

## Efficacy of Computer Games on Language Learning

**Blanka KLIMOVA**

*Department of Applied Linguistics, University of Hradec Kralove, Rokitanskeho 62, 500 03 Hradec Kralove, Czech Republic  
blanka.klimova@uhk.cz*

**Jaroslav KACET**

*Department of Applied Linguistics, University of Hradec Kralove, Rokitanskeho 62, 500 03 Hradec Kralove, Czech Republic  
jaroslav.kacetl@uhk.cz*

### ABSTRACT

Information and communication technologies (ICT) have become an inseparable part of people's lives. For children the use of ICT is as natural as breathing and therefore they find the use of ICT in school education as normal as the use of textbooks. The purpose of this review study is to explore the efficacy of computer games on language learning and list its benefits and limitations for foreign language learning. This was done by conducting a literature search in the databases Web of Science, Scopus, ScienceDirect and Springer, and consequently by evaluating the findings of the relevant studies. The findings indicate that computer games, especially the educational ones, are effective in the vocabulary acquisition in foreign language learning. In addition, there are other benefits of using computer games in classrooms such as exposure to the target language, increased engagement, or enhancement of learners' involvement in communication. On the contrary, the findings reveal certain limitations of their use in language learning such as the fact that high interactivity may hinder the vocabulary acquisition and learning, not all games are useful for language learning, or a lack of knowledge about computer games among language teachers and institutions hinders their proper use.

**Keywords:** computer games, videogames, language learning, non-native learners, effectiveness

### INTRODUCTION

Present life is unimaginable without the use of information and communication technologies (ICT) since they have already penetrated in all human activities and become an inseparable part of living. For children the use of ICT is as natural as breathing. As Prensky (2001) points out, children spend most of their free time interacting with computers and playing computer games. In fact, the average teenager in America spend 1.5 hour on the Internet and 1.5 hour on playing video games. Therefore it is no wonder that the use of ICT in school education is as normal as the use of textbooks. However, it is the pedagogy of the implementation of ICT in the classroom which is important: the how rather than what (Higgings, Xiao, and Katsipataki, 2012). Thus, research studies now start exploring what type of ICT intervention would be the most effective for learning purposes.

Ang and Zaphiris (2008) maintain that new technologies have completely changed the way games are played. Digital games have been very popular for several decades and are receiving increasing attention (deHaan, 2011). Currently, games frequently deal with more serious matters and can even be educational (Ang and Zaphiris, 2008). Research into the use of digital games in education is relatively novel, but growing rapidly and a lot of language teachers use digital games for teaching second language as it may be effective on every age group, particularly on children (Aghlara and Tamjid, 2011). Nevertheless, there are few investigations of game play and game culture, as well as descriptions or evaluations of using these activities in language classrooms (deHaan, 2011). In fact, various authors (deHaan, 2011) warn that the evidence of language learning benefits of using digital games is not clear cut. Ashraf, Motlagh, and Salami (2014) argue that the teacher should be careful when bringing games into the class. Effective game-based second language teaching and learning is more likely to occur if practical conclusions can be drawn from empirical evidence (deHaan, 2011).

Games create an environment where education is mostly learner-centred, with a good opportunity for socialisation when well-organised, and awakening the will to win and competitive desire inside people (Uzun, 2009). Talking about games, it is important to distinguish between game-based learning and gamification. Findley (2016) shows the difference between Game-Based Learning (GBL) and gamification as follows. *Game-based learning is training that uses game elements to teach a specific skill or achieve a specific learning outcome. It takes your core content and objectives and makes it fun.* On the other hand, *gamification is the*

*application of game mechanics in a non-game context to promote desired behavior and drive learning outcomes* (Findley, 2016). Thus, the main difference between these two concepts is the integration of game mechanics with training content. GBL fully integrates the two, so the game *is* the training. On the other hand, gamification uses game elements as a reward for completing existing training modules (Findley, 2016). Pappas (2015) defines gamification as a methodology that *involves the use of game design elements and mechanics in activities that are not inherently game-based. This is done to motivate and engage the learners, so that they can become active participants in their own learning process.*” On the other hand, Pappas (2015) claims that game-based learning integrates games into the learning process to teach a specific skill or achieve a learning objective.

Nevertheless, it is not clear cut whether or not computer educational games have more positive impacts than negative ones. For instance, Ashraf et al. (2014) focus on vocabulary acquisition as they view it as the basis of any language to be learned and see an advantage of games in vocabulary training in the fact that the use of computers and the Internet is natural for children. Therefore they claim that online games can be effective in vocabulary acquisition (Ashraf et al., 2014). Furthermore, Aghlara and Tamjid (2011) found out in their study that children learning vocabulary by playing digital games are more motivated than children who are taught vocabulary through traditional methods. They also believe that there is a relationship between language learning in early ages and digital games as they say that children are able to understand language with digital games easily (Aghlara and Tamjid, 2011). These authors also investigated the role of computer games in second language acquisition and learning and maintain that games create an environment that is mainly learner-centred and digital games have positive effect on the learning process (Aghlara and Tamjid, 2011). Last but not least, Agudo et al. (2007) see advantages of adaptive computer games as they may be adjusted to a particular student’s progress and add that playful elements are used as a source of motivation.

On the other hand, there are some negative impacts, too. For example, de Haan, Reed, and Kuwada (2010) point out that while language students watch a video with subtitles, they are only required to attend to, while players of video games must perform additional tasks in their second language input, which may interfere with learning in either a positive or negative way. They also mention the fact that not all video games are useful for language learning, and emphasize that pre-teaching vocabulary using drills and dictionary work might also be effective (de Haan et al., 2010). The role of the learner’s attention is also vital as the player’s attention is divided between playing the game and learning, which results in less convincing results of players in comparison with those who watch them play games (e.g., deHaan, 2011). Also de Haan et al. (2010) showed that if some students play video games, whereas others only watch them, the latter group of students can recall significantly more vocabulary. Moreover, both players and watchers tend to forget significant amounts of vocabulary over the course of their study (deHaan et al., 2010). Last but not least, Aghlara and Tamjid (2011) claim that teachers should not apply digital games for their own sake. As they put it, teachers ought to take into account that students come from different backgrounds and have various needs and expectations (Aghlara and Tamjid, 2011). Therefore, it is easy to understand why deHaan et al. (2010) warn teachers not to blindly accept these games as valuable only because they involve the language and students enjoy them. deHaan (2011) also maintains that language teachers and institutions must know more about games to use the media effectively.

Ang and Zaphiris (2008) provide an overview of game-based language learning. They maintain that computer-aided language learning technologies will continue to be developed and that they might help generate motivation and pleasure for learners (Ang and Zaphiris, 2008). Currently, computer games are full of learning materials for the learner to “discover”. In future, however, they may be designed as virtual learning environment in which learners may be able to congregate and engage in communication, thus learning from each other in a social context (Ang and Zaphiris, 2008).

The purpose of this review study is to explore the efficacy of computer games on language learning and list its benefits and limitations for foreign language learning.

## METHODS

The methodology of this study is based on the study by Moher et al. (2009). The main method included a systematic review whose goal was to identify the research studies on the basis of the key words in four databases Web of Science, ScienceDirect, Scopus, and Springer. This review was performed in the period from 2010 to October 2016 for the following key words: *foreign language learning AND computer games, foreign language learning AND videogames, foreign language learning AND gaming*. Most of the studies were found in ScienceDirect – 10,527 studies. In the Web of Science 222 studies were detected, in Scopus 90 studies and in MEDLINE only 3 studies were identified. Thus, altogether 10,842 publications were detected in the databases. The titles of all studies as well as their duplicity were then checked in order to discover whether they focus on the research topic. 128 studies remained for further analysis. After that, the author checked the content of the

abstracts whether the study examined the research topic. 44 studies/articles were selected for the full-text analysis, out of which the findings of 31 research studies were then used in the manuscript for the comparison of the findings in the part of Discussion, as well as in the Introductory part to discuss the topic, and only six studies could have been then used for the detailed analysis of the research topic (Fig. 1). In addition, most of the studies focused on the use of computer games in learning in general (e.g. Rondon et al., 2013). Therefore they were not included into the in-depth analysis, as well as the studies which were just short observations such as Bado and Franklin (2014) or Guerrero (2011), and did not use any vocabulary knowledge test.

The study was included if it matched the corresponding period, i.e., from 2010 up to October 2016; if it included young healthy adults; if the intervention involved the use of a computer game or a videogame; if it focused on the learning of foreign language; and if the study was written in English. The selection period starts with the year of 2010 since several reviews and studies (e.g., Peterson, 2010; Turgut and Irgin, 2009) were published on this topic before this period.

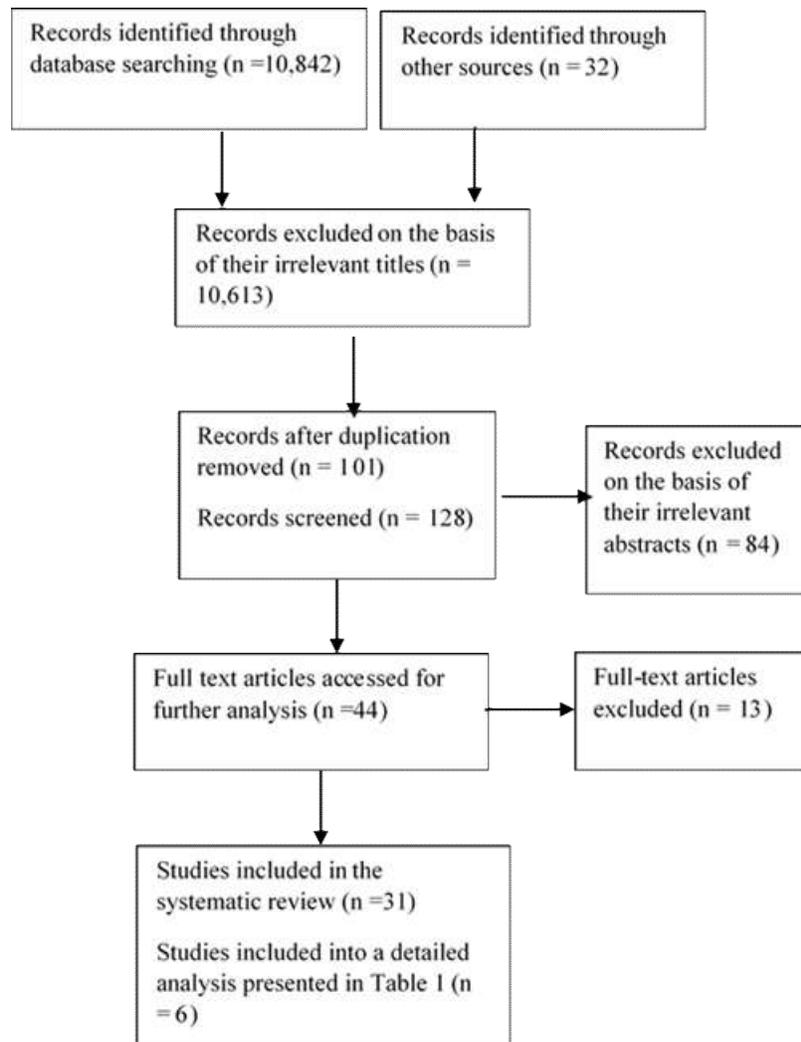


Fig. 1. Results of the selection procedure

## FINDINGS

Altogether six studies were identified for the in-depth analysis. Three studies originated in Iran, two in the USA and one was a joint cooperation of the authors from the USA and Japan. The age of the subjects ranged between 6 and 40 years, however, most of them were university students. The longest intervention period lasted 15 weeks, while the shortest was just four hours. In five studies there were both experimental/intervention group and control group. One study did not have any control group. The studies mainly concentrated on vocabulary acquisition. That is why the main outcome assessment was the vocabulary (recall) test. Table 1 below then

provides an overview of the main findings from the studies on videogames and computer games used in foreign language learning, specifically in learning English as a foreign language (EFL). The studies are presented in the alphabetical order of the first author.

**Table 1.** Overview of the findings from the studies on videogames and computer games used in foreign language learning

Study	Subjects	Age mean/range	Dose of intervention	Experimental group intervention	Control group intervention	Main outcome assessments	Findings
Aghara and Tamjed (2011) Iran	40	6-7 years	45 days; three times 90 min sessions per week	English vocabulary taught with the help of digital computer game SHAIEx.	English vocabulary taught in a traditional way.	SPSS statistical software version 16; vocabulary recall test.	The results reveal that digital games have a positive effect on learning process since the mean score of vocabulary test in the experimental group was significantly higher.
Ashraf et al., 2014, Iran	24	16-22	2 sessions of 2 hours for 15 weeks	Participants played an online game.	Controls were using pen and paper technique.	Written vocabulary recall test.	The results show that the experimental group outperformed the control group ( $t = 2.40$ ) and thus, that playing online games enhances vocabulary acquisition in language learning.

deHaa n et al., 2011, Japan, USA	80	18-24 years	5 times for 20 minutes	Subjects played the English- language music videogame.	Subjects watched the game.	Written vocabulary recall test; Cognitive Load Subjective Experience Questionnaire, subjective reports.	The results show that the videogame interactivit y hinders the language acquisition process.
Lim and Holt, 2011, USA	27	24-40 years	5 days for 2.5 hours	13 subjects trained via custom- designed videogame.	14 subjects received no training.	Category Learning test, Cue Weighting test	The results indicate that videogame training improves non-native speech categorizat ion.
Shokri and Abdol manafi - Rokni, 2014, Iran	40	14-16 years	8 session of 45 min per 1 month	Subjects played original computer game and simultaneousl y taught by the teacher.	Participants only played the game.	Likert scale questionnaire, vocabulary test	The findings reveal that the experiment al group significanl y outperform ed the control group.
Smith et al., 2013, USA	57	18-21 years	2 sessions of 2 hours	Reading + follow-up computer game.	No control group.	Vocabulary knowledge scale test	The results indicate that inference- based computer games result in better learning of new vocabulary than with traditional hardcopy lists of new words.

Source: Authors' own processing

### DISCUSSION

The results from the six studies (Aghara, Tamjed, 2011; Ashraf et al., 2014; Lim, Holt, 2011; Shokri, Abdolmanafi - Rokni, 2014; Smith et al., 2013) described in Table 1 reveal that computer games, especially the educational ones, are effective in the vocabulary acquisition in foreign language learning. Bado and Franklin

(2014) in their study report that besides the improvement of the EFL vocabulary and knowledge, educational videogames also enhance the development of cooperation, scaffolding, and motivation.

Only one study (deHaan et al., 2011) described in Table 1 exhibited a negative effect of the videogame on the vocabulary acquisition. In this study, 80 randomly-selected Japanese university undergraduates were paired based on similar English language and game proficiencies. One subject played an English-language music video game for 20 minutes while the paired subject watched the game simultaneously on another monitor. The follow-up tests revealed that both the players and the watchers of the video game recalled vocabulary from the game, but the players recalled significantly less vocabulary than the watchers. The authors argue that these results might be caused by the extraneous cognitive load induced by the interactivity of the game. In addition, the players perceived the game and its language to be significantly more difficult than the watchers did. The players also reported difficulty simultaneously attending to gameplay and vocabulary. The fact that high interactivity of games may provide less support for vocabulary learning has been recently confirmed by Yuditseva (2015).

Nevertheless, there are certain problems with using computer games in language classrooms. As it has already been mentioned, there are not many investigations of game play and game culture and the same applies to evaluations of using these activities in language classrooms (deHaan, 2011). Moreover, as Ashraf et al. (2014) maintain, teachers cannot bring games into the class without having thoroughly planned how to use them. Aghlara and Tamjid (2011) warn teachers not to apply digital games for their own sake as they teach students from different backgrounds with various needs and expectations. de Haan et al. (2010) add that not all video games are useful for language learning, and they also strongly recommend traditional techniques like pre-teaching vocabulary using drills and dictionary work. Even though playing video games may be a pleasant way to learn vocabulary, it is not the best one to retain vocabulary (e.g. deHaan, 2011; de Haan et al., 2010). Moreover, deHaan (2011) emphasizes that effective game-based second language teaching and learning is more likely to occur if practical conclusions can be drawn from empirical evidence and adds that language teachers and institutions must know more about computer games to use them effectively.

In addition, the findings also showed that the studies analyzed in Table 1 were short-term and small-scale. Therefore their efficacy is slightly questionable. Other research studies also claim that the test conducted shortly after the interventions generate short-term effects in terms of students' short-term knowledge retention (Guerrero, 2011).

Table 2 below summarizes the main benefits and limitations of the computer games for foreign language learning.

**Table 2.** Main benefits and limitations of the computer games for foreign language learning

Benefits	Limitations
<ul style="list-style-type: none"> <li>• exposure to the target language;</li> <li>• increased engagement;</li> <li>• improvement of language skills, structures and vocabulary in particular;</li> <li>• computer-aided language learning technologies will continue to be developed and may enhance learners' involvement in communication.</li> </ul>	<ul style="list-style-type: none"> <li>• high interactivity may hinder the vocabulary acquisition and learning;</li> <li>• low efficacy of studies;</li> <li>• a lack of studies on this topic;</li> <li>• not all games are useful for language learning;</li> <li>• a lack of knowledge about computer games among language teachers and institutions hinders their proper use.</li> </ul>

Source: Authors' own processing

Further research in the area of the use of computer games in classrooms should concentrate on the other aspects (e.g., the development of productive language skills such as speaking and writing, as well as pedagogical methods and techniques) than just the vocabulary acquisition in foreign language learning. In addition, this research should include longitudinal randomized controlled studies.

The limitations of this review study consist in the lack of available research studies on the research issue and different methodologies of the included publications. This might result in the overestimated effects of the findings, which may cause an adverse impact on the validity of these reviewed studies (Melby-Lervag, Hulme, 2013; 2016).

## CONCLUSION

The use of computer games seems to be an inherent attribute of present foreign language learning. It obviously generates many benefits such as exposure to the target language, increased engagement, or enhancement of learners' involvement in communication. On the contrary, there are certain limitations such as the fact that high interactivity may hinder the vocabulary acquisition and learning, not all games are useful for language learning, or a lack of knowledge about computer games among language teachers and institutions hinders their proper use. Therefore to confirm the efficacy of the use of computer games for foreign language learning, more longitudinal randomized control studies with larger subject samples are needed in this field.

## DISCLOSURE STATEMENT

The author has no conflicts of interest to declare.

## ACKNOWLEDGEMENTS

The paper is supported by the project Excellence (2017) at the Faculty of Informatics and Management of the University of Hradec Kralove, Czech Republic.

## REFERENCES

- Aghlara, L., and N.H. Tamjid. 2011. "The effect of digital games on Iranian children's vocabulary retention in foreign language acquisition." *Procedia Social and Behavioral Sciences* 29: 552-560.
- Agudo, J.E., Sanchez, H., Holguin, J. M., and D. Tello. 2007. "Adaptive Computer Games for Second Language Learning in Early Childhood." Accessed December 8 2016. [https://www.researchgate.net/publication/248707401\\_Adaptive\\_Computer\\_Games\\_For\\_Second\\_Language\\_Learning\\_In\\_Early\\_Childhood](https://www.researchgate.net/publication/248707401_Adaptive_Computer_Games_For_Second_Language_Learning_In_Early_Childhood)
- Ang, C. S., and P. Zaphiris. 2008. "Computer games and language learning." In *Handbook of Research on Instructional Systems & Technology*, edited by T. T. Kidd and H. Song, 449-462. Hershey, PA: IGI Global.
- Ashraf, H., Motlagh, F.G., and M. Salami. 2014. "The impact of online games on learning English vocabulary by Iranian (low-intermediate) EFL learners." *Procedia – Social and Behavioral Sciences* 98: 286-291.
- Bado, N., and T. Franklin. 2014. "Cooperative game-based learning in the English as a foreign language classroom." *Issues and Trends in Educational Technology* 2(2): 1-17.
- Chen, H.H.J., and C. Yang. 2011. "Investigating the effects of an adventure videogame on foreign language learning." In *Edutainment Technologies. Educational Games and Virtual Reality/Augmented Reality Applications*, edited by M. Chang et al., 168-175. Taiwan: Taipei.
- deHaan, J. 2011. "Teaching and learning English through digital game projects." *Digital Culture & Education* 3(1): 46-55.
- deHaan, J., Reed, W.M., and K. Kuwada. 2010. "The effect of interactivity with a music video game on second language vocabulary recall." *Language Learning & Technology* 14(2): 74-94.
- Findley, J. 2016. Game-Based Learning vs. Gamification: Do You Know the Difference? Accessed December 8 2016. <http://www.trainingindustry.com/learning-technologies/articles/game-based-learning-vs-gamification-do-you-know-the-difference.aspx>
- Guerrero, H.A.G. 2011. "Using video game-based instruction in an EFL program. Understanding the power of video games in education." *Colomb Appl Linguist* 13(1): 54-70.
- Higgings, S., Xiao, Z.M., and M. Katsipataki. 2012. "The impact of digital technology on learning: A summary for the education endowment foundation." *Full Report*. UK: Durham University.
- Melby-Lervag, M., and C. Hulme. 2016. "There is no convincing evidence that working memory training is effective: A reply to Au et al. (2014) and Karbach and Verhaeghen (2014)." *Psychon Bull Rev* 23(1): 324-330.
- Melby-Lervag, M., and C. Hulme. 2013. "Is working memory training effective? A meta-analytic review." *Dev Psychol* 49(2): 270-291.
- Moher, D., Liberati, A., Tetzlaff, J., and D.G. Altman. 2009. "The PRISMA Group. Preferred reporting items for systematic review and meta-analysis: The PRISMA statement." *PLoS Med* 6(6): e1000097.
- Pappas, C. 2015. Gamification vs game-based elearning: How to integrate them into your elearning course design. Accessed December 8 2016. <https://elearningindustry.com/gamification-vs-game-based-elearning-can-you-tell-the-difference>
- Peterson, M. 2010. "Computerized games and simulations in computer-assisted language learning: A meta-analysis of research." *Simulation & Gaming* 41:72.
- Prensky, M. 2004. The emerging online life of the digital native: What they do differently because of technology and how they do it. Accessed October 20 2016. [http://www.bu.edu/ssw/files/pdf/Prensky-The\\_Emerging\\_Online\\_Life\\_of\\_the\\_Digital\\_Native-033.pdf](http://www.bu.edu/ssw/files/pdf/Prensky-The_Emerging_Online_Life_of_the_Digital_Native-033.pdf). Accessed 5 October 2016

- Rondon, S., Sassi, F.C., and C.R. Furquim de Andrade. 2013. "Computer game-based and traditional learning method: A comparison regarding students' knowledge retention." *BMC Medical Education* 13: 30.
- Shokri, H., and S.J. Abdolmanafi-Rokni. 2014. "The impact of computer games on EFL learners' spelling: A qualitative study." *Studies in English Language Teaching* 2(3): 266-274.
- Smith, G.G., Li, M., Drobisz, J., Park, H.R., Kim, D., and S.D. Smith. 2013. "Play games or study? Computer games in ebooks to learn English vocabulary." *Computer & Education* 69: 274-286.
- Turgut, Y., and P. Irgin. 2009. "Young learners' language learning via computer games." *Procedia Social and Behavioral Sciences* 1: 760-764.
- Uzun, L. 2009. "An evaluative checklist for computer games used for foreign language vocabulary learning and practice: Vocaword sample." *Novitas-ROYAL* 3(1): 45-59.
- Yudintseva, A. 2015. "Game-enhanced second language vocabulary acquisition strategies: A systematic review." *Open Journal of Social Sciences* 3: 101-109.