Effects of Educational Video Games on English Vocabulary Learning and Retention

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Article Info	Abstract
	This study aims to integrate video games into classrooms not as a replacement for regular lessons but as supplementary materials under the teacher's supervision. To this extent, the researcher created an educational English learning video game specifically modeled on the students' real lives. Ninety-six middle school students, 48 in the control group and 48 in the experimental group, participated in the study. While follow-up activities were used in the control group and the regular classroom teaching, students in the experimental group played the educational game under the teacher's supervision with no follow-up activities. Pre, post, and retention achievement tests were applied to the students. Semi-structured interviews were also conducted with 18 students from the experimental group. The results showed that the experimental group's vocabulary learning and retention were significantly higher than the control group. Also, the views of the students on English lessons and games based on their lives were promising. By considering the achievement test and students' views on the game developed, it can be said that the game in the study includes educational features as well as the basic features of the games.

Introduction

Frequent use of games in educational settings helps game-based learning emerges as a recognized field of study (Hung et al., 2018). The studies on educational games are increasing rapidly but, there is no universal theoretical framework accepted regarding the use of computer games in educational settings. Similarly, even though it can be seen in the literature that educational games are used in language learning, many researchers emphasize that the number of studies conducted is not sufficient (Acquah & Katz, 2020; Hung et al., 2018; Whittle, 2016).

Genres of Video Games Used in Language Learning

To play video games, the players occasionally need to use the target language at a moderate level in the first place or straighten out the meaning of the game on their own (Dehaan, 2005). Therefore, video games might contribute to language education, even if they are not used for this purpose. Different genres of video games are used in language education according to the students' cognitive levels, language skills levels, environmental features, accessibility of the games, the platform used, expectations from the students, and various educational

environments. For example, after performing an extensive literature review, Hung et al. (2018) listed the genres of language learning video games as immersive games (games that players assume a role and avatar to interact with the game world), tutorial games (games that are improving learning), exergames (games that integrate motion into itself), simulation games (games to simulate real-life), adventure games (games that attract players with a rich story), music games (mainly based on music elements), board games (games that require a board and pieces), and alternative reality games (games that are offering virtual worlds via special equipment). Yet, a different literature review study on language learning, conducted by Acquah and Katz (2020), classified the genres as strategy, simulation, adventure, role-play, educational, and mini-games.

Educational Games in Language Teaching

Regardless of their genre, video games have the potential to contribute positively to the language learning process. For example, playing computer games enhances the students' cognitive skills (Gnambs & Appel, 2016). Additionally, some studies show playing educational computer games in language learning has positive effects on learners. For instance, vocabulary learning in students who play games is higher than the ones who are subjected to traditional teaching methods such as directing students to learn through memorization and recitation techniques (AlShaiji, 2015; Ashraf et al., 2014; Smith et al., 2013; Yip & Kwan, 2006). Besides, these games provide higher retention rates of vocabulary than the traditional teaching methods (Aghlara & Tamjid, 2011; Franciosi et al., 2016; Smith et al., 2013). Borgonovi (2016) found in his research covering 26 countries that computer games also had positive effects on reading skills. Cornillie et al. (2012) emphasized that computer games providing feedback for students keep them highly motivated, which makes it quite promising to use these games in language teaching. Hung et al. (2018) reviewed the literature on the acquisition of educational games in language learning. They identified six potential categories of language learning from the most frequently reported to the least: emotional/psychological states, language acquisition, participatory behaviors, correlational results, knowledge acquisition, and contemporary competencies.

Role-playing Games (RPGs)

While discussing the possible benefits and losses of video games, there is a tendency to make some common generalizations about some specific game genres, such as the notion that violent games could increase players' aggressiveness (Gonzalez & Greitemeyer, 2018; Greitemeyer, 2018). Or, puzzle games could be used to enhance gamers' creativity (Crombie et al., 2016; Karsenti & Bugmann, 2018). Different classifications are made while defining video game genres, but due to the complex nature of the classification process, it is almost impossible to reach a consensus on emerging classifications. The process involves various challenges, such as identifying exactly what elements constitute a genre, overlapping genres, and continuous evolution of genres (Clarke et al., 2017; Wolf, 2005). Wolf (2005) argued that classifying computer games was a complicated process; yet, classifying them by interaction forms effectively eliminated many sorting problems in the literature. He mentioned more than 40 genres of computer games. Among those, for example, he defined role-playing games (RPG) as to where the players put themselves in place of a character and even have their personality. The players could

determine the type, race, gender, or profession of these characters according to their wishes. Even abilities such as power, agility, and speed could appear as distinctive features in these games (Clarke et al., 2017; Wolf, 2005).

RPGs in Language Learning

Squire and Jenkins (2003) emphasized that when playing an RPG, students not only learn something but also take part in the game setting. Also, because all students would have a different experience, they would bring the topics that are important to them to after-game discussions, enabling them to deliberate on different perspectives in the process. For example, Hwang et al. (2017) tried to find the effect of anxiety on English language learning and the effect of computer games on anxiety. They stated that RPGs positively impact English language learning, and playing those games reduces the students' anxiety on their listening performance. In another study, after playing a Massively Multiplayer Online RPG in Korea, the experimental group achieved more success in four skills (reading, writing, listening, speaking) than the control group (Suh et al., 2010). Similarly, Betz (1995) found that introducing the target information in an RPG called Sims increased the motivation of the students and thus, had a positive impact on learning. Likewise, Miller and Hegelheimer (2006) found that RPGs increased success in learning vocabulary in a foreign language. Similarly, Rahman and Angraeni (2020) found that RPGs had a significant effect on mastering vocabulary. Correspondingly, Whittle (2016) conducted a study using a commercial RPG on language learning requiring students to complete some duties and take exams. He asserted that students significantly grasped the concepts better and got higher grades. Last but not least, Cornillie et al. (2011) mentioned that vocabulary acquisition while playing RPGs was incidental.

Theoretical Framework

Marscik (2001) identified incidental learning as "a byproduct of some other activity" (p.25), and it occurs almost always, but people are not always aware of this. Hucking (1999) stated that computer-aided instructions created new opportunities to use texts in incidental vocabulary teaching. Through RPGs, incidental vocabulary acquisition occurs when players are constantly exposed to the target language through visuals, texts, and audio. Ramos (2015) stated that L2 learners get much of their vocabulary incidentally when they encounter those words in informative contexts. He also suggested that technology-based methods for incidental vocabulary acquisition should be investigated for future research.

Clark and Mayer (2013) recommended using words (written on the screen people read) and graphics (static drawings such as drawings, charts, graphs, maps, or photographs, and dynamic graphics such as animation or video) in e-learning lessons instead of just words. Accordingly, such dual presentations can encourage learners to participate in active learning by mentally relating the material to words and pictures and connecting pictorial and verbal representations. Students can learn more efficiently by associating new information with concepts in memory through meaningful visual images (Oxford & Crookall, 1990). Moreover, Oxford and Crookall (1990) emphasized that the pictorial-verbal combination activates many parts of the brain, increasing cognitive capacity for learning. Shahrokni (2009) used three different versions of the same text to investigate the differences between texts, pictures, and a combination of text and pictures while teaching vocabulary. He found out that the

combination of texts and pictures enabled students to experience more incidental vocabulary learning. Similarly, Chun and Plass (1996) tried to analyze the different ways of teaching vocabulary, and they compared texts, texts and pictures, and videos. They concluded a more significant achievement in the text and picture combination compared with the other two.

Lohman (1996) defined spatial intelligence as "the ability to generate, retain, retrieve, and transform well-structured visual images" (p.3). According to Widyasari (2018), using spatial-visual intelligence while teaching vocabulary is useful for autonomous learning and retaining those vocabulary items much longer. Kost (1999), and Kim (2006) discovered that a combination of texts and visuals has a greater impact on vocabulary acquisition and retention than using those two methods individually. In his dual coding theory, Paivio (1990) stated that the human mind is specialized to deal with language and nonverbal objects simultaneously, and representational theories must accord with this duality. In other words, the human mind is accustomed to associate language, which is an abstract concept with tangible objects such as texts, pictures, etc. And the studies must accord with this duality. Oxford and Crookall (1990) analyzed various vocabulary teaching techniques and stated that only giving the words' definitions in paired lists is not useful. In addition, they emphasized that flashcards (the cards with words and visual representations of those words) can be used to provide greater context if they are used in creative ways. Visual imagery, a method similar to flashcards, is a very useful technique in L2 learning. This technique is based on making associations between pictures and words as most learners have the ability to associate new information with visual images in their minds. Goleman (1986) stated that about 94% of humans are at least intermediately good at using visual imagery.

Significance of the Study

It is stated in the literature that a lot of progress has been made in the use of video games as educational tools (e.g., Echeverría et al., 2011), many studies revealing the positive contribution of video games in language learning. For example, in their study, Smith et al. (2013) and Rahman and Angraeni (2020) revealed that video games positively affected learning English vocabulary. However, those games have not yet been successfully integrated into the classroom environment. In subsequent studies, Smith et al. (2013) and Whittle (2016) emphasized that isolating the factors that affect the results of educational video games can show the effects of the factors. In the literature, it could be seen that educational games were introduced to the students as a replacement for traditional lessons (e.g., Kebritchi, 2010). To this extent, the experimental group was first introduced to the same topics as the control group and then was asked to play the game as supplementary material. Meanwhile, the control group practiced with traditional follow-up activities. Thus, the total amount of time spent was the same in both groups. With this approach, it was aimed to measure only the game's effect on success without including the total time spent.

Researchers tend to use uniquely created games to more flexibly align game goals with their own learning goals. However, developing both challenging and entertaining games is a complex and difficult process, including educational and basic features that researchers seek to have (Charsky, 2010; Hung et al., 2018; Padilla-Zea et al., 2015). Also, Cornillie et al. (2011) stated that commercial games generally lack instructive qualities as they want

their games to be clearly understood by players. In this study, however, the researcher developed the game under the guidance of language learning and instructional technology experts to ensure that the game is suitable for the learning goals and the target audience. Additionally, the game was developed modeled on the students' immediate environment to accelerate the adapting process to avoid getting familiar with the game map. It was also aimed that the students identify with their characters in the game because it is how RPGs work. Besides, Cornillie et al. (2011) suggested that for future studies, whether having the option of requesting lexical help during the game without interrupting leads to more vocabulary learning or not could be investigated. The target vocabulary was always comprehensible in this research as they all had their visual representations below them.

This study aimed to investigate the effect of the video games, which were developed modeled on students' immediate environment and applied under the teacher's supervision, on the learning and the retention of vocabulary and the students' opinions.

Method

Research Design

This study aimed to investigate the effect of Educational Video Games on foreign language learning. Furthermore, it was planned to analyze the views of the students on Educational Video Games. Therefore, mixed methodology (Teddlie & Tashakkori, 2009) was chosen to investigate all factors thoroughly. It also used the general logic of a quasi-experimental design (Lodico et al., 2010). Since the classroom groups were formed before the study started, they were randomly assigned to the experimental and control groups.

Participants

The study sample consists of 96 students studying at a public secondary school in the sixth and seventh grades. The age of students ranged from 11 to 13. One classroom from the sixth and seventh grades was randomly selected and identified as the control and experimental groups. Thus, there were two classes, one in the sixth and the seventh in the control and experimental groups.

Application

At the beginning of the implementation, students were informed that they would participate in an educational experiment. It was stated to the students that this experiment would not affect their grades at school. After the explanation, the students were given the achievement test developed by the researcher. The students were expected to complete the test in 15 minutes.

After the achievement test, the control group was taught the target vocabulary items present within the game through traditional teaching methods, four lessons a week for four weeks. Those traditional teaching methods included translation of the target vocabulary items, showing off the vocabulary items with pictures, fill-in-the-blank activities, multiple choice quizzes, matching the images with the vocabulary items, sentence translation,

sentence formation, and ordering of the sentences. At the same time, the same vocabulary was taught to the experimental group for two lessons a week for four weeks with the same traditional teaching methods as in the control group. The experimental group also played the game on their computers two lessons per week for four weeks under the teacher's supervision. Thus, the sum of the lesson hours of the two groups remained the same. During the implementation stage in the experimental group, the discerning factor was that they played the game under the teacher's supervision. The teacher introduced the game on a smartboard by guiding the students and ensuring the recycling of the vocabulary items by referencing the content taught before. At the same time, students were allowed to use their dictionaries and help each other facilitate cooperative learning by helping their classmates during the completion of the game's quests. Students in the experimental group could play the game only on school computers. They were not allowed to take the game out of school property. At the end of the implementation, an achievement test was applied to both groups. Based on the test results, a total of 18 students were interviewed, who were randomly selected from the successful, average, and low-performance sub-groups in the experimental groups. Interviews were recorded and transcribed for the analysis. One month after the post-test, the retention test (the same test used in the achievement) was applied to both groups.

The Game

Development of the Game

The researcher developed the game by using the RPG Maker game engine. The map on which the game is played was created based on a small town where the students live so that a familiar and exciting environment could be created for them (see Figure 1). Once the map was developed, the characters that were also based on the students' real-life teachers were created, as well.

Figure 1. Map Creation

According to the game's story, the student needed to go to school and complete all the quests given by their school teachers to enter the game center downtown. All those quests required students to go places in the town and use some skills while doing so. That way, students were unconsciously exposed to more than 100 popping name tags (See Figure 2) of the objects scattered around the city. Through this process, the students were expected to

memorize the names of the objects without even knowing them. The main reason for this was to prevent students from realizing that they were still in a lesson so that the balance between entertainment and education remained intact (Prensky, 2001). Support was received from an instructional technologist and an academician working on educational games during all stages of the game's development process.
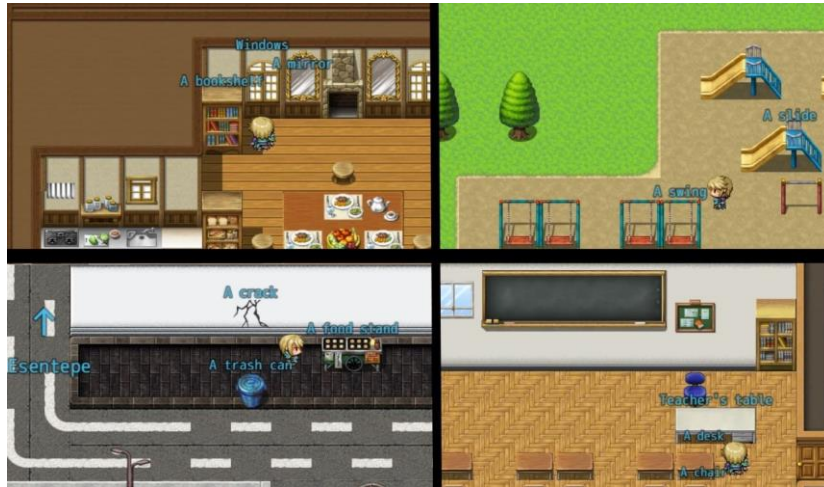

Figure 2. Popping Name Tags

Game Characteristic

The game was an open-world RPG with no restrictions at the beginning. The game opened with players in their homes, and they were free to go wherever they wanted. There was no map, no guidance, no explanation at all. The players were required to explore all things in the game by themselves. Because they spent more time around the map, they needed some help from outside to proceed. With this approach, it was expected from the students to be exposed to more popping name tags, which would only become visible if the player approached the objects. There was no order to complete the quests. After completing the quests, the students were free to enter the game center. Having reached the end, the students were also given a riddle as an endgame contented to enhance the replayability feature of the game. For those who wanted to complete more quests, there was a hidden path leading to a teacher. However, they could still walk around the town and play the mini-games to score more golds.

Instruments

Achievement Test

The researcher developed the achievement test consisting of 25 multiple choice questions derived from over 100 in-game words and was expected to be completed in a lesson hour. The test was discussed with other English teachers, presented to experts in English language teaching, and brought in its final state. Having reached an agreement, the test was applied to a group that was not in the study sample. According to KR-20 test scores, the internal consistency coefficient of the pre-test is found to be .70. The test consists of 25 multiple-choice questions.

There are singular or multiple objects for each question, and the students are expected to choose the correct option according to the pictures given.

Interview Questions

To conduct interviews, the questions on the research topic were written using brainstorming methods. First, drafted questions were divided into categories according to the fields for which it was intended to gather information. Three categories emerged: the lessons during which the students played the game, the content of the game, and the students' suggestions about the future lessons. Next, two academicians examined the drafted questions; one was an expert in language education, while the other was an expert in educational games. In the light of their opinions, the questions were divided into categories that intended to obtain information about the specific stages of the application. Thus, the first version of the questions was created. Afterward, the questions were applied to the students who were not going to take part in the research, and the issue of whether there were any incomprehensible questions or not was cleared. In light of the feedback from those students, the incomprehensible questions were edited, and the final version of the questions was created with the guidance of experts.

During the interviews, the students were first asked questions about the lesson they were playing in a video game. One of the questions about the lesson was, "What do you want to say about the lessons in which you have played the game?" Later, students were asked questions to get their views on the game they were playing. For example, one of the questions about the game was, "Did you cooperate with your friends? If so, about what?" Lastly, questions about the game and the lesson were asked to get the students' suggestions about the process. One of the questions asked to get students' suggestions was, "Do you want to play the game or any games similar to this again? If so, why?"

Data Analysis

Quantitative Data Analysis

For quantitative data analysis, descriptive statistics were calculated, an independent t-test was used to compare the students' pre-test scores, and Mann Whitney U test was used to compare post-test and retention test scores with a significance level of 0.05.

Qualitative Data Analysis

For the qualitative data analysis, 18 students, who were selected from the poor, average, and high achievement groups according to the post-test results, were interviewed. In addition, six students were randomly chosen from each of these three groups. For the interview, semi-structured questions were used.

After the interview, the recorded speech was transcribed by the researchers. Then, the data were analyzed with open coding (Yin, 2011). To do that, both researchers read the transcriptions several times, and tentative labels

started to emerge. Across each emerged label, keywords derived from the students' answers were written. The relationships between the labels were analyzed in the next step, and related ones were grouped with axial coding (Scott & Medaugh, 2017). With the consensus of the two researchers on grouped labels, the core labels were selected among the broader groups, and the researchers validated the relationship between them and the selected groups.

Results

Comparison of the Pre-test Scores

KR-20 test scores showed that the internal consistency coefficient of the pre-test is .700. Shapiro-Wilk test showed that for control group p=.067>α and for experimental group p=.219>α. Therefore, scores were distributed normally. Levene test showed that p=.868>α. Therefore, equal variances are assumed. Table 1 shows the mean scores and standard deviations of the pre-test scores of both groups. As indicated in the t-test, there was no significant difference between the pre-test scores of both groups (t=1.250, p>α). Therefore, the mean pre-test scores of the experimental group (Mean =14.729) and the mean pre-test scores of the control group (Mean=13.729) were accepted as equal.

Table 1. Independent T-Test Analysis of Pre-Test Scores

Group	N	Mean	sd	t	df	p
Control	48	13.729	3.917	1.250	94	.214
Experimental	48	14.729	3.917			

Comparison of the Post-test Scores

KR-20 test scores showed that the internal consistency coefficient of the pre-test was .868. However, the Shapiro-Wilk test showed that for the control group p=.346>α and for the experimental group p=.000<α. Therefore, scores of the experimental group were not distributed normally. Table 2 shows the median scores and standard deviations of the pre-test scores of both groups. As indicated in the Mann-Whitney U analysis, the post-test success of the experimental group (Median=24) was higher than the post-test success of the control group (Median=17) (U=1965, z= 6.002, p=.000<α).

Table 2. Mann-Whitney U Analysis of Post-Test Scores

Group	X	N	sd	Median	U	z	p
Control	16.625	48	4.261	17.000	1965	6.002	.000
Experimental	22.271	48	3.797	24.000			
Total	19.448	96	4.916	20.000			

Comparison of the Retention Test Scores

KR-20 test scores showed that the internal consistency coefficient of the pre-test was .872. However, the Shapiro-Wilk test showed that for the control group p=.370>α and for the experimental group p=.000<α. Therefore, scores of the experimental group were not distributed normally. Table 3 shows the median scores and standard deviations of the retention test scores of both groups. As indicated in the Mann-Whitney U analysis, the retention of the experimental group (Median=23) was higher than the retention of the control group (Median=17) (U=1889, z= 5.429, p=.000<α).

Table 3. Mann-Whitney U Analysis of the Retention Test Scores

Group	X	N	sd	Median	U	z	p
Control	16.667	48	4.628	17.000	1889	5.429	.000
Experimental	21.917	48	3.880	23.000			
Total	19.292	96	5.001	21.000			

Interview Results

The interview questions were about the lessons, the content of the game, and suggestions about future lessons. While the qualitative results were given, the data of each group were reported separately. When reporting qualitative data, aliases were used instead of names to provide anonymity.

Students' Views About the Course

Students generally had positive feelings about the lessons in which they played games. They stated that they liked lessons, improved academically, and their motivation towards English learning increased. For example, Sue expressed about the game, "So, the words in the game improved my English. The game and the vocabularies in the game made me like English more. Because you learn English by playing games, it's more fun and nicer. You are also informed." At the same time, students emphasized that the process is fun, helps them learn, and increases their success. For example, Harry, to emphasize that the game increased his learning, stated that "we normally couldn't memorize words, this time we could memorize them thanks to the game."

In addition, the students stated that the places in the game are similar to those in their lives and that they love the characters in the game, and they emphasized that these features help them adapt to the game environment more quickly. For instance, Ashley expressed that "there are sections from our lives in the game. It gets more beautiful like this. So, it helps us get used to it better." The students said that they liked the reward-winning sections, the quests, the details, the secret room, and the school map in the game. As an example, Elisa said, "What I liked most about the game was dodging the balls" to emphasize that she liked the process of winning gold.

Students' Views About the Content of The Game

Students also generally had positive feelings about the game and its features. Although a small number of students stated that they could not understand the game's purpose, most of them stated that the aim was to learn English, learn English words, and have fun / learn. For example, Abraham emphasized the game's purpose by saying, "I think our goal is to solve the riddles there and to reinforce our English. For example, we have improved our English better". Students, stating that they often play games on the computer or the phone at home, said they found the game fun, educational, and more beautiful than they played. Elisa emphasized that the game is educational by stating, "I think yours [the game] was more beautiful because it teaches, those games don't teach me anything, but yours [the game] taught something."

In addition, the students stated that they learned the words they did not know in the game from the popping name tags on the objects. Few students said that they were looking at dictionaries and notes in the lesson. "You will not forget anything you see because you see it," said Almila to emphasize that she learned from the popping name tags. The students mostly indicated that they did not encounter any difficulties during the game. But few students emphasized that they had trouble in the game. For example, Sue said, "It was difficult to solve the riddle. There were a lot of words in the riddle that I did not know. So, I had some difficulty. But I finally solved it."

Similarly, while students stated that they quickly completed the tasks, only a few indicated that they had some problems. For example, when asked why he could not complete the task, Adam said, "I don't know, I couldn't find [clues]. There wasn't enough time." During the game, all students stated that they helped their friends with tasks and unknown words. For instance, Elisa said, "We could not find the key. They told the location of the key. We told them to drink milk" to emphasize that they helped each other during the game. In addition, the students were able to give examples of the words they learned in the game during the interview.

Students' Suggestions about Future Lessons

Students generally wanted to play similar games in English and in other lessons. Few students also stated that the game they played should have a more advanced version. Having different environments, a multiplayer version, more quests, and longer versions are the traits that the students said would make the game better. For example, Mark said, "It would be better if we could play it online or get into the cars [in the game]." The students also stated that they wanted to play the game again because of its entertaining quality, and they learned vocabulary items by having fun. Sue, as a reason to play the game again in the lesson, stated that "Because it's more fun, I mean, more fun than the regular lesson," In addition, the students stated that standard lessons were boring and that their lessons were fun as a result of their desire to play games.

Discussion

There are different types of research on the usage of educational games in English lessons, and there are positive results of these researches. However, no study was developed according to the students' own lives and introduced under the supervision of a teacher. According to the result of the study, the success of the experimental and control

groups in learning vocabulary items showed a meaningful difference in post-test scores. In addition to the traditional teaching methods, the experimental group played an educational video game under the teacher's supervision. This game enabled the students to achieve higher success in the post-test results than the control group. These results coincide with the researches which show that the use of computer games in foreign language teaching increases student success (Aghlara & Tamjid, 2011; AlShaiji, 2015; Ashraf et al., 2014; Franciosi et al., 2016; Smith et al., 2013; Yip & Kwan, 2006).

The game is an RPG, about which many studies in the literature mention that they are an efficient form of teaching English (e.g., Hwang et al., 2017; Suh et al., 2010). The application results coincide with the studies of Miller and Hegelheimer (2006) and Peterson (2010), emphasizing the conclusion that RPG games increase success in vocabulary, especially in a foreign language. According to the retention test, the success of the experimental group was significantly higher than the control group. This result coincides with studies showing that computer games in education increase retention (e.g., Franciosi et al., 2016; Ricci et al., 1996). In contrast, in the study of Young and Wang (2014), the control group students' word retention rates were significantly higher than the game group.

The students' vocabulary learning success and retention in the experimental group were significantly higher than those in the control group. The reason for this positive effect, also stated by the students verbally during the interviews, could be the students' love towards lessons in which they play games (Sandford et al., 2006) and their increased motivation towards English learning (Betz, 1995; Hwang et al., 2017; Karsenti & Bugmann, 2018; Klein & Freitag, 1991; Turgut & Irgin, 2009). Another reason for this positive effect could be that the students find the English lessons in which they play games fun (Hung et al., 2018; Karsenti & Bugmann, 2018) and think that these games help them learn (Karsenti & Bugmann, 2018; Turgut & Irgin, 2009). This RPG, inspired by the environment in which students live, might have helped them identify themselves with the characters in the game (Wolf, 2005) and helped them to easily get used to the environment (which is time-consuming for non-gamers) (Joorabchi & El-Nasr, 2011).

In this process, the game may have helped the students feel like they are part of the game while learning something (Squire & Jenkins, 2003). It is understood from the statements of the students that they liked the features (award-winning sections, quests, details, the secret room, and map of the school) of the game and were aware that the aim of the game was educational. These students' statements about the game can be interpreted as an indication that shows the game developed includes the basic features (Charsky, 2010; Hung et al., 2018; Padilla-Zea et al., 2015) of the games as well as the educational ones.

In this regard, the existence of students who think that they played the game only for fun without realizing that they were playing an educational game can be interpreted as another finding revealing that entertainment and teaching traits of the game are emphasized in a balanced way. The students' emphasis on the cooperation factor (helping and supporting each other) throughout the game can be an indication that the game provides an environment for students to learn cooperatively (Karsenti & Bugmann, 2018). The students' ability to express the words they see in the game during the interviews might indicate that the students have learned the words in the game permanently.

Some students were not aware that the game was created to teach vocabulary. While trying to complete the game's tasks, it was planned to have the students incidentally come across the targeted words (popping name tags near the pictures of the objects). The higher vocabulary learning of the experimental group supports the findings (Hucking, 1999; Marscik, 2001; Ramos, 2015) about the positive effects of vocabulary acquisition through incidental learning. Popping name tags next to the pictures of the objects could also represent the duality method stated by various researchers (e.g., Chun & Plass, 1996; Clark & Mayer, 2013; Oxford & Crookall, 1990; Shahrokni, 2009). Students continued to play the game as they found it challenging, mysterious, entertaining, and re-playable in the study, through which they regularly came across popping name tags. Thus, pictorial-verbal combination in the popping name tags might have fostered incidental learning by enabling duality ((Kim, 2006; Kost, 1999; Lohman, 1996; Oxford, 1990; Widyasari, 2018).

Conclusion

It is possible to summarize the results of the research under three main headings.

- In addition to the traditional teaching methods, educational video games developed based on the students' individual needs and applied as supplementary material under the teacher's supervision, yield more efficient results significantly in vocabulary learning than traditional teaching methods.
- In addition to traditional teaching methods, the retention of the information learned through educational video games developed according to the students' individual needs and applied as supplementary material under the teacher's supervision is significantly more than the lessons taught with traditional teaching methods.
- In English lessons, where educational video games developed according to the students' individual needs are applied as supplementary material together with traditional methods under the teacher's supervision, students have fun, and their motivation for the lesson increases.

Implications

From the research results, it can be concluded that the game used in the study helped students increase their success in English vocabulary learning and change their views about English lessons. Several educational video games were created to help students learn English. In this study, the game was played at school under the teacher's supervision during class hours, and the content of the game was parallel to the curriculum.

In addition, the students helped each other during the application stage of the game. With this approach, it can also be said that education, entertainment, control, and cooperation were combined without disrupting the standard lesson flow. Audios, videos, music, flashcards, activities where students are active are used constantly in English lessons. Therefore, planned and standardized educational video games could be used as additional materials. Thus, students' motivation and achievement would increase, and successful classroom management would still be achieved (Karsenti & Bugmann, 2018).

Recommendations

The game's content can be designed to cover the topics that a class should cover for the entire academic year. Thus, the long-term impact of educational video games developed by inspiring students' environments can be measured. In addition, voiced dialogues can be added to the game so that a study on English listening skills can be done. By creating a multiplayer game instead of a single-player one as the students wished, all students in the class can be simultaneously in the game world, and interaction between the students can be enhanced. Thus, their impact on students' learning can be examined. By preparing similar games for different age groups, the effects of computer games on these groups can also be examined.

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