Yaman, 2006, p. 21; Ünalın, 2001, p. 141).

Briefly, on the grounds that new methods and techniques in teaching grammar have not been used in the classroom and that the content of grammar has been taught abstractly and explicitly, the success in teaching grammar has not been achieved and students have showed negative attitudes toward the lesson of grammar (Güven, 2013). If the success in teaching grammar is expected to be gained, it is a must to change those methods and techniques together with those approaches used (Demir, 2003, p. 407). Hence, it has commonly been assumed that supporting learning environments with technology-based practices will provide certain improvements in students' achievement and attitudes (Altunbay & Bıçak, 2018, p. 140).

Girls sit on the computer for 5.5 hours per week while boys spend their time on the computer for 13 hours per week. The elapsed time has been increasing day-by-day (Yağız, 2007). Considering the amount of time of playing games, Turkey has ranked 3rd worldwide while it is far from this rank concerning using games in learning and teaching (Yılmaz, 2018, p. 18). Using educational computer games in education has been claimed to be a necessity because children are very interested in computers and computer games, and because computers and their applications have become great parts of our lives. Along with those practices setting enjoyable learning environments, transforming knowledge into skills and therefore making it long lasting seem possible (Bayırtepe & Tüzün, 2007). One of the key fields in which skill-based instruction should be adopted is language teaching.

Today, several developed countries have placed an emphasis on language and language teaching. Teaching methods and techniques which will be developed together with models and approaches which will be used during that process have been thought as vital (Güneş, 2016, p. 13). Nevertheless, as grammar has still been taught with a mentality based on rote learning in schools (Demir, 2003, p. 407), the contribution of grammar to language teaching is regarded as unsatisfactory (Kerimoğlu, 2016). According to Güneş (2013, p. 172), from past to present, rules and definitions have been memorized and in-depth grammatical analysis has been practiced during grammar lessons. Instead of reasoning and skill, a rule-based understanding has been adopted. Because of those reasons, it has been detected that it affects students' psychology negatively, for example, some students are bored or some of them feel frightened during grammar lessons. Especially for primary school students who are just passing the concrete operational stage through the formal operational stage, it is significant that rules and definitions are concreted and given implicitly (Durukan, 2011, p. 42). At this point, it has been regarded as a major problem that different methods and techniques have not been used in teaching grammar. That problem has a negative impact on academic achievement and attitudes of students who do not quite comprehend course contents (Güven, 2013).

The present study aimed so as to examine the impact of computer-assisted instruction and correspondingly computer-assisted educational games on grammar academic achievement on Turkish course of students and attitudes toward grammar and Turkish course of students. The using of technology-based platforms with traditional approaches by teachers impedes to take advantage of earlier practices properly. It has been thought that this computer-assisted study supported by constructivist software and educational games directly affects academic achievement on grammar and attitudes of students. A considerable amount of literature has been published on academic achievement, attitude, self-efficacy, opinions of students and teachers related to computer-assisted instruction and computer-assisted educational games. The related publications and studies have reported that these methods have often provided positive changes on academic achievement and attitude. No studies have been found in the literature related to an experimental research on the using of "computer-assisted educational games" in teaching grammar of Turkish. For this reason, it has been proposed that the current study will serve as a base for future studies and draw attention to the gap in the field.

### *1.2 Research Questions*

Considering the research gap in the field, the study addressed the following research questions:

1. Is there a statistically significant difference in the results of the pretests of grammar achievement, attitudes toward grammar and attitudes toward Turkish course of students between the experimental group and the control group?
2. Is there a statistically significant difference in the results of the posttests of grammar achievement, attitudes toward grammar and attitudes toward Turkish course of students between the experimental group and the control group?
3. Is there a statistically significant difference in the results of the pretests and the posttests of attitudes toward grammar and attitudes toward Turkish course of students between the experimental group and the control group?

### *1.3 Literature Review*

According to Durukan (2012, p. 145), students show positive attitudes toward instruction software. The experimental group in the study of Durukan (2012) demonstrated improvements in academic achievement together with positive attitudes. The research has put forward that using such software in grammar teaching results in a significant difference in academic achievement and attitudes of students. Besides, the findings of Ural's study (2009, p. 46) have shown that using educational computer games prevents students from being bored, worry, and anxious during lessons and provides an enjoyable, peaceful, and motivating learning environment as well. Students participate enthusiastically in the lessons where educational computer games are practiced. The findings have also reported that students in the experimental group desire to practice educational computer games in every lesson.

Kulik (1983) has carried out a meta-analysis comparing with the results of fifty-one studies each other. The findings have indicated that computer-assisted instruction is more effective than traditional education on academic

achievement and attitudes. Randel et al. (1992) have investigated sixty-seven studies concerning educational games on academic achievement, attitude, and persistency of learning. Of the 67 studies, 27 of those have resulted in favor of educational games while 38 of them have concluded that there is no significant difference between traditional education and educational games.

In a study that set out to determine the effects of computer-assisted instruction and traditional education on academic achievement by Kamacı and Durukan (2012), 10%-18% positive results on the behalf of computer-assisted instruction have been obtained. Similarly, investigations on over 200 studies by Bangert-Drowns (1985) have asserted that computer-assisted instruction increases the rate of academic achievement up to 20%. In another meta-analysis regarding 43 experimental studies on the impact of computer-assisted instruction on academic achievement conducted between the years of 2007 and 2017, the results obtained have demonstrated that there is a strong relationship between computer-assisted instruction and academic achievement (Dikmen & Tuncer, 2018).

In Durukan's (2011) research attempting to examine the effect of computer-assisted instruction on academic achievement in Turkish courses, attitudes towards Turkish courses, and persistency of learning, Durukan (2011) has reported that computer-assisted instruction has increased academic achievement of students much more than traditional education. While Buran (2008) proposes that computer-assisted instruction is more effective than currently available curriculum practices in terms of the development of listening skill, Zobar (2011) highlights that computer-assisted instruction is more profound than traditional methods with regard to achievement on reading and writing. While earlier studies on Turkish and grammar teaching have been related to computer-assisted instruction, the current study identifies the impact of computer-assisted educational games on teaching grammar.

#### *1.4 Computer-assisted Instruction*

Computer-assisted instruction is a teaching method in which computers are used in learning environments; in which motivation of students is increased and opportunities of individual learning at one's own pace are available; in which the process of learning is strengthened (Güllüoğlu, 2010, p. 2; Koşar, 2004, p. 124; Uşun, 2004, p. 42). It is a term used to explain an instruction in which computers are regarded as a supplementary and powerful component of the system rather than an option, and an instruction through which tools help making course subjects be presented with certain software in the process of learning. Within that process, other methods and techniques are also practiced together (Akkoyunlu, 1993, p. 41; Durukan, 2011, p. 76; Uşun, 2004, p. 40). One of them is games.

#### *1.5 Games*

A game is defined by the Turkish Language Association as "an entertainment which is skill- and brain-training, has certain rules, makes somebody have a great time" (TDK, 2019). Games are enjoyable activities which exercise influence over both participants and audience through some factors such as skill, luck, intelligent, attention used by groups constituted on a voluntary basis in the frame of certain time, place and rules out of vital activities (Hazar, 1996, p. 7). Games are divided into subheads such as educational games, computer games, and educational computer games.

##### *1.5.1 Computer Games*

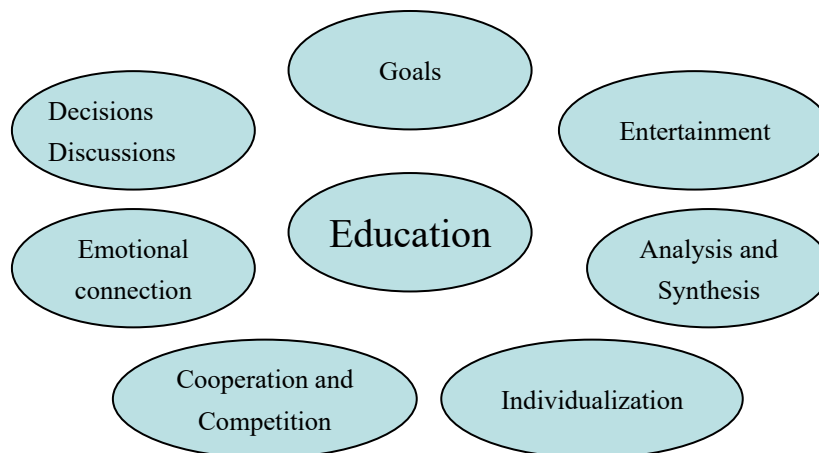
Computer games are entertainment environments where people have lots of fun without feeling obligated to do it, and where there are restricted certain rules in their own right out of the outer world (Garris, Ahlers, and Driskell, 2002, p. 43). They provide people with developing critical skills by establishing a connection with real life (Turvey, 2006). Along with those, they support individual learning by contributing the development of several skills (McFarlane, Sparrowhawk, and Heald, 2002, p. 13). Skills such as problem solving, creativity, and critical thinking are among some examples of promoting personal development skills (Berson & Berson, 2003). In addition, it has been viewed that computer games have a significant role in perception and interpretation of activities, and making decision in critical situations (Odabaşı, 2008, p. 141). Computer games are excellent learning tools. They provide learners with an opportunity of adjusting the level of difficulty of games and playing them again and again (Hostetter, 2002). A number of previous experimental studies have been reported that games have offered successful results even in teaching complex subjects. Interests and desires of gamers could ensure them to be motivated in learning these subjects and to achieve their educational goals (Garris, Ahlers, and Driskell, 2002, p. 441-442).

##### *1.5.2 Educational Games*

Educational games are games developed with the precise aim of education (Üçgül, 2006). They are entertaining activities which are designed so as to increase learners' motivation and provide a qualified and persistent learning; which are competitive; which have limited specific rules; and which require certain skills and creativity (Akıllı, 2007, p. 4). They play a key role in achieving education goals in a shorter time (Köseoğlu, 2012, p. 25). They are also

called as serious games (Yılmaz, 2017). Serious games have stories and win-lose situations as well. They involve in entertainment elements and socialization environments. Their environments and characters are so real-like (Yılmaz, 2017, p. 172; Yılmaz, 2018, p. 28).

Educational games used in education are amusing activities which are suitable for students' age, level, gender, ethical rules, making students have terminal behaviors. Not only do they promote using the time efficiently, but also they provide learning while having fun (Sönmez, 1993, p. 294). Educational games which improve creativity and imagination also help knowledge to be reinforced through individual and group works (Uğurel, 2003, p. 43). According to Gradler (1994, p. 28), educational games are used to apply to or examine essential knowledge and skills, determine imperfections in knowledge and skills, and serve as a summary or review and make a connection between principles and concepts. Prensky (2007, p. 107) suggests seven features that should be included in educational games below:



### 1.5.3 Computer- assisted Educational Games

Computer-assisted educational games have been a trend topic in recent years as a result of the adaptation of computer games into education. They are a kind of game created through adjusting entertaining and motivating computer games in order to increase the quality of education (Ural, 2009, p. 18). They are game-assisted software which facilitates learning course contents (Güngörmüş, 2007, p. 18), and developing problem-solving skills (Demirel, Seferoğlu, & Yağcı, 2003, p. 141). It is one of the most effective methods to achieve course objectives (Akpınar, 1999). Techniques used to draw attention and increase motivation of students can be used as both a supplementary material and a material in itself (Kiili, 2005). It is a learning method based on students' voluntarily participation without any pressure or force (Malta, 2010, p. 37), supporting learning by fun (Taşdemir & Şüyun, 2016, p. 123).

Educational computer games provide opportunities to develop several skills of students by supplying stress-free, flexible learning environments to them (Boyle, 2011, p. 3-4). The opportunity for repetitions ensures to internalization and consistency of knowledge learned (Yılmaz, 2017, p. 162). Not only are they for fun, but also they are for the reinforcement of knowledge. Therefore, they could be drawn on achieving course objectives (Bayırtepe & Tüzün, 2007).

Computer-assisted educational games support multiple intelligences and active learning. While they are helping to make knowledge permanent, they also make learning enjoyable (Uğurel, 2003, p. 42). Educational computer games are applications which have the fastest learning curve. While playing, students are learning as well (Siang & Rao, 2003). The knowledge learned is gripped very fast. They are placed into long-term memory (Taşdemir & Şüyun, 2016, p. 123). They are effective in developing students' skills of psychomotor, visual and reasoning and in increasing their speed of reaction to stimuli (Sardone & Devlin-Scherer, 2009, p. 50).

They are effective in increasing motivation of students, and attracting their attentions and their willingness to learn. Along with learning by doing and experiencing, active participation to learning process is enabled (Şahin, 2016, p. 30). According to Kirriemur and McFarlane (2004), they are practiced to increase motivation by having fun and enhance to learning by doing and experiencing. Linderoth, Lantz-Andersson and Lindström (2002) point out that educational computer games are exercised to teach course subjects, as a motivation source for students, and to improvise real life through simulations.

### 1.6 Design Phase

While games are one of the most effective learning methods during the ages of preschool, it would not be right to say that learning cannot be associated with entertainment in education environments (Ural, 2009, p. 2). However, the fact that a practice is fun does not mean that it is beneficial to development and learning (Yılmaz, 2017, p. 144). For this reason, while designing a practice, its objectives are determined considering which skills among cognitive, affective and psychomotor skills are developed (Seferoğlu, 2006). Important parts and summaries on subjects are presented without too much knowledge. Visuals are proportioned equally (Yanpar & Yıldırım, 1999, p. 27-31). Radoff (2011) indicates that during designing games, in addition to those, some entertainment factors should be included: visual, historical, affective, mathematical themes and environments a gamer are interested in. A well-balanced proportion of educational contents and these entertainment factors are very crucial (Smith & Mann, 2002).

Knowledge, talent and skill instead of chance should be determinant for success in games. It should include no qualities such as a situation in which one of them is winner; the others are losers (Gredler, 2004). Dempsey et al. (Dempsey et al., 2002, p.157-168) address that when gamers have a right to control games; when games have a good quality of screen design; when colors, audios, and animations in games are appropriate and have a well-balanced proportion, the games draw students' attention. In accordance with these principles, course contents and games are designed at the same time in the frame of expert opinions by taking into consideration course objectives (Bates, 2004, p. 80).

In the study, the effect of computer-assisted educational games on teaching grammar has been investigated. To design the software, a program called as "Scratch" has been utilized. Scratch is a programming language which is suitable for every age group, fun, and attracts users' attention to itself with a user-friendly interface. It was designed for people in the 8-16 age group by the MIT (Massachusetts Institute of Technology) in 2003. In time, it has become a programming language which people in every age group could be used. Thanks to its easy and clear interface, it is software created based on dragging code blocks without a need of knowledge of coding (Scratch About, 2015).

Scratch which promotes problem-solving and provides several positive feedbacks is an ideal programming language to be used for educational purposes (Genç & Karakaş, 2012, p. 982-986). It could be applied in several courses by being drawn on animation, visual, music and effects of Scratch (Çatlak, Tekdal, & Baz, 2015). Games designed through this program starts with a demo. Following the demo, the goals and rules of the game are clearly explained. Then, the story and scenario of the game are reflected on the screen. Feedbacks about decisions of the gamer are given to him/her (Korkusuz & Karamete, 2013, p. 89). Earlier studies shows that Scratch has had a positive effect on achievement and motivation of students (Sanjanaashree, Kumar, & Soman, 2014; Ching-San & Ming-Horng, 2012).

## 2. Method

### 2.1 Research Design

In the study, a quasi-experimental design based on a quantitative study with a pretest-posttest nonequivalent group was applied. According to Büyüköztürk (2016, p. 205), "When a design provides an opportunity of finding out the beginning point of groups related to the measured quality, and therefore measuring and testing any change, this increases its usefulness. The focus of that kind of design is often to test to the extent to which the change observed in one group is different from the change observed in another group."

### 2.2 Participants

Participants of the study consist of two groups with six-grade students at the same level studying at a middle school in Kocaeli, Turkey. Each group includes 35 participants. The fact that the school has a good quality of technological infrastructure and that students at the school have a tablet have been a key factor to determine the participants.

**Table 1.** Characteristics of the Participants

	Control Group (35)		Experimental Group (35)		
	<i>F</i>	%	<i>f</i>	%	
Gender	Female	16	45.71	20	57.14
	Male	19	54.26	15	42.86

### 2.3 Data Collection Instruments

The Turkish Course Attitude Scale, which is reliable and valid, developed by Ünal and Köse (2014) as a scale of attitude toward Turkish course, and the Grammar Attitude Scale developed by Pehlivan, Aydın and Uyumaz (2018) as a scale of attitude toward grammar were conducted. As a grammar academic achievement test, Durukan's (2011) Grammar Achievement Test was applied.

The reliability analysis demonstrated that the value for Cronbach Alpha of the Grammar Achievement Test was found as 0.837. The average difficulty index (p) of the Grammar Achievement Test was measured as 0.56 while the average discrimination index (r) was measured as 0.42. The value for Cronbach Alpha of the Turkish Course Attitude Scale was found as 0.914. In addition, the Grammar Attitude Scale's Cronbach Alpha value was calculated as 0.887.

### 2.4 Data Collection Process

The study was conducted in two phases. While, in the first phase, computer-assisted educational games and practices to use in a computer-assisted learning environment were developed, in the second phase, whether or not these developed materials in the first phase were effective were investigated. To decide the software for the course to use in the practice part of the study, writing systems were investigated and the program of Scratch was found to be suitable for the study. It was determined that parts of speech which was consistent with the objectives in the 6<sup>th</sup> grade Turkish Teaching Program based on the Ministry of National Education were supposed to be taught through the program of Scratch in company with the computer-assisted games and practices. The reason why this subject was chosen has been that the practice time of the study coincided the time when the subject selected was supposed to be taught in the curriculum.

- *Pre-Practice:* The computer-assisted educational games were designed in the frame of previous studies and expert opinions. Feedbacks from informatics teachers, Turkish teachers, and academicians about the current practices were also gotten. With reference to the feedbacks, the games and the practices were revised. They were implemented to 7<sup>th</sup> grade students studying at the same school during Turkish courses. Feedbacks from the students were gotten in both a written form and a spoken form. Accordingly, some slight changes were made. A plan for 12 weeks to teach grammar based on the curriculum was organized. In the plan, which subjects would be taught, how and how long they would be taught, which methods, techniques and applications would be used were listed. The Grammar Achievement Test, the Turkish Course Attitude Scale, and the Grammar Attitude Scale were applied as a pretest, data were collected from the students, and then the appropriateness of the method was confirmed by comparing the data from the experimental group with the data from the control group.

- *During-Practice:* Within the frame of the plans, each lesson started with presenting videos, animations or various visuals and therefore students' attentions were attracted to the lesson, then some questions about the contents of the practices were asked to the students. These questions included some statements which aimed to make the students be aware of and discover the rules of grammar. Texts in the course book were presented on a smart board and words related to the subject were underlined. Thus, the students had an opinion about the use of those words. Through presentations of some examples and different uses of those words on digital education platforms, the students had an opportunity to find out their definitions on their own. The students who discovered the rules of grammar through implicit learning practiced the subject by using available educational applications on the smart board. Games were played on the smart board and the students' tablets. The students were divided into groups of 5 or 6. Each group had a symbolic name and a symbolic visual. Groups were changed according to the order of the list per week. Hence, students with different levels could be worked in the same group. The students prioritized the group success within cooperation rather than the success of an individual and as a result, they developed their skills such as sharing and helping with each other. They listened to different ideas, criticized them, and stated whether they agree or disagree with. This also enabled peer teaching among the students. During playing the games, these group works were often administered. The students discussed and made a decision with their group members, then the decisions were written on a cardboard and explained to the rest of the class. As to tablets, the educational games were played individually via them. After the games played as a group work, feedbacks were given to each student, and therefore all of them were able to feel as a winner rather than feel as if while one of them was the winner, the rest of them were the losers. The necessary applications were set up in the tablet of each student and ensured that they made repetitions at home. The computer-assisted educational games were applied both in the phase of practice and in the evaluation of what was learned. It took two course hours a week during 12 weeks.

- *Post-Practice:* Posttests were conducted to determine whether the students show a difference in their academic achievement, attitudes toward Turkish course and grammar at the end of the 12-week period.

### 3. Results

#### 3.1 Statistics and Data Analysis

Before data analysis, the negatively worded items in the Turkish Course Attitude Scale and the Grammar Attitude Scale were reverse-coded. Then, missing values and outliers were examined and after all, none of them was found in the analysis. To measure the reliability of the items' scores in the scales, the Cronbach Alpha internal consistency coefficients were estimated. The estimated Cronbach Alpha coefficients were calculated as 0.923 in the pretest of the Turkish Course Attitude Scale course and measured as 0.929 in the posttest of the Turkish Course Attitude Scale while it was found as 0.887 in the pretest of the Grammar Attitude Scale and calculated as 0.887 in the posttest of the Grammar Attitude Scale. It has showed that the scores obtained from the scales are highly reliable (Özdamar, 2004). The normality of the data was tested and has been presented in Table 2.

**Table 2.** Test of Normality

	Group	Shapiro-Wilk		
		SW	Sd	p
Grammar Achievement Pretest	Experimental	.969	35	.422
	Control	.978	35	.686
Grammar Achievement Posttest	Experimental	.935	35	.039
	Control	.974	35	.574
Grammar Attitude Pretest	Experimental	.952	35	.133
	Control	.981	35	.795
Grammar Attitude Posttest	Experimental	.987	35	.943
	Control	.968	35	.384
Turkish Course Attitude Pretest	Experimental	.907	35	.006
	Control	.948	35	.101
Turkish Course Attitude Posttest	Experimental	.956	35	.176
	Control	.930	35	.027

It is apparent from Table 2 that the scores of the grammar achievement posttest and the Turkish course attitude pretest and posttest were normally not distributed. Besides, the lower limit of using non-parametric tests for the number of observation/participant in groups is 30 (Delice, 2010 as cited in Ross, 2004; Sümbüloğlu & Sümbüloğlu, 1993). The number of the participants in the subgroups is very close to the lower limit. Due to the fact that normality distribution in small sample sizes is generally incidental, the Mann Whitney U test and the Wilcoxon signed-rank test were conducted to find out an answer to the sub-problems. In order to determine the correlation between two continuous variables, the Spearman Brown formula was calculated.

Findings about the sub-problems are explained below.

Is there a statistically significant difference in the results of the pretests of grammar achievement, attitudes toward grammar and attitudes toward Turkish course of the students in the experimental group and the control group? The results of the Mann Whitney U test conducted to answer this question are presented in Table 3.

As shown in Table 3 that before applying the computer-assisted educational games, there is no statistically significant difference in the scores of grammar achievement pretest ( $U=579.000$ ,  $p>0.05$ ), grammar attitude pretest ( $U=461.500$ ,  $p>0.05$ ), and Turkish course attitude pretest ( $U=607.000$ ,  $p>0.05$ ) of the students between the experimental group and the control group. The second sub-problem of the study asks whether there is a statistically significant difference in the scores of the posttests of grammar achievement, attitudes toward grammar and attitudes toward Turkish course of the students between the experimental group and the control group. The results of the Mann Whitney U test applied to find out an answer to this question are summarized in Table 4.



**Table 3.** Differences in the Results of the Pretests between the Experimental Group and the Control Group

	Group	N	Mean Rank	Sum of Ranks	U	p
Grammar Achievement Pretest	Experimental	35	34.54	1209.00	579.000	.691
	Control	35	36.46	1276.00		
	Total	70				
Grammar Attitude Pretest	Experimental	35	31.19	1091.50	461.500	.076
	Control	35	39.81	1393.50		
	Total	70				
Turkish Course Attitude Pretest	Experimental	35	35.66	1248.00	607.000	.948
	Control	35	35.34	1237.00		
	Total	70				

**Table 4.** Differences in the Results of the Posttests between the Experimental Group and the Control Group

	Group	N	Mean Rank	Sum of Ranks	U	p
Grammar Achievement Posttest	Experimental	35	42.64	1492.50	362.500	.003
	Control	35	28.36	992.50		
	Total	70				
Grammar Attitude Posttest	Experimental	35	45.93	1607.50	247.500	.000
	Control	35	25.07	877.50		
	Total	70				
Turkish Course Attitude Posttest	Experimental	35	43.44	1520.50	334.500	.001
	Control	35	27.56	964.50		
	Total	70				

Table 4 illustrates that there is a statistically significant difference in the scores of grammar achievement posttest ( $U=362.500$ ,  $p<0.05$ ), grammar attitude posttest ( $U=247.500$ ,  $p<0.05$ ) and Turkish course attitude posttest ( $U=334.500$ ,  $p<0.05$ ) of the students between the experimental group and the control group after the practices of the computer-assisted educational games. It shows that the difference is in the favor of the experimental group. In other words, the posttest scores of grammar achievement, Turkish course attitudes and grammar attitudes of the students in the experimental group are higher than the posttest scores of students in the control group. Along with that there is a significant difference in the scores of the pretest and the posttest of grammar achievement of the students in the control group, the practices of the computer-assisted educational games have resulted in that grammar achievement of the students in the experimental group is statistically and significantly more higher than the control group's grammar achievement.

The third sub-problem of the study has investigated whether there is a significant relationship in the pretest and posttest scores of grammar attitudes and Turkish course attitudes of the students between the experimental group and control group. The Spearman Correlation Coefficients calculated in order to answer this question are illustrated in Table 5 below.

**Table 5.** Relationship in the Pretest-posttest of Grammar Attitude and Turkish Course Attitude between the Experimental Group and the Control Group

Group		r	p
Experimental	Grammar Attitude Pretest- Turkish Course Attitude Pretest	0.615	0.000
	Grammar Attitude Posttest- Turkish Course Attitude Posttest	0.681	0.000
Control	Grammar Attitude Pretest- Turkish Course Attitude Pretest	0.379	0.025
	Grammar Attitude Posttest- Turkish Course Attitude Posttest	0.689	0.000

N=35

Table 5 shows that there is a positive, moderate and statistically significant relationship between the scores of grammar attitude pretest and Turkish course attitude pretest of the students in the experimental group ( $r=0.615$ ,  $p<0.05$ ). Accordingly, it can be deduced that the increase in the scores of grammar attitude pretest of the students will lead to a moderate and statistically significant increase in the scores of Turkish course attitude pretest of the students. Also, it has been found out that there is a positive, moderate and statistically significant relationship between the scores of grammar attitude pretest and Turkish course attitude pretest of the students in the control group ( $r=0.379$ ,  $p<0.05$ ). This could be explained that the increase in the scores of the grammar attitude pretest of the students in the control group will result in a low level and statistically significant increase in the scores of Turkish course attitude posttest of the students in the control group.

As can be seen in Table 5, it has been brought to conclusion that there is a positive, moderate and statistically significant relationship between the scores of grammar attitude posttest and Turkish course attitude posttest of the students in the experimental group ( $r=0.681$ ,  $p<0.05$ ). This could be summarized that the increase in the scores of grammar attitude posttest of the students in the experimental group will cause a moderate and statistically significant increase in the scores of Turkish course attitude posttest. Also, it has been found out that there is a positive, moderate and statistically significant relationship between the scores of grammar attitude posttest and Turkish course attitude posttest of the students in the control group ( $r=0.689$ ,  $p<0.05$ ). In other words, the increase in the scores of grammar attitude posttest of the students in the control group will cause a moderate level and statistically significant increase in the scores of Turkish course attitude posttest of the students in the control group.

#### 4. Discussion

In the favor of the experimental group, a significant difference in grammar academic achievement between the experimental group in which the computer-assisted educational games were practiced and the control group in which current practices in the curriculum were applied has been observed. It has been concluded that computer-assisted educational games are more effective in increasing grammar academic achievement. Also, it has been found that a significant difference has been observed in the scores of the pretest and the posttest of grammar achievement of the students in the control group. It can be reported that adopting the constructivist approach in the control group as well could lead to this significant difference.

Similar results have been obtained from earlier studies related to language teaching. In the study of Durukan (2011) in which the effect of computer-assisted instruction on students' academic achievement of Turkish course has been investigated; in the research of Buran (2008) in which the impact of computer-assisted education on listening skill has been examined, and in the study of Zobar (2011) in which the success of computer-assisted instruction on reading and writing has been analyzed, it has been reported that computer-assisted instruction is more effective than traditional methods. Similar results have been detected in previous studies from different fields:

In the field of teaching mathematics, the impact of (a) educational computer games (Tural, 2005; Öztürk, 2007); (b) computer-assisted instruction (Uygun, 2008; Bayturan, 2011); (c) computer games (Kebritchi, Hirumi, & Bai, 2010); and (d) computer-assisted applications (Ragasa, 2008) on academic achievement;

In the field of teaching science, the effect of (a) educational games (Şaşmaz, Ören, & Avcı, 2004); (b) computer-assisted instruction with the constructivist software in biology class (Pektaş, 2008); (c) computer-assisted instruction in biology course (Kara, 2009); (d) computer-assisted instruction in physics course (Ergörün, 2010); (e) computer-assisted instruction in science and technology course (Güven & Sülün, 2012) on academic achievement;

In the field of teaching English, the effect of (a) educational games (Taşlı, 2003); (b) computer-assisted educational

games in teaching English grammar (Shagga & Omar, 2012); (c) computer-assisted instruction in teaching English grammar (Naba'h, Hussain, Al-Omari, & Shdeifat, 2009); (d) educational computer games in English teaching (Donmuş, 2012) on academic achievement;

In the field of informatics, the impact of (a) web-based educational games (Güngörmüş, 2007); (b) digital games-based learning (Papestrergiou, 2009); (c) ClassDojo learning environment (Özer, 2016) on academic achievement;

In the teaching of social sciences, the impact of educational computer games (Polat & Varol, 2012) on academic achievement have been investigated and resulted in a significant difference in favor of the experimental group.

There are also other published studies which do not support the findings of the current study. Kula and Erdem (2005) found no significant difference in the effect of educational computer games on achievement of mathematics in their study. Bayırtepe and Tüzün (2007) examined the impact of game-based learning environments on computer course achievement and no significant difference between the experimental group and the control group was obtained. Yiğit (2007) inquired the effect of computer-assisted educational games on achievement of mathematics of students and obtained no significant difference between the groups. Yağız (2007) examined the impact of game-based learning on computer-assisted instruction and no significant difference was detected between the experimental group and the control group.

In the favor of the experimental group, a significant difference between the experimental group in which the computer-assisted educational games were practiced and the control group in which current practices in the curriculum were applied in terms of attitudes toward grammar and Turkish course has been observed. No significant difference in the results of the pretest and posttest of the attitudes of the control group was found. Appearance of some characters fed by traditional culture (e.g. Keloğlan, Nasrettin Hoca, Evliya Çelebi, Hezarfen, Dede Korkut) in games has affected significantly increasing the attitudes of students in the experimental group.

Similar results have been observed in the studies of Durukan (2011) and Zobar (2011). However, there are some studies which have been unable to demonstrate the results of the current study. It was concluded that there was no significant difference (a) in the effect of computer-assisted instruction with an constructivist approach on attitudes toward biology course (Pektaş, 2008); (b) in the impact of the computer-assisted instruction on attitudes toward mathematics course (Uygun, 2008; Bayturan, 2011; Ragasa, 2008); (c) in the effect of the computer-assisted education as a method on attitudes toward biology course (Kara, 2009); (d) in the effect of the computer-assisted instruction on attitudes toward to science course (Güven & Sülün, 2012) between the experimental group and the control group.

In the studies mentioned above which have demonstrated different results from the current study, the reason why the attitudes did not show a positive change could be based on the duration of the practices and the quality of the software used. Also, the fact that earlier studies have not been conducted long enough to be able to change the attitudes positively, the fact that the software has not included entertaining elements and it has not been appropriate to the ages and levels of students, that the computer-assisted instruction has been used only as a knowledge transmitter can be among the causes of these results.

As a conclusion, according to the results of the pretests and the posttests obtained from the experimental group in which the computer-assisted educational games were practiced and the control group in which current subjects in the curriculum were followed, there is a positive, moderate, statistically significant relationship between the attitudes toward grammar and the attitudes toward Turkish course. The attitudes toward grammar determine the attitudes toward the Turkish course of students.

## 5. Conclusion

As a result of this experimental study, the experimental group in which the computer-assisted educational games were practiced showed an increase in grammar academic achievement in attitudes toward Turkish course and grammar comparing to the control group. Besides, the increase in adopting attitudes toward grammar positively influenced the increase in adopting attitudes Turkish course. It was revealed that the approaches and methods used in grammar teaching had also an influence over shaping attitudes toward the language.

Although the traditional methods practiced in the control group helped to enhance the success, it did not reach the level of success which the computer-assisted educational games reached. Furthermore, it was detected that the computer-assisted educational games had a significant role in improving learning together with attitude. As a conclusion, in the light of the findings and discussions, it was found out that “Computer-assisted Educational Games”

is a must to provide with teaching of language skills and grammar in educational environments where technological developments and correspondingly digitalization are widely practiced.

## 6. Recommendations

As regards to the present study, recommendations for future research are listed as below:

1. The number and types of computer-assisted educational games can be increased. Games which are under the level of students could be boring for them. For this reason, for educational games which will be practiced in the classrooms, software support from experts may be desired. While designing educational games, feelings and opinions of students might be obtained via questionnaires. Especially educational games that are similar to current popular games could draw students' attention much more.
2. Designing or selecting computer-assisted educational games, it should be attentive to balance the proportion of entertainment and educational elements. Not to have that balance makes the achievement of the objectives difficult. In the phase of designing, while taking into consideration students' levels and developmental features, adopting a sexist approach should be avoided. Games should also provide an opportunity to practice what students know and evaluate what they have learned beyond knowledge transferring.
3. Teaching grammar should be practiced through an understanding based on implicit learning and emphasizing learning by discovery. Practices for skill development such as computer-assisted educational games designed for that purpose should be more used in the classroom. Seminars should be given to pre-service teachers who still study at a university and in-service teachers who work at schools for that purpose.

## Note

This article is based on one part of M.A. thesis of the first author.

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