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**Investigating effects of digital gamification-based language
learning: a systematic review***

Hossein Dehghanzadeh**

Assistant professor, Faculty of Educational Science and Psychology, Tabriz
University, Iran

Hojjat Dehghanzadeh*** (Corresponding Author)

Phd candidate of instructional technology, Faculty of Humanities, Tarbiat Modares
University, Iran.

Abstract

The purpose of this study is to investigate and synthesize the trends and key findings of the studies related to gamification as a new method in the field of learning a Foreign language (LFL) over the past 11 years. Databases including Web of Science, ERIC, and Scopus were searched for this purpose, analyzing a total of 28 articles. The research methodology of this study was a systematic review. A content analysis method was used for analyzing the selected articles. Our findings found that after 2015, the use of gamification in LFL became popular among researchers, and the number of field studies increased rapidly over the past two years (2017–2018). Additionally, quantitative methods were found to be the most frequently used research methods regarding gamification in LFL studies. In the analyzed studies, vocabulary and grammar abilities were the most commonly investigated basic language skills. In addition, English language, Duolingo, high school, and feedback were the most commonly investigated Foreign language, gamified platform, education level, and gamification element for learning a new language in the reviewed articles. More analysis disclosed challenges, as well as advantages associated with using gamification in LFL. Furthermore, in studies examined concerning the effectiveness of using gamification in LFL, the results mainly pointed to the benefits of gamification based learning. The systematic review also provides valuable recommendations for future researches and practitioners.

Keywords: Gamification, Gamified learning, Learning a foreign language,
Systematic review

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**E-mail: hossein.dehghanzadeh@gmail.com

***E-mail: hojjat.dehghanzadeh@gmail.com

Introduction

At this time, learning a foreign language (LFL), especially English, has not only become a necessity, but it is a trend in certain areas of society. Globalization has driven most people to move faster and collaborate with each other for most of the interaction and action that has taken place between them over the past decades; e.g. the rise of inherently global online social interaction and increasingly international workplaces require English as a Foreign language. Such advances have culminated in a revived and growing interest in LFL (Schlueter, 2019). In addition, the development of technologies have altered the profiles and needs of students and learners (e.g. today's learners are technologically immersed and see technologies as an essential tool for learning), because of these changes, researchers are seeking for new ways of teaching to fit the changing necessities of students and learners in teaching a new language (Turan & Akdag-Cimen, 2019). It is a widely known reality that learning a new language entails time, endurance, and rehearsal (Han, 2015)

Scientific researchers have shown that learning a new target language is a challenging issue (Akbari, 2015). For example, Iaremenko (2017) argued that speaking with a new language as a second language in front of others is stressful in many countries. Complexity and long processing because of sociocultural practices, learning methods (Schlueter, 2019), anxiety (Rafek, Ramli, Iksan, Harith, & Abas, 2014), disengaging, negative attitude, learner ability and so forth (Liu, 2017) could affect on learning a new foreign language. For these reasons, students must be able to involve in various activities in order to get a better understanding of the new target language for effective and positive learning outcomes (Ardoiz García, 2017; Turan & Akdag-Cimen, 2019; Wong & Nunan, 2011). In learning a foreign language, in this meaning, active learning methods are more efficient and effective than traditional teaching methods (Dehghanzadeh, Salimi, Dehghanzadeh, & Azizi, 2016).

One of the active and student-centered teaching methods is gamification-based learning that has come out as a consequence of

scientific efforts to meet the demands of the modern era and has been embraced by researchers, practitioners, and educators (Kapp, 2012) and from 2008 was used in educational settings (Jakubowski, 2014). A review of the literature shows that gamification is argued as an enjoyable, engaging, motivating, and successful way to learn a new language as a second/foreign language (Lui, 2014; Munday, 2016; Nahmod, 2017; Perry, 2015; Sundqvist & Wikström, 2015) because of using game elements in the non-gamified learning environments can increase the interest and motivation of learners to learn a new language (Wu & Huang, 2017; Kingsley & Grabner-Hagen, 2018). In addition, in gamification based learning, learners can experience the learning without failing (Lee & Hammer, 2011) and enable them to achieve a desirable learning behavior (Deterding, Sicart, Nacke, O'Hara, & Dixon, 2011; Kapp, 2012; Werbach, 2014; Werbach & Hunter, 2012; Zichermann & Cunningham, 2011).

In gamification based learning, the elements and concepts of games can be incorporated into educational content teaching_ learning a new language_ to support high-level expectations (Kapp, 2012). According to Bunchball (2010), game elements are divided into two categories: game mechanics and game dynamics. Game mechanics defined as the processes, fundamental actions, and control mechanisms that are integrated into 'gamify' activity and to create engaging experiences for learners. Game mechanics include but not limited to level, badges, storytelling, space, point, virtual goods, leaderboard, challenge, and charity and gifts (Bunchball, 2010; Caballe & Clariso, 2016). Game dynamics drive, stimulate, and trigger the emotions of the learners to experience the game. Game dynamics include but not limited to self-expression, reward, achievement, altruism, fun, status, satisfaction, and competition (Bunchball, 2010). To date, studies have shown that gamification and game-based learning contributes to academic achievement and can increase students' intrinsic motivation to learn (Hanus & Fox, 2015), increase students' engagement and learning outcomes (Clark, Nelson, Chang, Martinez-Garza, Slack, & D'Angelo, 2011), visualize the learning progress (Kapp, 2012), and provide

students with freedom to fail without fear during their learning (Lee & Hammer, 2011).

Games and gamification can play an important educational role in creating a fun and stress-free learning environment for LFL (Arnold, 2014). Scientific evidence shows that learning a new language is more successful and effective across games than non-game learning environments (Purgina, Mozgovoy, & Blake, 2019; Zarzycka-Piskorz, 2016). In summary, a review of the literature suggests that learning a new language with gamification method can be related to content language learning, motivation, engagement, self-directed learning, confidence, satisfaction, competence, self-efficacy, autonomy, peer interaction, and scaffolding (see Castañeda & Cho, 2016; Cho & Castañeda, 2019; Cruaud, 2018; Deterding, Dixon, Khaled, & Nacke, 2011; Deterding, Dixon, et al., 2011; Kapp, 2012; Priebatsch, 2010; Rachels & Rockinson Szapkiw, 2018; Schonfeld, 2010; Werbach, 2014; Werbach & Hunter, 2015).

Previous researches (empirical and conceptual) has been focused to the effectiveness of games and gamification on learning language (Flores, 2015; Homer, Hew, & Tan, 2018; Ketyi, 2016; Liu & Chu, 2010; Mchucha, Ismaeil, & Tibok, 2017; Medina & Hurtado, 2017; Palomo-Duarte, Berns, Doderio, & Cejas, 2014; Perry, 2015; Purgina, Mozgovoy, & Blake, 2019; Rachels & Rockinson-Szapkiw, 2018; Sun & Hsieh, 2018; Uzun, Çetinavci, Korkmaz, & Salihoglu, 2013; Tsai & Tsai, 2018; Zarzycka-Piskorz, 2016).

In the field of gamification and education in general, there are also systematic review and literature review studies (see de Sousa Borges, Durelli, Reis, & Isotani, 2014; Dicheva, Dichev, Agre, & Angelova, 2015; Faiella & Ricciardi, 2015; Jackson, 2016; Kiryakova, Angelova, & Yordanova, 2014; Nah, Zeng, Subhash & Cudney, 2018; Telaprolu, Ayyappa, & Eschenbrenner, 2014), digital-based game language learning (Hung, Yang, Hwang, Chu, & Wang, 2018), and gamification and learning English as a second language (Dehghanzadeh, Fardanesh, Hatami, Talaee, & Noroozi, 2019). The review article of Dehghanzadeh et al (2019) is similar to the current study a little but they have not

investigated using gamification for learning all foreign languages, only English, also, aims and research questions of this systematic review are quite different. So, this study is more comprehensive and applicable. Based on the above studies, it can be noted that the existing literature related to the effectiveness of games and gamification on education and learning a foreign/second language. Nevertheless, even now there is not a systematic review on the use of gamification for all foreign languages. Although game and gamification are similar, they are different terms (Kapp, 2012; Werbach & Hunter, 2015).

Gamification is comparatively a new field, particularly in the context of language learning, and there is still little research (Garland, 2015). Despite the growing interest in gamification-based learning, a systematic review of learning a foreign language with gamification-based method has not been carried out. The present systematic review intends to provide an overview of the latest state of the literature on gamification for LFL.

The current study in this field is of significance because the findings of the systematic review reported by the prior studies in the related publications can prepare the way for future researches and provide guidance and insights to researchers and practitioners.

Finally, overall a review of the literature determined that there was a scarcity of investigation on the advantages and challenges of using digital gamified environments in LFL. The vision becomes more ambiguous when it comes to the effectiveness of different elements of gamification and LFL in connection to advantages. This is remarkable because each particular element of gamification has a specific goal and advantages that would enable learners to involve in processes of meaningful learning and thus reach desired learning outcomes (see Jackson, 2016). Table 1 shows the main research and related subcategories questions for this systematic review. Therefore, answers to the following questions are obtained for the aims of this research:

Table 1. Sub-classifications of research questions

Main research question	Sub-classifications
1. What are the directions and trends in language learning research in gamification-based learning?	Distribution by years of the articles: To identify the number of articles for each year, the included papers were analyzed with regard to their stated publishing year.
	Research methods of the selected articles: The reviewed studies were analyzed in order to determine the used research methods. Articles' methodology sections were scrutinize and their method were classified under qualitative, quantitative, and mixed headings.
	Education levels of participants: The selected articles were categorized as primary (elementary), high school (secondary), and higher education.
	The reviewed articles' countries: Through a detailed investigation of the sections of abstract and methodology, the country of each article was determined. Also, the authors' workplace were taken in to account.
	Foreign language of participants: The articles were analyzed regarding foreign languages that were learned by learners.
	Digital gamified platform of samples: The sections of abstract and methodology in the reviewed articles were analyzed with regard to the used digital gamified platforms.
2. What were the key findings of the existing literature?	Investigated basic language skills: The reviewed studies were examined with regard to their emphasis on the basic language skills (reading, writing, speaking, grammar, etc.). The articles were read from beginning to end, with detailed examination of the abstracts, questions of research, and results sections.
	Gamification elements: The included articles were analyzed in terms of used gamification elements for LFL. Each article was read from the beginning to the end, with detailed examination.

	Advantages and challenges of gamification in LFL: The findings, discussions, and conclusion sections of reviewed articles were carefully analyzed to identify the challenges and advantages. The strategy of open coding was followed and through content analysis, the codes contained in the reviewed papers were analysed.
	Gamification effectiveness in LFL: The first move was to identify the studies that compared the gamification based learning method with traditional methods or non-gamified learning. Then the parts of abstract, results, and discussion were investigated in depth. To ascertain the effectiveness of gamification based learning method, the criterion was whether statistically significant results were obtained.

Research Question 1: What are the directions and trends in LFL research in gamification-based learning?

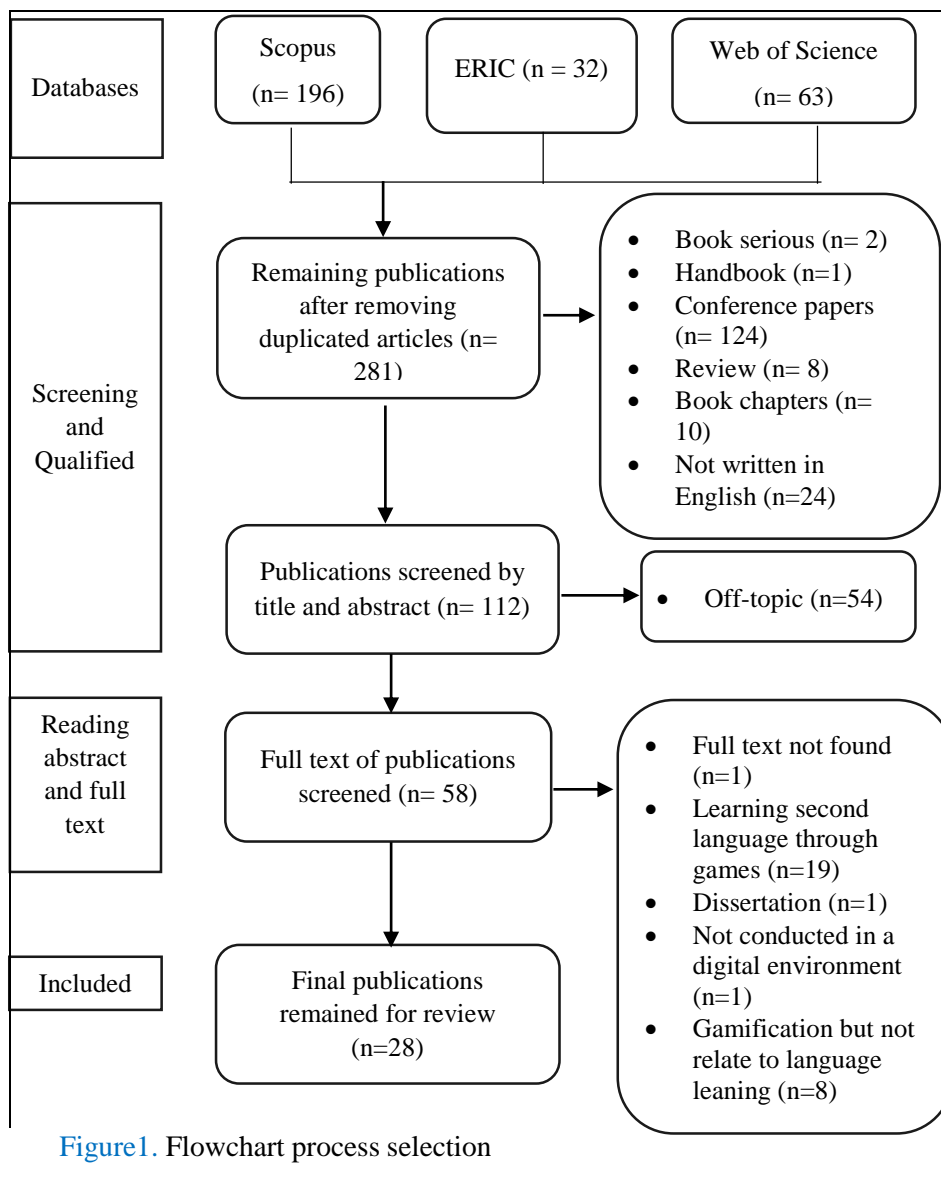
Research Question 2: What were the key findings of the existing literature?

Method

Databases and search keywords

The process of selecting scientific articles for this systematic review is shown in Table 1. A systematic search strategy was executed in the bibliographic databases such as Scopus, ERIC, and Web of Science to identify the related publication. The search keywords used in this study included “Gamification” or “Gamify” or “Gamified” or “Playful” and “Language Learning”, “Gamification” or “gamify” or “gamified” or “playful” and Second Language Teaching”, “Gamification” or “gamify” or “gamified” or “playful” and “Language Instruction”, “Gamification” or “gamify” or “gamified” or “playful” and “Second Language learning”, “Gamification” or “gamify” or “gamified” or “playful” and “Foreign Language learning”, “Gamification” or “gamify” or “gamified” or “playful” and “Foreign Language

Teaching”. The keywords were selected on the basis of appropriate literature on gamification and language learning. Because gamification was primarily used in educational environments from 2008 (see Jakubowski, 2014). To collect the most applicable and up-to-date literature in the area, this systematic review was limited to the search period from 2008 to 2019.



Criteria for inclusion and exclusion

Different inclusion criteria were applied to select the most appropriate articles. After screening titles, abstracts and when needed the full text of the articles, we separated a number of irrelevant articles that did not include the inclusion criteria. Only peer-reviewed articles were included in the study in order to achieve scientific integrity in the research. To verify the studies' homogeneity; 1) only peer-reviewed journal articles were selected in the study, 2) The study included only published articles in English language, as the authors of this study were unable to understand other languages, 3) The time period was limited to articles from 2008 through 2019, the span in which many studies on the use of gamification for LFL/LSL are published, 4) Only when gamification was applied for LSL/ LFL, articles were selected. This indicates that articles focusing on video games, educational games, and serious games were omitted as they are different terms (Kapp, 2012). 5) There was no exclusion criterion for the methodology of the articles in this study, which means that studies could be quantitative, qualitative, and mixed methods. 6) Only when learners were taught language learning through digital gamified learning environments, articles were elected. Articles that were excluded from more analysis: 1) did not include evidence related to digital gamified learning environments, 2) did not consider both gamification, language learning in combination, i.e. studies focused only on gamification or language learning, 3) did not get published in peer review journals, and 4) not written in English language.

With our keywords, the initial search yielded 291 publications. From 291 publications, 10 articles duplicated which were omitted for the next steps. Many articles that were not appropriate for further study (book series= 2, handbook = 1, conference papers = 124, review = 8, book chapters = 10, and not written in English language= 24) were excluded from 281 publications. Out of 112 articles, 54 papers were off-topic. It means that there was no relationship to this study with publications. Of the remaining 58 articles, 30 articles were excluded for further analysis by exclusion criteria as discussed above (Full text not

found =1, Learning a second language through games =19, dissertation =1, not conducted in a digital learning environment =1, gamification but not relate to language learning =8). Finally, 28 articles selected for conducting a systematic review and for the next steps. Fig 1 shows the process of selecting publications. Two coders independently carried out the process of identifying relevant publications to ensure the inclusion of relevant publications. The similarity of the decisions of the two coders was adequate, then we resolved all the differences and reached consensus on them by discussing the coders and also the first author of this study. Table 2 provides a comprehensive list of publications and their quantitative details.

Table 2: Quantitative description of the scientific research into gamification for LFL

Language skill(s)	Vocabulary	Pronunciation
Challenges of gamification	-	Technical problems
Foreign language	English	French
Country	United States	Belgium
Advantages of the gamification	Improving interest-driven learning Providing learning environment at learners' own pace	Enhancing motivation of learners
Gamification element(s)	Progress bar, feedback, medal, challenge, reward, competition, point, achievement	Clear goal, narration, story, feedback, mirror exercise, reward, progress, collaboration
N	31	27
Data collection method	Observation Interview	Self-report
Methodology	Qualitative	Qualitative
Educational level	High school	High school
Platform	Gamified online educational environment	Spoken karaoke
Authors/year	Abrams & Walsh (2015)	Athanasopoulos et al., (2018)

Listening	Grammar	Pronunciation	Grammar
-	Insufficient operating device	Technical problems	the lack of sufficient resources
English	Spanish	English	Spanish
Colombia	United States	Colombia	United States
Improving listening skills of learners	Increasing students' accuracy in conjugating Spanish verbs (grammar) Improve learner's confidence	Improving learning performance of learners Increasing learning empathy of learners Increasing learners' engagement	Increasing learners' engagement Improving learners' intrinsic goal orientation, Improving self-efficacy of learners for learning Improving satisfaction of learners for learning Controlling of learners' beliefs for learning
Reward, level- system, badge, point, challenge, instant feedback, progress bar, clear goals, notification	Feedback, progress, competition, forum, quizzes	Feedback, performance graph, sounds, Collaboration,	Competition, peer feedback, collaboration, challenge,
12	80	163	82
Questionnaire	Questionnaire	Questionnaire	Questionnaire Interview
Quantitative	Quantitative	Quantitative	Mixed-method
High school	Higher education	Elementary	Higher education
Duolingo	Conjugation Nation	Caterpillar count	Conjugation Nation
Bustillo et al., (2017)	Castañeda & Cho (2016)	Castañeda, Guerra, & Ferro (2018)	Cho & Castañeda (2019)

Vocabulary/ Writing	Listening/ Reading Writing/ Speaking	Vocabulary	Vocabulary
-	-	-	-
French	French	English	French
Norway	Norway	Puerto Rico	Israel
Increasing learners' engagement Enhancing expressions of playfulness and autonomy Enhancing positive attitudes of learners to the language learning activities	Supporting learner autonomy Providing learning environment at learners' own pace	Enhancing motivation of learners Improving vocabulary skills of learners Enhancing students' higher order thinking skills	Increasing learning performance of learners Enhancing positive attitudes of learners to the language learning activities
Badge, collaboration, quest, level, reward, competition	Quest, collaboration, unlocking, level, reward, badge	Track progress, automatic feedback, reward, specific phrases	Reward, level- system, badge, point, challenge, instant feedback, progress bar, clear goals, notification
13	13	-	66
Questionnaire Interview	Observation Interview Data log	Written Journals	Questionnaire
Mixed-method	Qualitative	Qualitative	Quantitative
High school	High school	-	High school
-	-	Brainscap	Duolingo
Cruaud (2018)	Cruaud (2018)	Flores (2015)	Gafni, Achituv, & Rahmani (2017)

Speaking Reading	Vocabulary	Speaking (audio output)	Vocabulary	Writing
English	English	German	English	English
China	Taiwan	Finland	United States	China
Improving speaking skills of learners Boosting sense of pervasiveness in the learning environment	Increasing learning performance of learners Enhancing motivation of learners Enhancing peer interactions Enhancing interactivity with the teacher	Increasing learners' engagement Improving collaboration of learners	Improving vocabulary knowledge of learners	Improving writing skills of learners
Badge, avatar, point, leaderboard, immediate feedback	Enhancing learners' satisfaction, attention Points, leaderboard, time limits, sound effect, nickname, rank, score, Feedback	Collaboration, feedback, role play	Challenge, quest, reward, point, level, narration, story, badge, achievement, progression, feedback	Points, leaderboard, exploration, role play, feedback
120	44	99	21	72
Questionnaire	Questionnaire Interview	Questionnaire Observation	Observation	Questionnaire
Quantitative	Mixed-method	Mixed-method	Qualitative	Quantitative
Elementary	Higher education	High school	High school	High school
ClassDojo	Kahoot	Berlin Kompass	Padlet	Edmodo
Homer, Hew & Tan (2018)	Hung (2017)	Kallioniemi et al (2015)	Kingsley & Grabner-Hagen (2018)	Lam, Hew, & Chiu (2018)

Reading	Vocabulary	Vocabulary Grammar	Grammar	Reading Writing Grammar Istifeme Sneakino
-	Wireless connection	Pedagogical problems (accuracy of translation)	Technological imitations	Pedagogical problems (lack of contextual meaning and communicative tasks)
English	English	Spanish	English	Turkish
Singapore	Ecuador	United States	Japan	United States
Boosting learners' motivation	Increasing learners' engagement Improving interaction of learners Enhancing motivation of learners Improving learners' acquisition of vocabulary	Promoting learners' self- directed learning	Improving learners' grammar knowledge	Enhancing motivation of learners Improving writing, grammar, reading, speaking and listening skills of learners
Narration, quest, story, level, feedback, challenge, reward, avatar,	Uploading videos, pictures and music, challenge, leaderboard, feedback, point, emotions, like or dislike, time pressure, reward, , badge, competition	Reward, leaderboard, level- system, badge, point, challenge, instant feedback, progress bar, clear goals, notification	Feedback, chunking	Reward, leaderboard, level- system, badge, point, challenge, instant feedback, progress bar, clear goals, notification
-	70	60	21	9
Questionnaire Interview	Questionnaire	Questionnaire	Questionnaire	Questionnaire Interview
Mixed-method	Quantitative	Quantitative	Quantitative	Mixed-method
Higher education Protégé	Higher education Kahoot	Higher education Duolingo	High school WordBricks	Higher education Duolingo
Ling (2018)	Medina & Hurtado (2017)	Munday (2016)	Purgina, Mozgovoy, & Blake (2019)	Loewen et al (2019)

-	Vocabulary	-	Speaking Listening Reading Writing	Grammar
-	Insufficient mobile devices for every student in class	-		
English	English	Japanese	English	English
Spain	Taiwan	Indonesia	South Korea	Poland
Enhancing motivation of learners Improving English competence Enhancing learner's ICT skills Increasing learners' engagement Enhancing positive attitudes of learners to the language learning activities	Improving the students' levels of intrinsic motivation Increasing learners' engagement Improving learners' focused attention	Improving writing skills of learners Boosting learners' motivation	Improving English competence Improving reading skills of learners Improving listening skills of learners	Improving learners' grammar knowledge Boosting learners' motivation
Point, performance graph, quest, avatar, reward system, peer assessment, collaboration, feedback, narration, leaderboard	Background sound effects, time pressure, challenge, fantasy, curiosity, control, feedback, leaderboard, competition	Collaboration, goals, feedback, rules, progress, level	Profile, wall, status, message, like or dislike, new feed, feedback	Like or dislike, level, rules, leaderboard, Emoticons, feedback
50	144	150	52	112
Questionnaire Open-ended questions	Questionnaire	Questionnaire	Questionnaire	Questionnaire
Mixed-method	Quantitative	Quantitative	Quantitative	Quantitative
High school	High school	-	Higher education	Higher education
Online English course	IHTT3	GEQ	SNS	Kahoot
Sevilla-Pavó & Osca (2017)	Sun & Hsieh (2018)	Udjaja (2017)	Won & Kim (2018)	Zarzycka-Piskorz (2016)

Vocabulary Grammar	Speaking	Grammar
Internet connection	-	Technical problems Pedagogical problems
Spanish	English	Irish
United States	Germany	Ireland
Providing scaffolding for learners Improving students' performance	Improving speaking skills of learners Enhancing motivation of learners Decreasing learners' anxiety Enhancing peer interactions	Improving learners' grammar knowledge Enhancing learners' enjoyment
Reward, leaderboard, level, system, badge, point, challenge, instant feedback, clear goals progress bar, notification	Level, competition, feedback, collaboration, Goals, Unlocking, avatar	Feedback, Chunking
187	26	119
Questionnaire	Questionnaire	Questionnaire Observation
Quantitative	Quantitative	Mixed method
Elementary	High school	Elementary
Duolingo	Haunted	WordBricks
Rachels & Rockinson Szapkiw	Reitz, Sohny, & Lochmann	Ward, Morzgovoy, & Purgina

Data analysis

The two authors scrutinized and analyzed all the included studies in this article with regard to the coding scheme. The authors used a form of content analysis to compare and classify the data for the study (Fraenkel & Wallen, 2000). Next, a template was developed using Microsoft Word to document and analyze the results. This included research questions-related classification such as the study year/place and the advantages/ benefits and challenges of using gamification for language learning. Following the precise reading of each selected paper, the template/ form was filled with connected details. Next, the articles were organized according to codes and classification and analyzed using Microsoft Excel. As shown in Table 1, The first main research question and connected sub-classifications contained descriptive details that are reported directly in the included articles. On the other side, the second main research question and connected sub-classifications looked for

comprehensive information in the included articles. The first phase was to scrutinize all the articles after that the codes and classifications were discerned in order to determine the basic language skills, gamification elements, advantages, challenges and effectiveness of digital gamified learning environments on LFL.

Table 2. Sub-classifications of research questions

Main research question	Sub-classifications
1. What are the directions and trends in language learning research in gamification-based learning?	Distribution by years of the articles: To identify the number of articles for each year, the included papers were analyzed with regard to their stated publishing year.
	Research methods of the selected articles: The reviewed studies were analyzed in order to determine the used research methods. Articles' methodology sections were scrutinize and their method were classified under qualitative, quantitative, and mixed headings.
	Education levels of participants: The selected articles were categorized as primary (elementary), high school (secondary), and higher education.
	The reviewed articles' countries: Through a detailed investigation of the sections of abstract and methodology, the country of each article was determined. Also, the authors' workplace were taken in to account.
	Foreign language of participants: The articles were analyzed regarding foreign languages that were learned by learners.
	Digital gamified platform of samples: The sections of abstract and methodology in the reviewed articles were analyzed with regard to the used digital gamified platforms.
	2. What were the key findings of the existing literature?

	The articles were read from beginning to end, with detailed examination of the abstracts, questions of research, and results sections.
	Gamification elements: The included articles were analyzed in terms of used gamification elements for LFL. Each article was read from the beginning to the end, with detailed examination.
	Advantages and challenges of gamification in LFL: The findings, discussions, and conclusion sections of reviewed articles were carefully analyzed to identify the challenges and advantages. The strategy of open coding was followed and through content analysis, the codes contained in the reviewed papers were analysed.
	Gamification effectiveness in LFL: The first move was to identify the studies that compared the gamification based learning method with traditional methods or non-gamified learning. Then the parts of abstract, results, and discussion were investigated in depth. To ascertain the effectiveness of gamification based learning method, the criterion was whether statistically significant results were obtained.

Findings

Directions and trends in gamification and LFL literature

In answer to the first research question, the sub-classifications inspected by the authors contained the studies' distribution per year, used research methods, the participants' education levels, the countries' distribution, participants' second language, and used gamified platform that the participants were learned. The subsequent section includes each category's details.

Distribution by years of the articles

Figure 2 demonstrates the distribution of years of selected articles relating to the gamification based learning in LFL. The first field research was published in 2015 (n =3), after which the number of studies increased in 2017 (n=6), 2018 (11), and 2019 (5). In other words, there were no studies until 2015 and most of the articles on the use of gamification in LFL were published in 2018.

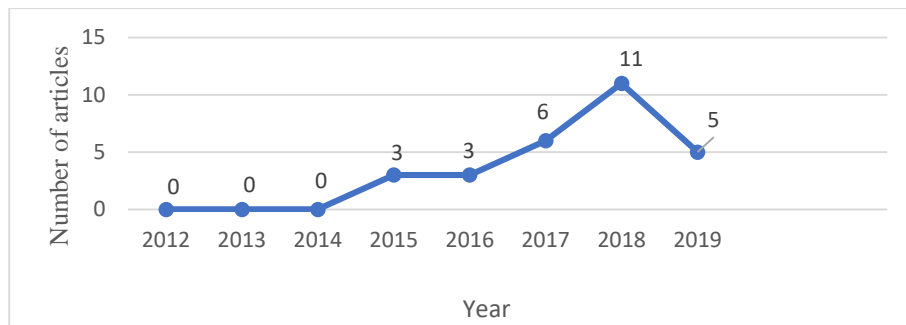


Figure 2. The number of articles per year.

Research methods of the selected articles

The most frequently used research method, as seen in Figure 3, was the quantitative method (n=15), followed by the mixed-method (n=8). Qualitative method (n =5) was the least commonly used method that included articles used.

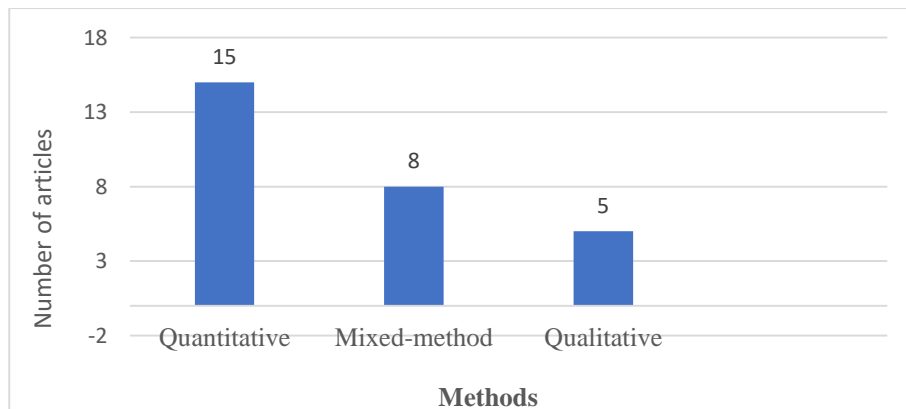


Figure 3. Research methods of the selected articles.

The targeted education levels of the participants in the articles

Figure 4 shows that most of the articles (50%) picked students from high school as the sample, followed by university students (35%). The least commonly used samples were the elementary students or lower levels with different backgrounds (15%).

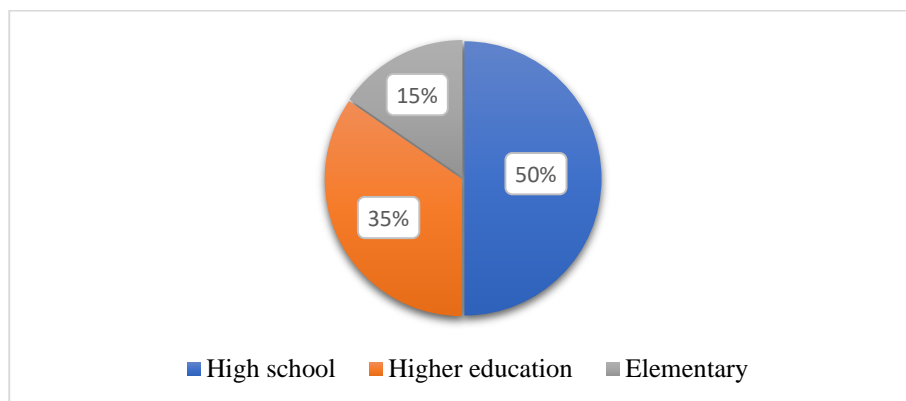


Figure 4. The targeted education levels of the participants in the articles.

The reviewed articles' countries

Most of the gamification based learning studies in LFL were carried out in the U.S. (n=7). The other four countries (Norway, China, Colombia, and Taiwan) were next with two articles each (Figure 5). There was an acceptable span of countries where gamification studies in the LFL field were executed, but as are shown in the (Figure 5), there were e.g. no articles covering the countries of Africa.

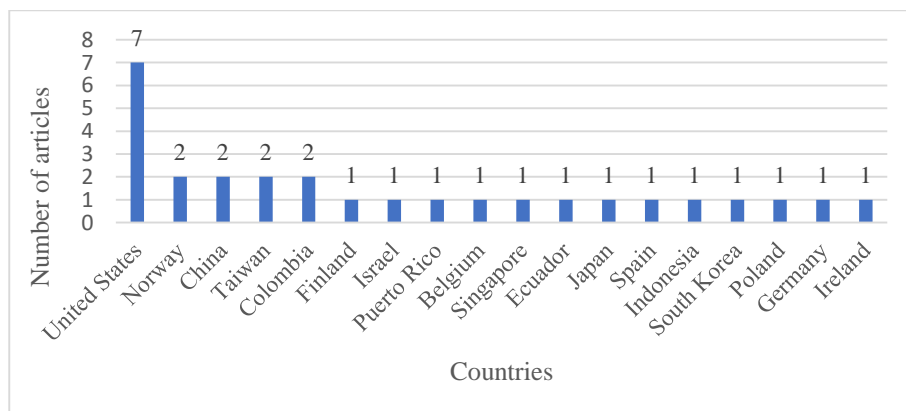


Figure 5. The reviewed articles' Countries.

The foreign languages taught in the reviewed articles

As shown in Figure 6, six languages reported as a second language in the reviewed articles which are taught in the digital gamified learning environments to the participants. English was the most common language taught as a foreign language in the reviewed articles (n=16). Spanish and French languages were next with four frequencies. The least commonly taught languages are Irish, German, Japanese, and Turkish with one frequency.

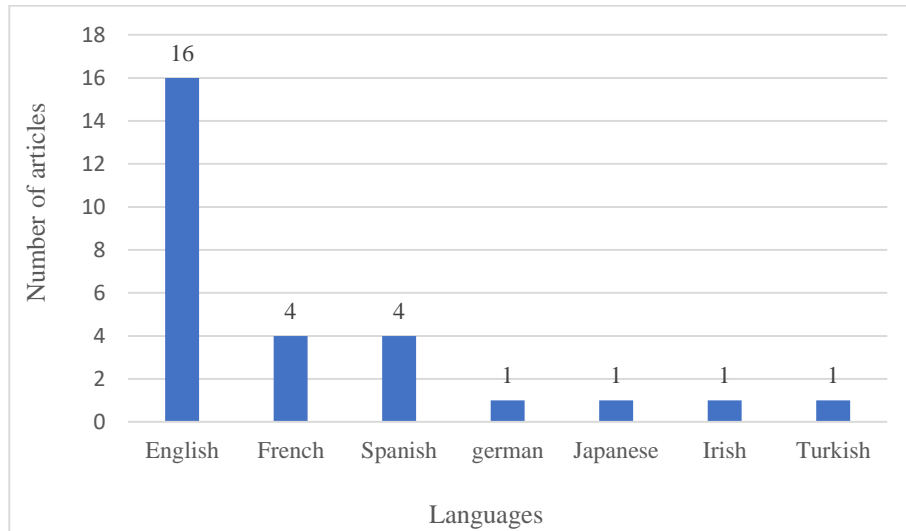


Figure 6. The foreign languages in the reviewed articles.

The used digital gamified platforms for LFL

Various digital gamified platforms were used for LFL in the included articles. Duolingo was the most used digital gamified platform for learning a foreign language with five frequencies. Kahoot was the next digital gamified platform in LFL with three frequencies. Conjugation Nation and WordBricks digital gamified platforms were used in two articles for learning a second language (n=2). The used digital gamified platforms in two reviewed articles were not reported. The other digital gamified platforms used for teaching a foreign language are shown in Figure 7. All digital gamified platforms used in the reviewed articles for LFL, along with their names and frequencies are shown in Figure 7.

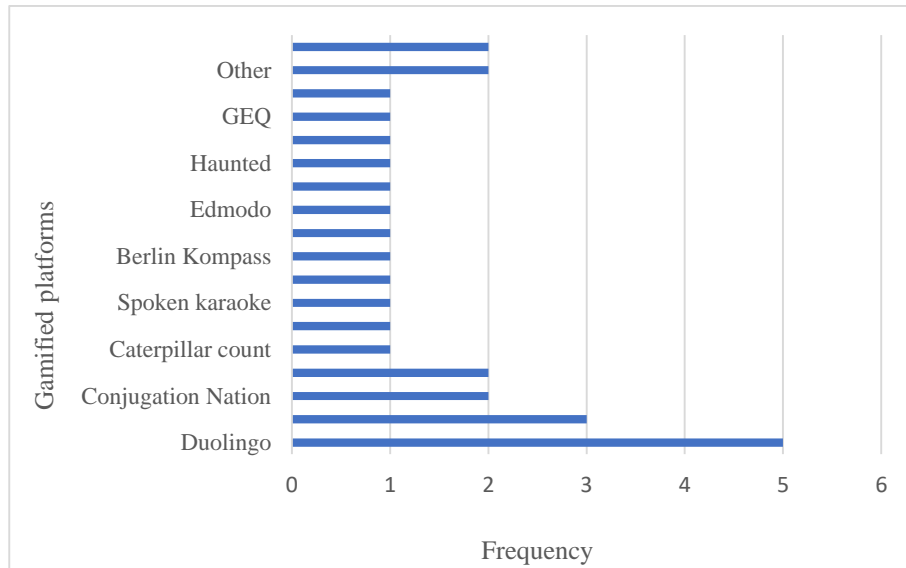


Figure 7. The used digital gamified platforms for LFL

The key findings of the gamification and LFL literature

The subsequent sub-classifications were identified and investigated by the researchers for the aim of answering to the second research question: learned basic skills, elements, advantages and challenges of using the digital gamified platforms, and the effectiveness of gamification based learning in LFL. The subcategories are described in detail in the below section.

Investigated basic language skills

In the included articles, basic language skills were taught as contents in digital gamified learning environments. Of all the 28 studies, only 1 article did not report which basic language skills they examined. Other articles indicated that basic language skills they studied were vocabulary (n=10), grammar (n=7), speaking (n=6), writing (n=6), reading (n=5), listening (n=4) and pronunciation (n=2) (Figure 8). In other words, vocabularies were the most used as a basic skill for learning second languages in digital gamified learning environments. By contrast, pronunciation skill was the least used as a basic skill for learning second languages in digital gamified learning environments.



Figure 8. The leaned basic language skills

The gamification elements used for LFL

The reviewed articles used a range of gamification elements (both dynamics and mechanics) for LFL in digital learning environments. Feedback, point, reward, challenge, progress bar, level, and leaderboard were the most commonly used elements for gamifying LFL in digital learning environments. Curiosity, profile, medal, chunking, emotion, and rank were the least widely used game elements to gamify LFL in digital learning environments. Table 3 provides an overview of the gamification elements and the frequency of each game element used in the reviewed articles to gamify LFL in digital learning environments.

Table 3. The gamification elements used for LFL

Gamification elements	Frequency (N)	Gamification elements	Frequency (N)	Gamification elements	Frequency (N)
Feedback	26	Reward	14	Point	12
Level	12	Progress bar	11	Challenge	11

Badge	10	Leaderboard	10	Collaboration	9
Competition	7	Clear goal	6	Quest	5
Notification	5	Narration	4	Avatar	4
Time pressure	3	Like or dislike	3	Sound effect	3
Story	3	Achievement	2	Chunking	2
Performance graph	2	Rule	2	Role play	2
Unlocking	2	Score system	1	Exploration	1
Curiosity	1	Profile	1	Forum/Status	1
Message	1	Peer assessment	1	Quizzes/New feed	1
Uploading videos, pictures and music	1	Emoticon	1	Control/Rank	1
Fantasy	1	Mirror exercise	1	Specific phrases	1
Medal	1	Nickname	1	Wall	1

Advantages of using digital gamification in LFL

Table 4 provides the advantages of using gamification in LFL with the frequency of each category and sample article. Enhancing motivation of learners (n=11), increasing learners' engagement (n=7), improving learners' learning performance (n=4), increasing positive attitudes of learners to the language learning activities (n=4), improving learners' grammar knowledge (n=4) are among the most frequently listed. The least frequently advantages of using gamification in LFL were enhancing learners' enjoyment (n=1), decreasing learners' anxiety (n=1), enhancing ICT abilities of learners (n=1), and other benefits that are shown in Table 4.

Table 4. Advantages of using gamification in LFL

Advantages	f	Sample article
Enhancing motivation of learners	11	Athanasopoulos et al., (2018)
Increasing learners' engagement	7	Castañeda, Guerra, & Ferro (208)
Improving learning performance of learners	4	Rachels & Rockinson Szapkiw (2018)
Enhancing positive attitudes of learners to the language learning activities	4	Gafni, Achituv, & Rahmani (2017)
Improving learners' grammar knowledge	4	Castañeda & Cho (2016)
Improving learners' vocabulary skills	3	Medina & Hurtado (2017)
Enhancing learners' peer interactions	3	Hung (2017)
Improving learners' listening skills	3	Bustillo, Rivera, Guzmán, & Acosta (2017)
Improving learners' speaking skills	3	Homer, Hew, & Tan (2018)
Improving learners' writing skills	3	Lam, Hew, & Chiu (2018)
Supplying learning environment at the own pace of learners	2	Cruaud (2018)
Providing learners' playfulness and autonomy	2	Cruaud (2018)
Improving English competence	2	Sevilla-Pavó & Osca (2017)
Improving learners' focused attention	2	Sun & Hsieh (2018)
Improving satisfaction of learners	2	Cho & Castañeda (2019)
Improving learners' reading skills	2	Won & Kim (2018)
Improve learner's confidence	1	Castañeda & Cho (2016)
Improving learners' intrinsic goal orientation	1	Castañeda, Guerra, & Ferro (2018)
Improving self-efficacy of learners	1	Cho & Castañeda (2019)
Improving interest- driven learning	1	Abrams & Walsh (2015)
Providing scaffolding for learners	1	Rachels & Rockinson Szapkiw (2018)

Enhancing higher order thinking skills of learners	1	Flores (2015)
Controlling of learners' beliefs for learning	1	Cho, & Castañeda (2019)
Boosting sense of pervasiveness in the learning environment	1	Homer, Hew, & Tan (2018)
Enhancing interactivity with the teacher	1	Hung (2017)
Improving collaboration of learners	1	Kallioniemi, et al., (2015)
Promoting learners' self-directed learning	1	Munday (2016)
Enhancing ICT abilities of learners	1	Sevilla-Pavó & Osca (2017)
Decreasing learners' anxiety	1	Reitz, Sohny, & Lochmann (2019)
Enhancing learners' enjoyment	1	Ward, Mozgovoy, & Purgina (2019)

Challenges of using digital gamified platforms in LFL

Even though the use of digital gamified platforms in the LFL field was led to various advantages, but some problems also are reported by researchers in the reviewed articles. We classified the challenges of using digital gamified platforms for LFL in two categories: technological and pedagogical. Table 5 shows the most commonly reported challenges as technology-related problems (n=9), insufficient mobile devices (n = 3), and pedagogy related problems (wasting times, without scaffolding opportunities, without customized learning, decontextualized grammar-translation exercises, and audiolingual drills; lack of communicative tasks) (n= 4).

Table 5. Challenges of the using digital gamified platforms in LFL

Challenges	F	Sample article
Technological challenges	9	Ward, Mozgovoy, & Purgina (2019)
	3	Sun & Hsieh (2018)

Pedagogical challenges	Wasting times; lack of scaffolding opportunities; lack of customized learning	3	Munday (2016)
	Decontextualized grammar-translation exercises and audiolingual drills; lack of communicative tasks	1	Loewen et al., (2019)

Effectiveness of digital gamified learning environments on LFL

The effectiveness of digital gamified learning environments was evaluated in a total of 13 papers by comparing them with traditional teaching methods or non-digital gamified learning environments or by pre-testing and post-testing as seen in table 6. Twelve of 13 studies discovered that the gamification based learning method is more effective than traditional teaching methods in LFL. One study concluded that there is no difference between gamified learning and traditional teaching in LFL.

Table 6. Effectiveness of gamification in LFL

Findings	F	Articles
Gamification is more effective	12	Castañeda & Cho (2016), Castañeda, Guerra, & Ferro (2018), Cho & Castañeda (2019), Gafni, Achituv, & Rahmani (2017), Homer, Hew & Tan (2018), Hung (2017), Kallioniemi, Posti, Hakulinen, Turunen, Keskinen, & Raisamo (2015), Lam, Hew, & Chiu (2018), Purgina, Mozgovoy, & Blake (2019), Reitz, Sohny, & Lochmann (2019), Won & Kim (2018)
No significant	1	Rachels & Rockinson-Szapkiw (2018)

Discussion

The study analyzed 28 articles from Web of Science, ERIC, and Scopus with regard to their directions/ trends and key findings. The analysis revealed a rapid growth in the number of gamification articles in LFL since 2015 (Figure 2). The increasing number of researches could be ascribed to this method's rising popularity and acceptable advantages it causes. It can be understood that there has been a great deal of interest in this field, especially in the last two years, meaning that interest and attention will increase in the coming years. In the reviewed articles, the quantitative method (n=16) was recognized to be the most frequently used method of research, which could be due to the incentive to carefully investigate the effects of the gamification on LFL. While the proportion of quantitative studies is high, qualitative studies have the lowest frequency. It means that qualitative studies in this field have been neglected by researchers in past years. For example, in the present research, our search resulted in 28 available studies that met the review criteria. Nonetheless, 5 of the 28 studies provided qualitative data related to digital gamified learning environments and LFL, indicating that there is still rare qualitative research in this field.

Learning a foreign language through gamification has been used at various levels of education, ranging from elementary to higher education. This indicates that this research field is becoming increasingly popular across different educational levels. The most common participants in the analyzed reviewed studies included high school students, with fewer studies carried out with elementary students. Similar to this finding, Rachels & Rockinson-Szapkiw (2018) also reflected on the scarce of gamification-based learning research among elementary students in LFL. However, the impact of digital gamified learning environments that are thought to be effective in the context of LFL should need to be further explored in primary education grades.

The systematic review showed a number of researches in a wide span of countries on LFL through gamification, with the U.S. having the largest number of articles. In countries with various cultures and

educational backgrounds, further research on the use of gamification in LFL can provide valuable insight into the subject and field.

We focused our attention on the type of digital gamified platforms that have been used for LFL in the included studies. The systematic review indicated that LFL has used various digital gamified learning environments in different education levels (Abrams, & Walsh, 2014; Cruaud, 2018; Kingsley, & Grabner-Hagen, 2018; Turan & Akdag-Cimen, 2019). Duolingo investigated the most frequently used a gamified platform for LFL in the current study (Bustillo et al, 2017; Gafni, Achituv, & Rahmani, 2017; Munday, 2016). Using a digital gamified platform like Duolingo, as part of teaching and learning, inherently provides playful opportunities for edutainment and peer learning in the learning environments. Therefore, this might lead to more opportunities to deepen learning, especially with the additional feedback provided to learners by instructors or classmates (Kapp, 2012).

We also analyzed the included articles in terms of languages that have been taught as a second language by digital gamified learning environments in which English language examined the most frequently second language. This might be due to the fact that learning English language has been of major importance and top priority worldwide, especially in non-English speaking countries (Turan & Akdag-Cimen, 2019).

Vocabulary and grammar were the most important basic language skills that reported in the reviewed articles. However, such studies in the literature, especially on pronunciation skills, are still scarce. The gamification elements that have been used for LFL were our next focus in the included articles. Even though different game elements have been used for LFL, there was no clear trend as to which types of game elements might be more appropriate for which aspects of learning processes and basic language skills and advantages. Feedback was the most frequently used element for gamifying LFL. In general, feedback plays an important role in teaching language skills. It helps students to look at themselves "remotely" and have a space for thinking and

reflection that gives them a realistic vision of their own abilities and self-image (Fukkink, Trienekens, & Kramer, 2011). In addition, feedback improves self-efficacy and results in a more regular display of behavior (Hattie and Timperley 2007; Kluger and DeNisi 1996). Finally, effective feedback helps to identify the key elements of their learning behaviour and to evaluate their achievement (Fukkink, Trienekens, & Kramer, 2011).

This study gained numerous advantages yielded by using gamification in LFL. The most frequently reported advantages of using gamification in LFL were enhanced learner motivation and increased student engagement, which can be ascribed to the essence of gamification based learning method which allows learners to engage mentally and physically (Ardoiz Garcia, 2017). This finding is in line with a previous study (Looyestyn, Kernot, Boshoff, Ryan, Edney, & Maher, 2017) which have shown how gamification increase the engagement of learners. Gamification also takes into account three learners' psychological needs: autonomy, competence, and relatedness that motivates the learners in LFL (Landers, Bauer, Callan, & Armstrong, 2015). This research also confirms that gamification in LFL improves the courses from several perspectives, with the key findings suggesting that this kind of learning helps learners to improve their personalized learning (own space), reading, vocabulary, pronunciation, writing, listening, and grammar skills, peer interaction and teacher interaction, positive attitude, and overall learning performance. The advantages of using gamification in LFL along with sample articles and the frequency of each benefit reported by previous studies are shown in Table 4.

However, the process of using gamification in LFL might pose challenges. In the reviewed articles, the challenges are reported in two categories: pedagogical and technological. Wasting times (Ward, Mozgovoy, & Purgina, 2019), Lack of scaffolding opportunities (Hung, 2017), lack of customized learning (Kallioniem et al., 2015), low accuracy of translation (Munday, 2016), decontextualized grammar-translation exercises and audiolingual drills; lack of communicative

tasks (Loewen, Crowther, Isbell, Kim, Maloney, Miller, & Rawal, 2019) are reported as pedagogical challenges. Technological challenges are related to the insufficient availability of mobile devices (Castañeda & Cho, 2016; Cho, & Castañeda, 2019), and internet connections (Hung, 2017; Medina & Hurtado, 2017). These findings are in line with the results of the study by Sun & Hsieh (2018), Rachels & Rockinson Szapkiw (2018), and Loewen, Crowther, Isbell, Kim, Maloney, Miller, & Rawal, 2019).

The investigation of the studies comparing gamification based learning and traditional teaching disclosed the superiority of gamification in the field of LFL. The pre and post-test studies measuring the impact of gamified learning on the learning of students also concluded that the method improves the learning quality.

The findings of this study can help researchers, practitioners, and teachers elaborate their ideas with regard to the practices of using gamification in education, particularly in LFL. First, on the basis of the findings, a gamified LFL can increase motivation and engagement, so it can give advantages by enhancing the rate of motivation and engagement in the classrooms, especially in cases where presence is not mandatory. Students are more likely to develop autonomy by taking responsibility for learning the course content in their own space (Cruaud, 2018). Gamification also smooths the way for personalized learning as it helps all students to learn the content and courses as they desire (Kapp, 2012). Therefore, teachers can choose the proper game elements to gamify learning, particularly if there is a wide variety of needs for students in their courses. Additionally, by giving personal and peer feedback to learners in the courses, the gamification method is likely to have a positive effect on the overall performance of the students (Castañeda, Guerra, & Ferro, 2018; Rachels & Rockinson Szapkiw, 2018). The courses of LFL and curriculum should be modified to integrate a smooth move from traditional teaching methods. In addition, educators who want to implement gamification method need to know how it works and which elements of game should choose to gamify learning environments.

Conclusion and Limitations

In summary, this research is important because it is the first systematic review study on the use of gamification in LFL. It is also expected that this study to direct scholars who want to carry out researches into gamifying LFL learning environments. In addition, this systematic review provides an overview of the current state of using gamification for LFL in different digital learning environments. A timely systematic review is required because gamified LFL environments have begun to become a promising field that attracts academics, scholars, and educators interested in gamifying their learning environments (Roy & Reddy, 2019). This systematic review aims to add to an increasing body of knowledge on gamified LFL environments development. Finally, it provides interested practitioners and scholars with information on how to apply advantage of the potential benefits of gamification for LFL to improve students' learning processes and their related positive learning outcomes.

While this research provides an extensive review, it has certain limitations. Only articles published in peer-reviewed journals in English from the three databases (ERIC, Web of Science, Scopus) accessible through the authors' institutional library were taken into account, so articles published on LFL and digital gamified learning environments in other languages and databases have been excluded. Additionally, for this paper, books, book chapters, grey literature, conference papers, and dissertations were not included.

Recommendations for future research

- Additional experimental researches on the impact of the gamification based learning method on LFL should be conducted. Future researches can integrate other effective factors in LFL such as different practices in different sociocultural environments. It is necessary to consider the effectiveness of gamification in a different culture with different learning practices, which is only superficially addressed in the current state of the literature.
- As we saw in the systematic review of the articles, the number of qualitative articles is low. Therefore, further qualitative researches

are required to provide insight into the use of gamification-based learning method on LFL and how digital gamified learning environments can be designed to enhance learning processes and associated learning experiences and results for learners.

- Further studies on the implementing of gamification in LFL classrooms/ courses with elementary student participants need to be carried out because we find out that there are a few types of research in elementary levels for LFL. For promising results of gamification in LFL at elementary levels, future researches are necessary.
- In future research, the effect of the gamified LFL environment on learners' pronunciation knowledge should be examined. As we discussed, there are scarce studies in the field of pronunciation skill.
- While most publications reported at least one learning benefit for the use of gamification on LFL in virtual learning environments, none of the selected articles mentioned which game elements could be used specifically to enhance that particular learning outcome. What game elements are more appropriate for different aspects of LFL's learning experiences and outcomes is not clear. One way to address this issue for future research is to explore how each single micro-level game element can contribute to the learning outcomes in each aspect. This could be achieved through an empirical study that would incorporate similar game elements with different functions and objectives and compare them with other elements of game.

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