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Theory of Games Design

IO1: Theory of Games Design



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IO Number: 1

IO Name: Theory of Games Design

Description: The general aim is to construct sound knowledge about why and how to make use of games in 2D and 3D virtual environments for language training in different contexts. The theory of game design focuses on creating and applying games for language acquisition in immersive environments. The target of this IO are all parties who have an interest in promoting or experiencing language learning within schools.

Dissemination Level: Public

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List of Abbreviations

BECTA	British educational communications and technology agency
BYOD	Bring your own device
CALL	Computer-assisted language learning
CLIL	Content and Language Integrated Learning
CMC	Computer-mediated communication
DES	Department of Education and Science
DS	Digital Schools
EFL	English as a foreign language
ESL	English as a second language
EU	European Union
FL	Foreign language
GUINEVERE	Games Used IN Engaging Virtual Environments for Real-time language Education
ICALL	Intelligent computer-assisted language learning
ICT	Information and communication technologies
L1	First language
L2	Second language
MALL	Mobile-assisted Language Learning
MMOG	Massively multiplayer online games
MOOC	Massive Open Online Courses
MOODLE	Modular object-orientated dynamic learning environment
OECD	Organization for Economic Co-Operation and Development
OFSTED	Office for standards in education, children's services and skills
PC	Personal computer
PISA	Programme for International Students Assessment
SLA	Second language acquisition
TELL	Technology-enhanced Language Learning
TL	Target language
TPACK	Technological pedagogical content knowledge
UNDP	United Nations development programme
VLE	Virtual learning environment
WELL	Web-enhanced language learning

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1. Introduction

This review of the literature aims to examine the current state of research on gamification, games design and L2 Learning; investigate the theoretical perspectives that inform current research in the field; discuss gaming as a motivational tool in L2 Learning; identify affordances and challenges of gaming in general and gaming in 3D Virtual Learning Environments in particular for L2 learning and teaching; address the learning and teaching of an additional language using both content and language (CLIL - Content and language integrated learning); and, finally, identify the limitations of existing research.

1.1 Background and description of the research

The use of digital games and their unique features in different settings have become increasingly popular in the last few years. Industry and educational professionals are regularly using digital games to foster users' motivation and engagement, as confirmed by Johnson et. al (2013), who argues that "game play has traversed the realm of recreation and has infiltrated the worlds of commerce, productivity, and education, proving to be a useful training and motivation tool" (p. 21).

Research has widely shown that games play a crucial role when it comes to education but it is important to specify that identifiable categories and concepts in relation to digital games emerge from the current research and the boundaries between them are not always clearly defined. Several authors, for example, use the terms gamification and game based learning to describe the same concept (Callaghan, McCusker, Losada, Harkin & Wilson 2013; Epper, Derryberry, & Jackson, 2012). The categories proposed by the literature include game inspired design, gamification, game-based learning, serious games, simulations and games as follows:

- 1) Game inspired design focuses on the use of ideas and dynamics related to games to better support learning and intrinsic motivation (Kiryakova, Angelova, & Yordanova 2014).
- 2) Gamification will be one of the foci of this review and this growing phenomenon will be discussed in more depth in what follows. The term "gamification" was coined initially in 2002 by Nick Pelling and it described the application of "game-like accelerated user interface design to make electronic transaction[s] both enjoyable and fast" (Pelling, 2011). Years later, this definition was re-formulated by Detering et al. (2011b) who defined it as "the use of game design elements in non-game contexts" (p. 9). Generally, gamification is associated with points, levels, leaderboards, badges among other forms of reward (Hamari et al., 2014; Seaborn & Fels, 2015).
- 3) Game-based learning (GBL) focuses on the use of digital or non-digital games in the classroom to enhance the learning and teaching experience. Educators have been using games in the classroom for years and "digital games remain an option for enhancing

educational curricula in the interest of attracting and maintaining attention and to increase retained knowledge” (Wiggins, 2016, p.19).

4) Serious games aim to use gaming technologies for educational and training purposes. As Kiryakova et al. (2014) specified, “serious games are games designed for a specific purpose related to training, not just for fun. They possess all game elements, they look like games, but their objective is to achieve something that is predetermined”.

5) Simulations are very similar to serious games but their focus is on user training in a simulated real-world setting.

6) Games include all the above mentioned elements but they are designed for entertainment.

In this context we define the concept of gamification as the use of “game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems” (Kapp, 2012, p. 42) and explore its role in the educational field. In their review of the literature, Caponetto, Earp and Ott, (2014) confirmed an increased number of studies devoted to gamification and education in recent years. Their review focuses on the research published over a four year time period (2011-2014), and it demonstrates how each year the works published in the field have grown exponentially (see Figure 1). Koivisto and Hamari (2014) in their paper confirmed this trend with a graph showing search hits for the term gamification (see Figure 2) over a three year period (2010-2013). Their research indicates how the academic literature on the topic is growing each year but also that the appearance of the term gamification in academic research paper titles has been increasing even more quickly than general search hits. These trends confirm that gamification is becoming a more popular subject of research across several academic fields. Borges, Durelli, Reis and Isotani (2014) carried out a systematic mapping process to provide an overview on gamification. They analysed 357 papers on the subject and, among them, 48 were related to education and only 26 met the criteria for inclusion and exclusion of articles defined in their study. These 26 papers were selected and categorized according to their contribution. The literature review study presented here aims to continue this investigation by researching the number of studies focused specifically on gamification and education in most recent years. Therefore, a search for the terms *gamification and education* has been conducted and visualised (see Figure 3). As shown, this search focuses on works published from 2014 to the first half year of 2018 and confirms the trend already suggested by both Caponetto and Hamari of a constantly increasing interest in the subject across the last 4 years. Further details on the methodology of this research study and the papers selected and analysed will be provided in the following paragraphs. This increased interest in gamification and education, according to Huang and Soman (2013), is due first to the fact that today's “digital generation” can relate more to gaming because of its exposure to

technology, and secondly, when playing games, users are free from all the negative feelings they may experience in real life when facing obstacles. Gaming platforms represent a comfortable environment where users can express themselves without feeling overwhelmed or frustrated. Furthermore, games provide instant gratification and reward which help users enormously to feel engaged and motivated.

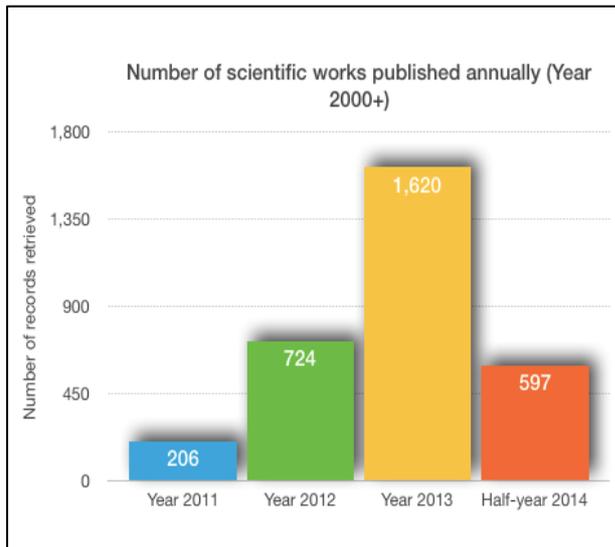


Figure 1 Number of scientific works published annually (half year for 2014) (Caponetto et. al, 2014).

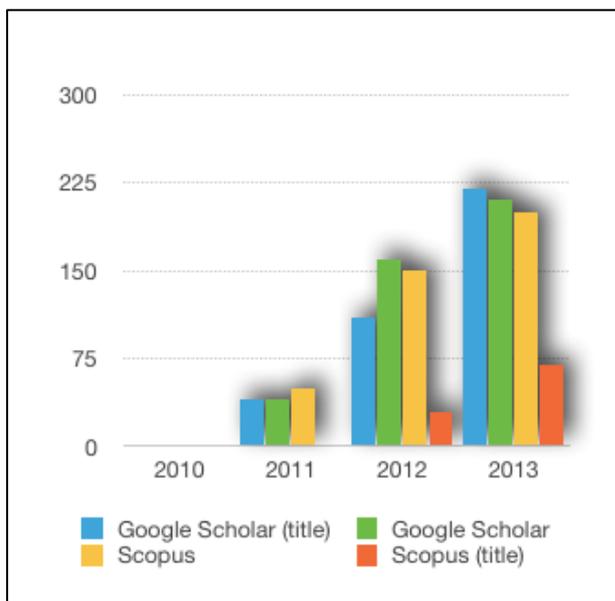


Figure 2 Search hits for gamification (Koivisto et al., 2014).

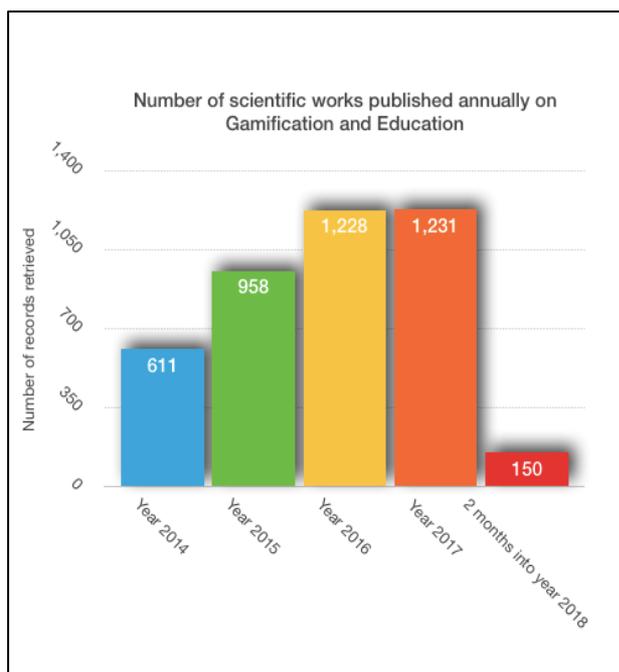


Figure 3 Number of scientific works published annually (from 2014 to 2 months into 2018).

It has been shown that integrating games mechanics into the classroom increase students' intrinsic motivation to learn as well as improving student's engagement and learning outcomes (Clark et al., 2011; Hanus & Fox, 2015; McGonigal, 2011). A gamified curriculum offers also students the possibility to obtain a visual display of their progress while having the freedom to explore multiple identities and experiences and to fail without the fear of penalty when learning (Kapp, 2012; Klopfer, Osterweil & Salen 2009; Lee & Hamer, 2011). However, some barriers have been identified when integrating games into education such as lack of support for teachers willing to integrate games into the curriculum, the logistics of game-school integration (Osterweil & Salen 2009) and, as Lee and Hammer pointed out, the challenge of a gamified curriculum that "might absorb resources, or teach students that they should learn only when provided with external rewards" (p. 4). It is therefore crucial to understand the foundation of a good game design in order to include its elements effectively and appropriately into the educational curriculum.

Literature has shown that the use of games and game elements have been applied across all levels of education with more emphasis on primary and secondary education as well as to teach different subjects (Dib & Adamo-Villani, 2014; Lim & Ong, 2012; Su and Cheng 2015; Wiggins, 2016) and that educators are supporting and increasingly adopting gaming into their practices as the NMCHorizon Report (2014, p. 78) confirms: "the Gamification of education is gaining support among educators who recognize that effectively designed games can stimulate large gains in productivity and creativity among learners".

Because its very nature and the affordances of gamification when integrated into education, the second stage of this review turns to analyze the relationship between gamification and L2 language learning and teaching.

Since the end of the last century, second language acquisition has been experiencing an important shift, moving from a cognitive orientation to a more social one, from closed classroom settings to more open and naturalistic ones, and from L2 learning to L2 use (Block 2003; Firth & Wagner, 1997; Johnson, 2008). This shift seems to be in perfect alignment with the developments of technology tools and applications over the years and, furthermore, to the development of CALL (Computer-Assisted Language Learning) as a subdiscipline of SLA in its own right. CALL is often perceived as an approach to language teaching and learning where technology is used as a valuable tool to present, reinforce and assess the material that will be learned in a way that is usually interactive. CALL embraces a wide range of information and communication technology approaches to teaching and learning foreign languages, from the first drill and practice programs that characterized CALL in the 1960s and 1970s to more recent applications (Chapelle, 2001; Beatty, 2013; Levy, 1997). It also extends to the use of corpora and concordances, interactive whiteboards, Computer Mediated Communication (CMC), web-based distance learning, mobile-assisted language learning (MALL) and language learning in virtual worlds, one of the core topics of this paper and, above all, the backbone of the GUINEVERE project.

It is important to highlight that basic applications (such as MS Word, Excel or PowerPoint) and particularly Web 2.0 tools (including digital games) that have transformed the way students approach their learning and the way teachers deliver their knowledge, as they are all involved in a crucial change where ease of participation, collaboration, information sharing and communication are the core elements of learning. Research shows that the applications of Web 2.0 technology in many L2 learning contexts have transformed the conception of language acquisition, curriculum design and teaching pedagogy (Godwin-Jones, 2014; Warschauer & Grimes 2007). Web 2.0 tools offer language learners the potential for a collaboration-oriented and community-based language environment. In addition, the language learning environments afforded by Web 2.0 technologies seem to have expanded the scope of enquiry on technology and language learning focusing not only on the traditional four language skills (e.g. listening, writing, speaking and reading) but also on new literacies, culture, peer feedback, interaction, discourse, knowledge construction, communication skills and comparison of instructional methods (Murray, Farr 2016; Warschauer, 2004).

Within CALL and SLA contexts, gamification has been the subject of extensive research, discussion and application for several years now. Gamification opens the door to the L2 learner and teacher working with technology allowing them to enhance their language

learning/teaching experience and, at the same time, acquire and foster their digital and language skills. Gamification offers L2 learners the opportunity to interact among peers as implied in a social game. In addition, motivation may increase in gamified instructional environments where learner performance is recognized by a proper reward system (such as badges or other reward-gamified systems). When gaming badges are implemented in SLA, for example, they serve not only as a motivational tool for students that can be involved in more competitive tasks but also as a form of formative assessment (Buckingham, 2014; Glover et al, 2012). As pointed out by Flores (2015), “Gamification with educational purposes is based on the implication that envisions educational objectives. These educational objectives will be seen by the learner as challenges to be accomplished in order to move from one stage to the other. At the end the challenge and moving from one stage to the other becomes part of the learning outcome” (p. 43). In this sense, L2 teachers have the flexibility to plan the language learning experience and related tasks while rethinking their practices in accordance with the similarities they may find in games and learning.

1.2 Aims and Rationale

1.2.1 Key questions

The aims of this review have been distilled into the research questions presented below:

1. Gamification and game design for L2 Learning and teaching: Which aspects have been analysed in this body of literature? What types of languages, learners, contexts and games have been investigated?
2. How can gaming work as a motivational tool for L2 learning?
3. Which theoretical frameworks are important for the current research? Which research methodologies have been used and what are some of the limitations of these studies?
4. 3D Virtual Learning Environments and L2 Learning and Teaching: What are the identified affordances and challenges in the studies reviewed?

2. Methodology

This research focuses on the review of works published between 2014 and 2018. The reason to limit the review to the last 4 years is due to the willingness of the researchers to provide a review of the literature on gamification, game design and education as current as possible while analyzing in some depth the topics presented in the selected works. The works reviewed have been organized in different tables and analysed accordingly.

Specifically, Table 1 presents the distribution of empirical research in books and related articles; Table 2 presents the distribution of empirical research in journals; Table 3 presents the distribution of non-empirical research in the form of articles and book chapters; Table 4

presents the distribution of dissertation studies. The inclusion of such diverse publications allowed the researchers to differentiate the review while making it more comprehensive.

Appropriate books, chapters and articles were selected via a keyword search in multiple databases such as Google Scholar, ERIC (Cambridge Scientific Abstracts), JSTOR Education, SAGE Full-Text Collection, SCOPUS, Web Science all relevant for the subject area. Various topic keywords and subject headings and combinations of both were used to conduct the research including terms such as: *game design, gamification, games, education, motivation, learning, language learning, language teaching and language education.*

2.1 Distribution tables

Table 1 Empirical Research in books and related chapters

No.	Book	No.	Chapters
1	Shernoff & Csikszentmihalyi (2014)	1	Crisp (2014)
2	Werbach & Hunter (2015).		
3	Kapp (2016)		
4	Benson & Voller (2014)		
5	Chou (2015)		

Table 2 Empirical Research in Journals

No.	Journal Title	No. of Articles	Empirical Study
1	Computers in Human Behavior	8	Landers & Armstrong (2017); Koivisto & Hamari (2014); Kuo & Chuang (2016); Mekler, Brühlmann, Tuch & Opwis (2017); da Rocha Seixas, Gomes & de Melo Filho (2016); Seaborn & Fels (2015); Hamari (2017); Landers & Armstrong (2017); Sailer, Hense, Mayr & Mandl (2017).
2	Computers & Education	2	de-Marcos, Garcia-Lopez & Garcia-Cabot (2016); Barzilai & Blau (2014).
3	Procedia. Social and Behavioral Science	1	Martí-Parreño, Seguí-Mas & Seguí-Mas (2016).
4	Journal of e-Learning and Knowledge Society	1	Galbis Córdova, Martí Parreño & Currás Pérez (2017).

5	Research in Learning Technology	1	Barr (2017); Young & Nichols (2017).
6	Transaction on Learning and Technologies	1	Ibanez (2014).
7	Journal of e-Learning and Knowledge Society	1	Galbis-Córdova, Martí-Parreño, Currás-Pérez (2017).
8	Proceedings	1	Ramirez & Squire (2014).
9	Psychological Bulletin	1	Cerasoli, Nicklin, & Ford (2014).
10	Language Learning & Technology	2	Reinhardt & Sykes (2014); Chik (2014).
11	Interactive Learning Environments	1	Hung, Sun & Yu (2015).
12	IEEE Transactions on Affective Computing	1	Sabourin, & Lester (2014).

Table 3 Non-Empirical Research

No.	Category	Format
9	Conceptual Discussion Potential benefit discussion	Articles: Hamari (2014); Flores (2015); Borges; de-Marcos, Domínguez; Caponetto et al., (2014); Kim & Lee (2015); Dicheva, Dichev, Agre, & Angelova (2015); Erenli (2015); Muntean & Nardini, (2015); Kiryakova, Angelova & Yordanova, (2014); Ortiz, Chiliza & Valcke, (2016); Mora, Riera, Gonzalez & Arnedo-Moreno (2015); Sykes (2018). Book chapters: Reinhardt & Thorne, (2016).

Table 4 Reports and Funded Projects

No.	Reports	Funded Projects
2	NMCHorizon Report (2014)	Persico, Bailey, Dagnino, Earp, Haggis, Manganello & Passarelli (2017).

Table 5 Dissertation Studies

No.	Format
3	Master: Arabul Yayla (2015); Jackson (2016); Reeves (2016); Birsen (2017); Nordengen & Brinch (2018) PhD: Martinez (2014); Fis Erumit (2016); Exton (2017); Boendermaker (2017)

3. Findings and Discussion

This section presents the findings of our review of the research on gamification, games design, education and L2. The first paragraph presents the review of selected and recent (2014-2018) studies on gamification discussing its definitions and criticisms. References to previous research have been discussed in order to provide a solid and comprehensive background. This paragraph comprises three subparagraphs where different themes that emerged from the gamification review are outlined. Specifically, the first sub-paragraph examines the enormous potential of games as motivational tools by approaching Self Determination Theory (SDT). In the following sub-paragraph, the concepts of autonomy and community are discussed with reference to SDT. The third sub-paragraph discusses the game context and feedback. Finally, the last section is dedicated to game design where game design elements, game mechanisms and strategies are outlined and discussed.

3.1 Gamification: Definitions and criticisms

The last two decades have seen the rise of digital games in the entertainment industry, popular culture and in education. Even though the story of digital games and their success is quite recent, games in general, as Seaborn and Fels (2015) reported, “have existed in human cultures since the dawn of recorded culture” being “firmly entrenched in human culture, continuing to influence our social and leisure lives on a scale unprecedented and yet historically anticipated” (p. 14). The affordances offered by digital games have promoted their use beyond the entertainment field leading to the development of gamification.

Over the years, there have been several definitions of gamification. The term appears to have been initially coined by Pelling in 2002 who described it as “applying game-like

accelerated user interface design to make electronic transactions both enjoyable and fast” (Pelling, 2011). Later on the term was applied more widely to situations where game design elements were implemented in non-game settings in order to change user behaviour. Some researchers have referred to the concept of placing a “game layer” over everything (Priebatsch, 2010), however the majority of researchers seem to agree on the definition of gamification as the use of game elements and mechanics in non-game situations in order to support and motivate users to perform tasks promoted by the services (Deterding et al., 2011; Flores, 2015; Hamari 2014; Huotari & Hamari, 2012; New Media Consortium Horizon Report 2013; Seaborn & Fels 2015; Werbach & Hunter, 2012). It is important to say that this definition includes all types of gamification, whether is intended for marketing, business, education or as an addition to games themselves. Maybe because of its extensive use and integration in fields other than the education, as Reinhardt and Thorne (2016) suggest in their paper, various scholars and game designers, among these Bogost, Schell (2011) and Robertson (2010), criticised gamification as a simplification of the game medium created by marketers and big business for the purpose of easy profit. However, many supporters of the term have highlighted in both their theoretical and empirical studies that gamification should not be considered only as an easy addition to learning which makes it enjoyable and fun, rather it should be investigated as a core medium in the educational setting that has the potential to improve learning performance (Córdova et. al., 2017; de-Marcos & Garcia-Lopez 2015; Ibanez, 2014), to attract, motivate, engage and retain users (da Rocha Seixas, Gomes et al. 2015; Ibanez, 2014; Karagiorgas & Niemann, 2017; Kuo, & Chuang, 2016; Landers, & Armstrong, 2017; Mekler, Brühlmann et al, 2017) and to improve the user experience of interactive systems in terms of design (Seaborn & Fels, 2014). As stated by Reinhardt and Thorne (2016) “much of the debate surrounding gamification revolves around terminology and the problematic definition of game, which is sometimes as much in the disposition of the players as in the rules that define it” (p. 423). In this review, the term gamification is examined and used in parallel with education in general and computer-assisted language learning and teaching in particular.

3.2 Gamification in educational settings

Werbach and Hunter (2015) differentiate between three types of gamification, specifically internal, external and behaviour-change gamification. Internal gamification targets employees, external gamification focuses on customers engagement, while behaviour-change gamification aims explore habit formation. Educational gamification systems fall into this third category. Several researchers have suggested applying game mechanics and game elements, core features of gamification, to learning. De-Marcos, Domínguez, Saenz-de-Navarrete and Page, (2014), for example, have stated that using games in education has

several advantages and game design mechanics have been demonstrated to be successful in the educational field. Based on previous literature, Lee and Kim (2015) emphasized the cognitive, emotional and social benefits of game-based techniques in education. Firstly, Lee and Hammer (2011), Stott and Neustaedter (2013) and later Dicheva and Dicev (2015), identified four game dynamics which have proven to be successful in an educational context, namely, freedom to fail, rapid feedback, progression and storytelling. According to Kapp (2016), games can be extremely useful for providing instant feedback. As a matter of fact, in class teachers can provide feedback to one student at the time and time constraints are often in place. Therefore, integrating frequent and immediate feedback found in game design may prove to be extremely beneficial. Erenli (2015) proposed the use of geolocation services for gamifying learning. Muntean (2015) proposed to design rewards that could be obtained when proper behaviour is observed in a gamified classroom. Furthermore, teachers usually present information to their students by dividing it into different categories according to difficulty levels. It may be challenging sometimes to accommodate each student's needs and in this sense, as indicated by Kyriakova and Angelova (2014), games may provide difficulty progression on an individual basis, keeping players at a particular level until they have demonstrated that they are able to pass that level and move on. Armstrong and Landers (2017) indicate that creating a narrative around a specific task may enhance motivation and engagement while other elements of game design usually applied to gamification such as leaderboards and badges encourage competition and participation while also offering a visual representation of progress (Hamari 2017). Having said that, Luma da Rocha Seixas et al. (2016) stated that "the use of gamification in education should not be restricted to giving points every time a student visualizes a lesson or delivers an assignment. It's important to highlight that the use of other gaming strategies, allows the student to awaken creativity, leave room for errors, promote the exchange of experiences collaboratively and build learning situations in which they are free to make choices" (p. 50).

Looking at future directions, very recently Sykes (2018) proposed three ideas which new research on gamification should focus on: (1) increased access to community-based games, (2) meaningful incorporation of virtual reality, and (3) increased access to commercial games. These suggestions find their roots in a previous study by the same author (2012) in which she highlighted five relevant features of games for language teaching and learning, each of which parallels best practices in second language teaching and learning:

1. There is a learner-directed goal orientation: Tasks and goals set for learning are dynamic, learner driven, and directly related to learning objectives.

2. There are opportunities for interaction with the game, through the game, and around the game.
3. And just-in-time, individualized feedback is provided.
4. The relevant use of narrative and context is important: this means the creation of a space in which context and narrative can be cultivated to create a meaningful experience.
5. Motivation is central as it is often the result of powerful learning experiences in which the players continually engage.

The positive impact of gaming in the educational sphere has been increasingly investigated since the eighties, however, this review will focus on the potential value of gamification in relation to the following aspects: motivation, autonomy and community, game context and feedback.

3.2.1 Gamification as a motivational tool to engage learners

In the educational field, games are considered an important part of the development of knowledge and play a role in the engagement of students. Gamification techniques offer the possibility of incorporating games into learning situations while promoting the engagement of students. Many studies (Borges, de-Marcos, Domínguez et al., 2014; Caponetto et al., 2014; Hamari et al., 2014; Reinhardt & Thorne, 2016; Thiebes et al., 2014) have emphasized that gamification has become an area of great interest for researchers because, among other reasons that will be discussed in the following paragraphs, it provides a valuable alternative to engage and motivate students during their learning process. Gamification uses game-thinking and playful design in non-game contexts and this may serve as an effective motivational tool to engage users.

According to the NMC Horizon Report in 2014, the motivational potential of games stems from the way “designed games can stimulate large gains in productivity and creativity among learners” (NMC Horizon Report, 2014). Furthermore, “gamification techniques are a critical set of design tools in an educator’s toolbox” (Ramirez & Squire 2014, p. 647).

The motivational aspect of games has been discussed widely in the literature and examined through different theories and approaches. Reinhardt and Thorne (2017) explain the concept of motivation in game design theory “as emerging from the balance between challenge and reward or accomplishment. Game designers try to keep players engaged by providing challenges and rewards through goal and feedback systems targeted at, or just beyond, a player’s level” (p. 426). This status or level of engagement goes back to “flow theory” proposed by Csikszentmihalyi where a feeling of mastery, complete engagement and intrinsic motivation is at the core of the activity (Shernoff & Csikszentmihalyi, 2014) and in gamification this is a means to motivate behavioural and psychological outcomes (Koivisto & Hamari 2014).

Ryan and Deci (2000) distinguished two types of motivation, intrinsic and extrinsic, in their Self-Determination Theory (SDT) recently discussed also by Mekler, Brühlmann et al. (2017). Intrinsic motivation refers to the pursuit of an activity because it is inherently interesting and enjoyable while extrinsic motivation refers to doing something because it leads to a separable outcome such as receiving rewards, and reducing pressure. SDT has been tested across a range of different disciplines (Denis & Jouvelot, 2005; Ryan et al, 2006; Ryan & Deci, 2000; Standage et al., 2005) and it has been shown that it is a highly useful theory to examine motivation in relation to games and gamification (Deterding, 2011b). It is important to recognize that “extrinsic and intrinsic factors are fluid and not necessarily preconditional, gameful activities would have learners reflect on and revisit their motivations over time. Process models of motivation implicate providing choice and agency to students, and explicitly incorporating executive processes like planning, decision-making and critical evaluation into learning activities” (Reinhardt & Thorne 2016, pp. 426-427). Several recent studies have addressed the need to evaluate empirically the impact of gamification on intrinsic and extrinsic motivation as some of the most frequently discussed, yet rarely empirically studied constructs in gamification research (Hamari et al., 2014; Mekler et al., 2017; Seaborn & Fels, 2015).

Luma da Rocha Seixas et al. in their empirical work published in 2016, present the effectiveness of gamification as a motivation and engagement tool among students in the elementary school sector. In this study, students who presented the highest levels of engagement with respect to the indicators were also those who had more badges given by the teacher and, on the contrary, those with lower levels of engagement were those with fewer badges from the teacher. Here it has been highlighted how the process of building gamification strategies must also be aligned with educational purposes and that both extrinsic and intrinsic motivation promote performance gains as well as increases in the extent and quality of effort that students put into a given task as discussed in Cerasoli et al. research (2014)

It can be said that games are typically considered to provide enjoyable, intrinsic motivation, and gamification tries to employ those characteristic of games in non-game applications. Because people may lack intrinsic motivation for non-game applications, extrinsic motivation, as seen in the form of rewards or other mechanisms, may be necessary to make them engage in the gamifying process.

3.2.2 Autonomy and community

The concepts of autonomy and community together with related concepts such as independent learning, self-direction, cooperation and co-action are at the core of discussion

on learning in general and gamification in particular. The notion of autonomy has a strong link with motivation and was introduced into L2 motivation studies mainly by Deci and Ryan (2000) with their self-determination theory. Their work highlights the importance of “a sense of personal autonomy”, which they describe as a feeling that people’s behaviour “is truly chosen by them rather than imposed by some external source”. This concept, as Benson and Voller (2014) indicate in their research, together with the concept of independence, has grown exponentially over the years, becoming mainstreamed as a key concept in educational planning.

The authors also offered a definition of a learning community as “consist[ing] of individuals who come together to accomplish a specific end or goal” (p. 70). As indicated by Thorne et al., (2012) and Reinhardt, Sykes (2014), when applied to digital gaming and L2 learning, the concepts of autonomy and community are crucial for two specific reasons: firstly, gamers are often in the position to make independent decisions when playing, secondly the use of communal resources external to the games themselves (such as dedicated blogs or social media pages) are an integral aspect to the gaming experiences. Gamers do in fact participate in online communities and produce game-related paratexts as a result. Therefore, as Chik (2014) stated in her study, “when digital gaming is a community-based activity, the autonomous learning involved will inevitably be community-based as well” (p. 87).

Chick’s empirical research (2014) discussed the concepts of autonomy and community within the digital gaming field and second language learning (L2) in East Asia. It shows that teachers and researchers should provide precise structures and guidance for young L2 learners on how to use digital games to enhance autonomy when learning. As a result, “students can be made aware that they have the ability to turn their preferred leisure activities into learning practices, and learn how to seek help from online communities” (p. 97).

3.2.3 Game context and feedback provision

According to Reinhardt and Steven Thorne (2016), “game context can be understood as the context represented by the game narratives around the rules (i.e. the context-in-the-game of abstractions), as well as the cultural and situational context of where, when, and by whom the game is played (i.e. the context-of-the-game)” (p.426). Game narratives play an essential role in enhancing cultural competence and improving participation while enhancing different language skills. Gamers and specifically students using games to learn, as they are immersed in a game context, are exposed to flow experiences (Hamari & Koivisto, 2014) which lead to positive learning outcomes (Barzilai & Blau, 2014; Hung, Sun, & Yu, 2015; Sabourin & Lester, 2014). As a consequence, Crisp (2014) suggested that learning and

gamified curricula will become more common and a way to raise engagement and flow in students. Language pedagogy informed by the principles of game design outline that “just as a game rule has no function without designed narratives, language form has no meaning without narrative context” (Reinhardt & Thorne, 2016, p. 426).

Several research studies have shown how gamification has the potential to provide immediate and effective feedback (Flores 2015; Kapp 2016; Reinhardt & Thorne, 2016) which is something that L2 instruction, for example, may not been able to provide easily . When it comes to game design, feedback can be offered through points, sounds and messages. As Reinhardt and Thorne (2016) discussed, in game contexts feedback is “instructional rather than punitive, and is formative rather than summative” (p. 425) as it is provided in a timely fashion thus giving the possibility to the players to understand the action that caused it, and it is personalized as it takes into account the feedback already provided while the quality and quantity of the feedback itself are adjusted.

3.3. Game design and game elements

As indicated in the previous sections, the main idea characterizing gamification is to use elements of game design to motivate desired behaviour in non-game contexts as essentially, anything that involves human motivation, as long as it is not already a game, can be gamified (Chou, 2015, p. 49).

Sailer, Hense, Mandl, and Klevers (2017) provided specific definitions of the terms involved in gamification, focusing first on the term “game” itself, moving then to “element” and finally “design”:

the term game is usually understood to imply the following situational components: a goal, which has to be achieved; limiting rules which determine how to reach the goal; a feedback system which provides information about progress towards the goal; and the fact that participation is voluntary. The term element helps to distinguish the concept of gamification from serious games, which describe full-fledged games for non-entertainment purposes. Gamification on the other hand refers to the explicit use of particular elements of games in non-gaming contexts. The term design refers to the use of game design instead of game-based technologies or practices of the wider game ecology. (p. 29)

Game design can be described therefore as the action of adjusting all aspects related to games while deciding what a game should be (Schell, 2014). In their work Salen and Zimmerman (2004) provided a set of game design principles that should be considered in the designing process, these include:

- Understanding systems, and interactivity, as well as player choice, action and outcomes.
- Including a study of rule-making and rule-breaking, game experience and representation and social interaction.
- Adding and focusing on the connection between the rules of a game and the play that the rules engender, the pleasures games invoke, the meanings they construct, the ideologies they embody, and the stories they tell.

Moving from those principles, researchers have focused on the identification of the different game elements and how they should be incorporated and organized together in order to obtain a successful overall game design (Reeves 2016; Schreiber & Brathwaite, 2009). On the one hand, Brathwaite and Schreiber (2009) used the term game design atoms to introduce the basic elements of games including game states, players, avatars and game bits as well as game mechanics, game dynamics, goals and themes. On the other hand, Reeves (2016) pointed out the 10 components that make a game design successful and these include: self-representations, three-dimensional environments, narrative, feedback, reputations ranks and levels, marketplaces and economies, competition under rules, teams, communication and finally time pressure.

As Mora and Riera et al. explained in their paper (2015), after having organized and integrated game elements into game design fundamentals what should follow is a standardized structure that bring them together into a framework. However, it has been stated that game design is such a flexible process that it does not always need to fall into a precise framework (Gavillo-Gamez, 2010; Julius & Salus, 2013). Having said that, a set of conditions such as interface design pattern, dynamics, design and heuristic principles should be met in the designing process in order to have a positive playing experience (Gavillo-Gamez, 2010) as confirmed also by Detering et al (2011) who indicate that a global set of components necessary is necessary in game design to reach *gamefulness*, namely, game interface design patterns, game design patterns and mechanics, game design principles and heuristics, game models and game design methods.

3.3.1 Game elements

Game elements are the core ingredients of gamification as they are the specific components through which the agency of a game can be constructed and/or analysed. There have been several attempts to create comprehensive lists of game elements that can be applied to gamification (Kapp, 2012; Robinson & Bellotti, 2013; Sailer et al, 2017; Werbach and Hunter, 2015; Zichermann, G., Cunningham, 2011). Typical game elements or “components”, as described in some cases, include badges, leaderboards, progress bars, performance graphs, quests and avatars. Kapp (2002) suggest a list where typical game elements include

goals, rules conflict, competition, cooperation, time, reward structures, feedback, levels, storytelling, curve of interest and aesthetics whereas other authors like Robinson and Bellotti (2013) provide detailed lists of elements with their functions in various gamification settings. As indicated by Sailer et al. (2013), it is important to understand that “different authors follow distinct strategies in their attempts to create such lists. One is to create liberal sets of elements found in any game. Another strategy is to provide a constrained set of elements, which are unique to specific games” (p. 30).

This research proposes a wide list of game elements used in gamification design and related definitions in accordance with the literature reviewed here (see Table 6) with the aim of being as exhaustive as possible.

Game Components	Definitions
Avatar	Visual representation of a player or alter ego.
Badges	Visual representations of achievements
Boss fights	Particularly hard challenges at the culmination of a level
Collection	Set of items or badges accumulated
Combat	A defined battle, typically short-lived
Content-unlocking	Elements available only when players reach objectives
Gifting	The opportunity to share and give items within a game to other players as a reward or as part of a specific team strategy
Leader boards	The ranking of players based on the number of points they have been awarded
Levels	A section or part of the game outlining the number of points a player has. As a player progresses, the levels become increasingly difficult.
Points	Numeric accumulation awarded for certain activities
Progress bar	Shows the status of a player
Quests	Specific tasks player have to complete in a game
Social elements	Relationship with other players within the game
Social Graphs	Representation of player’s social network within a game

Teams	Group of players working together to reach common goals
Virtual goods	Items that can be purchased by performing specific tasks within a game

Table 6 Game components and related definitions according to the literature analysed

Werbach and Hunter (2015), being game players themselves, took the elements that they consider to be the most important from their own experience of game playing and provided a comprehensive description of the key elements of games organizing them into three distinct categories: **Dynamics**, **Mechanics** and **Components**. Structured as a pyramid, Components are the base, Mechanics in the middle and Dynamics at the top (see **Fig. 4**).

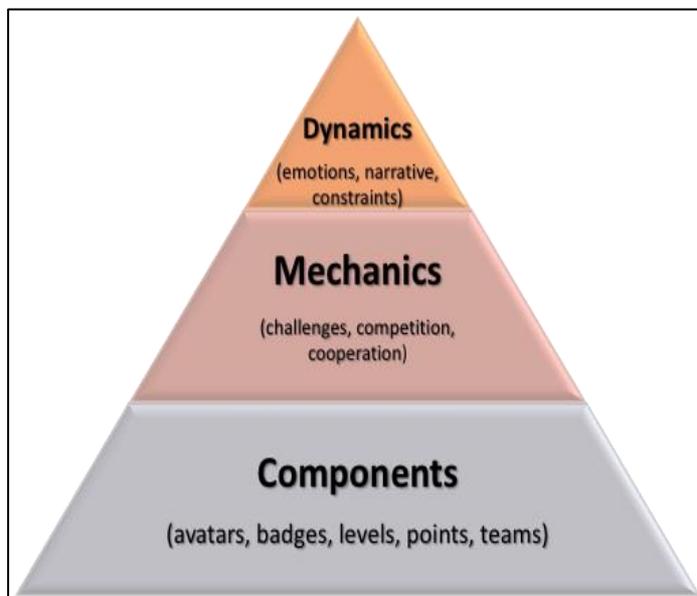


Figure 4 Categories of game elements (Werbach & Hunter, 2015)

Components are the base of the pyramid and they make up the largest group of game elements. They are the least abstract among the three categories presented and they lead to the tools that can be used to integrate gamification into the field of interest (see Table 6).

Mechanics are the basic processes that guide users to engage with the content while continuing to drive the action forward. Specifically, the mechanics elements include challenges, chance, competition, cooperation, feedback, resource acquisition, reward system, transactions, turns, and win Sstates. Table 7 provides a list of game mechanics and related definitions based on Werbach and Hunter work (2015).

Game Mechanics	Definitions
Challenges	Tasks presented that prompt the player to generate a solution.
Chance	Element(s) of possibility/randomness in a game.
Competition	Intuitive mechanic where one player (or a team) wins whether another (or a team) loses.
Cooperation	Player(s) who works best together to achieve a specific goal within a game.
Feedback	Providing information on how a player is performing.
Resource Acquisition	Acquiring useful or collectible items as the player progresses.
Reward system	System to motivate player to accomplish a quest.
Transactions	Trades between users, (they can be either direct or through an intermediary).
Turns	Sequential participation of players.
Win States	Objectives that make one player the winner (Note that it is also possible to have Draw and Loss states).

Table 7 Game mechanics and related definitions based on Werbach and Hunter (2015)

Finally, dynamics represent the most high-level conceptual elements in a game. There are five dynamics elements: constraints, emotions, narrative, progression, and relationships and these elements must be considered and managed when developing a gamified system.

Dynamics elements constitute the abstract notion of a game and when they are included in the design process, gamification occurs naturally. Table 8 provides a list of game dynamics and related definitions based on Werbach and Hunter work (2015).

Game Dynamics	Definitions
Constraints	Limitations or trade-offs that need to be considered when designing a game.
Emotions	Feelings that drive the interaction and engagement with a game.
Narrative	Storyline characterizing a game.
Progression	Growth and development of a player navigating a game.
Relationships	Social interactions that occur when games are played.

Table 8 Game dynamics and related definitions based on Werbach and Hunter (2015)

4. Limitations of the current research

As Hanu and Fox (2014) pointed out, the number of studies examining the benefits of gamification are considerable (Dicheva & Dicev, 2015; Kapp, 2016; Lee & Kim, 2015; Stott & Neustaedter, 2013), however, empirical research on the effectiveness of gamification into educational practice is still limited. In addition, the current research is limited in terms of the provision of empirical data and analysis relating to the usefulness of particular game elements. As Seaborn and Fels (2015) have indicated in this respect, "Since gamification in action is defined by applying a limited number of game elements to an interactive system, future research should aim to isolate the most promising and least promising game elements in particular contexts for particular types of end-users" (p.29).

5. Limitations of this review

In this literature review, only studies specifically concerned with gamification and education have been selected and examined. As a consequence, this review is limited with regards to reporting research that has been conducted on other subjects related to gamification (such as gamification and business or gamification and behaviour).

There have been studies approaching gamification using a similar meta-analysis method (Borges; de-Marcos, Domínguez et al. 2014; Caponetto, 2014; Hamari, 2014), however, this study focuses on very recent literature on gamification and education which have not been covered by previous studies. As a consequence, this study aims to serve as a continuum to previous studies while contributing to further research. Because of timeline constrictions, this study has presented a selected number of both theoretical and empirical studies, thus further research may be needed to expand the analysis further.

6. Gamification and SLA

The aim of this research is to investigate systematically the using of digital gamification for foreign language teaching/learning in 3D virtual learning environments. In this respect, sub-problems of the research have been identified as follows:

1. What is the distribution of research on digital gamification by year?
2. What is the distribution according to research topics?
3. What is the distribution according to the research methods used?
4. What is the distribution according to the data collection tools used?
5. What is the distribution according to selected sample levels?
6. What is the distribution by sampling methods?
7. What is the distribution by sample size?
8. What is the distribution according to data analysis methods?

A total of 40 publications that fell within the scope of the research were examined. Gamification, Second Life, 3D virtual learning environments and/or language learning, and second language acquisition key words have been used to identify research in the following databases, Ebsco, Google Scholar and Proquest.

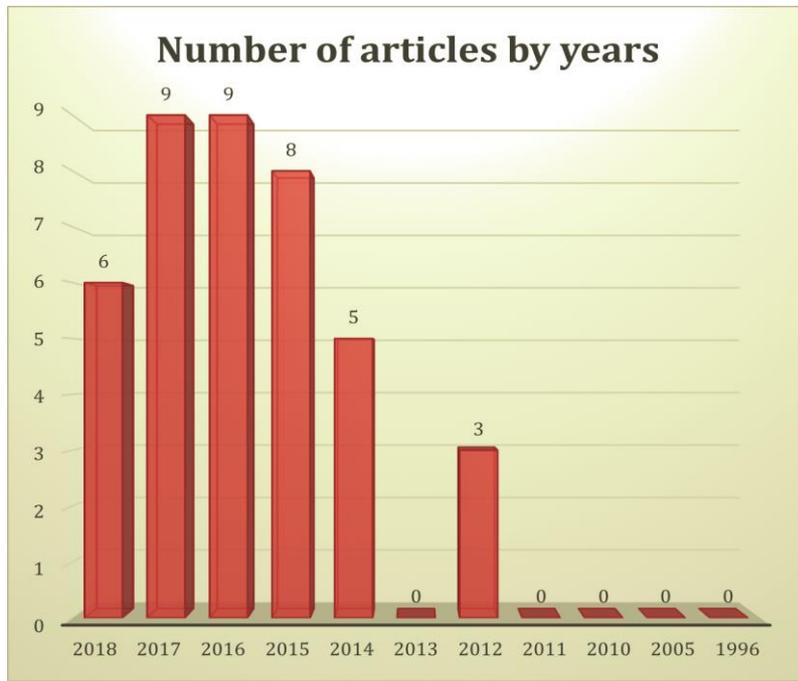


Figure 5 Number of articles published by year

The distributions of the reviewed studies by years are shown in Figure 5. When Figure 5 is examined, it is seen that the highest number of studies were published in 2016 (23%, $f = 9$) and 2017 (23%, $f = 9$). The year 2018 is not yet complete but it is expected that the number of studies for this year will increase. It is noteworthy that the number of research papers has increased in recent years as has the number specifically addressing digital gamification in 3D virtual learning environments.

The distribution of the research according to the subjects they focused on is presented in Figure 6.

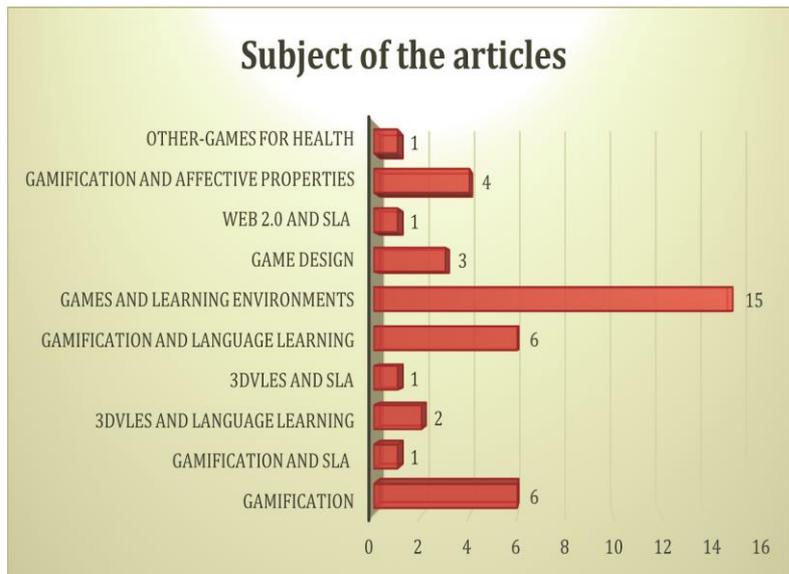


Figure 6 Subjects of the articles

When the topics where research intensify are examined, it is observed that the using of games in learning environments seems to be studied more (%38, f=15). Especially in recent scientific studies, it is understood that the emphasis is placed on the using of the game in learning environments. Besides it can be said that the studies carried out in the subjects of gamification and gamification on language learning are also of some volume.

The distributions of the research methods used in the reviewed studies are shown in Graph 3.

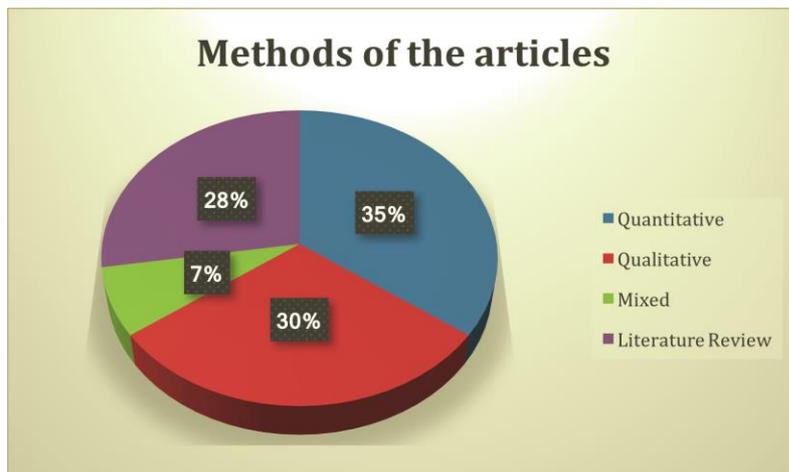


Figure 7 Methods of the articles

Examining the research more carefully it can be seen that it mainly consisted of quantitative studies (35%, n=14), qualitative studies (28%, n=11) and meta-analysis (28%, n=11). It is evident that most of the quantitative research included semi-experimental studies (57%, n=8), qualitative research included case studies (75%, n=9) and the meta-analysis included

literature reviews (73%, n=8). The distributions of the data collection tools used in the examined studies are presented in Figure 8.

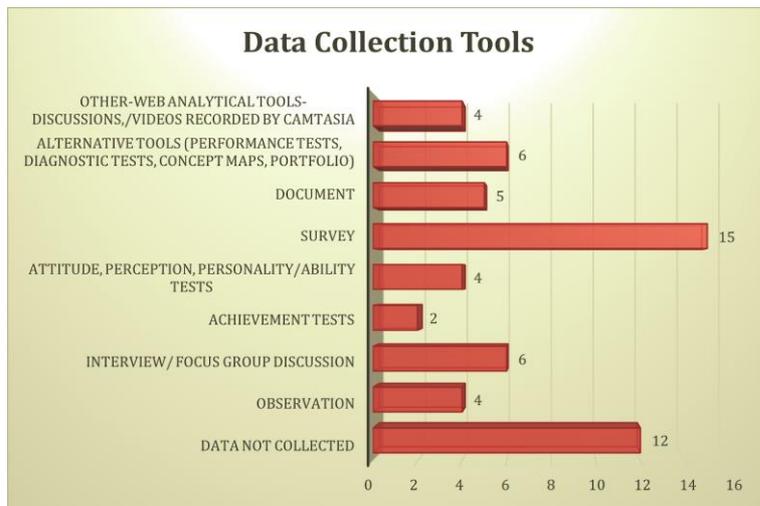


Figure 8 Data Collection Tools

It is evident that no data collection tool was used in 12 studies. The most frequently used data collection tool was the survey (38%, n=15). Questionnaires were used intensively as data collection instruments (Bozkaya, Aydın ve Kumtepe, 2012; Karataş, 2014; Palvia, Pinjani ve Sibley, 2007) along with interviews and focus group discussions (15%, n=6) and alternative tools such as concept maps, portfolios and performance tests (15%, f=6) were also quite popular.

The distributions of the reviewed studies according to selected sample levels are presented in Figure 9.

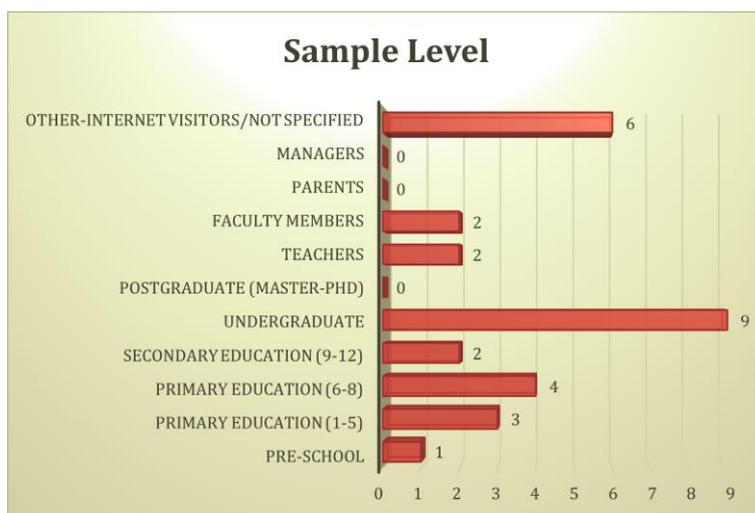


Figure 9 Sample Levels

Most studies were conducted on undergraduate students (23%, f=9) (Bozkaya, Aydın ve Kumtepe, 2012; Hwang ve Wu, 2012; Karataş, 2014).

The distributions of the reviewed studies according to selected sampling methods are presented in Figure 10.

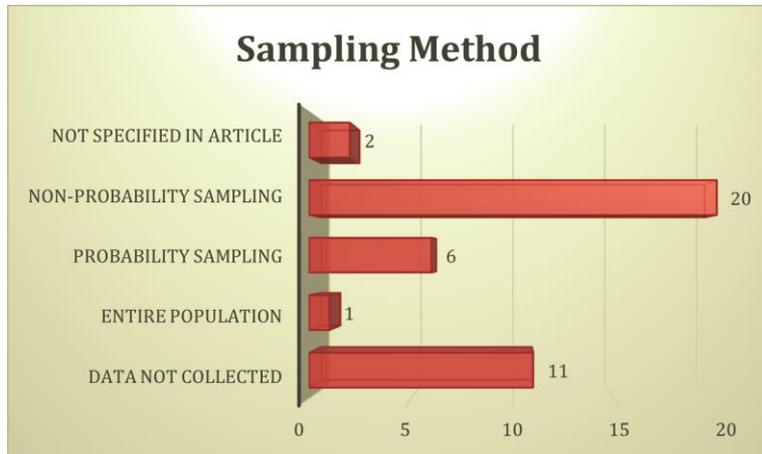


Figure 10 Sampling Method

In a significant portion of the reviewed studies non-probability sampling was used (50%, n=20). The distributions of the reviewed studies according to number of samples are presented in Figure 11.

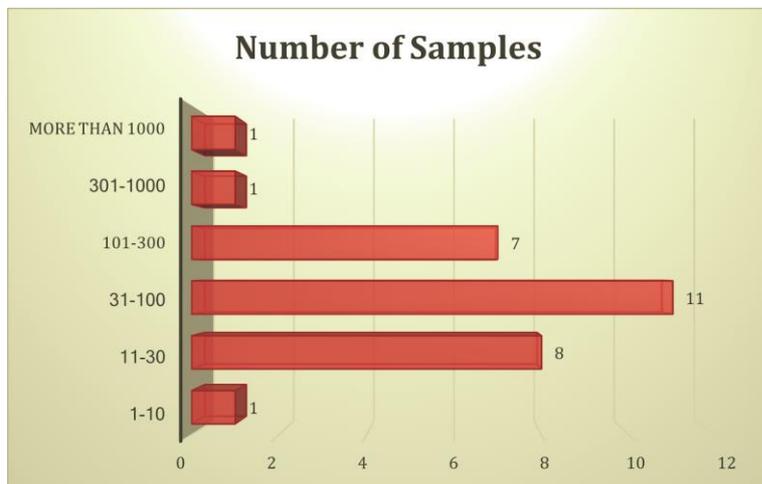


Figure 11 Number of Samples

When the studies are examined according to the sample sizes, it is seen that sample sizes smaller than 100 and larger than 30 were preferred (28%, n=11). It is thought that the preference of sample sizes larger than 30 may be related to the availability of parametric tests in data analysis.

The distribution of the reviewed studies according to data analysis methods are presented in Figure 12.

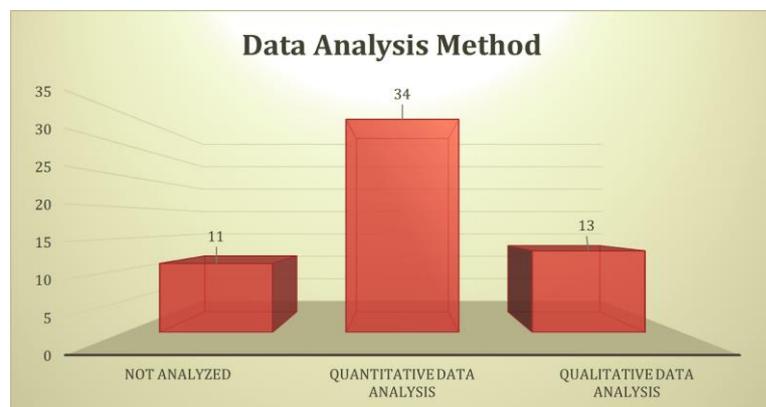


Figure 12 Data Analysis Method

No data analysis was performed in 11 of the reviewed studies. In other studies, it is understood that the quantitative analysis techniques were much more intensively used (85%, $n=34$). Among the descriptive statistics used, frequency and percentage (23%, $n=9$) were the most frequently used, and ANOVA/ANCOVA (18%, $f=7$) were the most used in inferential statistics.

6.1 3DVLEs and language learning

Language learning requires learners to be exposed to rich, comprehensible, varied and compelling (Krashen, 2014) linguistic input. The learners need to exploit the foreign language in social, authentic and meaningful contexts to individually and autonomously negotiate meaning, to produce comprehensible output. Not only grammatical competence but intercultural and pragmatic competences need to be employed in the learning of the target language (Ellis, 2005)

Research suggests that both the nature of games and the elements that make games fun are intrinsically motivating (Adams et al., 2012). A constructivist approach to game-based learning has pointed out that the Social Play Continuum (Broadhead, 2006) concurs with Vygotsky's Zone of Proximal Development "by depicting a progression of social development through play" (Liu, Yuen & Rao, 2015, p. 11) providing a framework in which games can be used to develop social competence and social status (Liu, Yuen & Rao, 2015). Research also provides evidence that game-based learning improves competencies such as critical thinking and decision-making, problem-solving, conflict-resolution and communication skills (Cordova et al., 2017).

In her review of digital games and language learning Sykes (2018) concluded that studies have examined both game-enhanced learning (e.g., through the use of commercial,

off-the-shelf games) and game-based learning (e.g., though the use of digital games built explicitly for the teaching and learning of world languages) and have shown that digital games support learning in a variety of areas. Benefits include the creation of a learning community (e.g., Bryant, 2006; Peterson, 2012; Reinhardt & Zander, 2011), the opportunity for intercultural learning (e.g., Thorne, 2008), access to a diversity and complexity of written and spoken discourse (e.g., Liang, 2012; Thorne, Fischer, & Lu, 2012), access to authentic texts (Reinhardt, 2013; Squire, 2008), evidence of authentic socioliteracy practice (Steinkuehler, 2007; Thorne, Black, & Sykes, 2009), and affordances for the sociocognitive processes of learning and language socialization (e.g., Piirainen-Marsh & Tainio, 2009; Zheng, Young, Wagner, & Brewer, 2009), especially of lexis (e.g., deHaan, Reed, & Kuwada, 2010; Hitosugi, Schmidt, & Hayashi, 2014; Neville, 2010; Purushotma, 2005; Sundqvist & Sylvén, 2012).

6.2 Affordances and challenges of gaming in 3DVLEs

In the game design arena, Lazzaro (2005) identified four keys to unlocking players' emotions: 1) providing opportunities for challenge, strategy, and problem-solving (hard fun); 2) introducing elements that foster mystery, intrigue, and curiosity (easy fun); 3) leading players to excitement or relief moods (altered states); and 4) promoting competition and teamwork (people fun). On the other hand, LeBlanc (2000) organised the types of player pleasure into eight categories: sensation, fantasy, narrative, challenge, fellowship, discovery, expression, and submission as cited by Schell. Successful game use, according to LeBlanc, found ways to balance combinations of these categories effectively.

In this respect, Van Eck (2006) asserts that "games embody well-established principles and models of learning. For instance, games are effective partly because the learning takes place within a meaningful (to the game) context." This is called situated cognition where the learner takes the environment in which the learning takes place into account. Researchers have also pointed out that play is a primary socialization and learning mechanism common to all human cultures. Games provide modelling and play strategies in learning and thus help the learners. Interacting within games requires a constant cycle of hypothesis formulation, testing, and revision. This happens very quickly during gameplay and feedback is constant as well.

On the other hand, to facilitate foreign language learning, 3D VLEs bring new opportunities to the field, as Warburton (2009, p. 421) indicates, in that VWs and SL enable 1) "*Exposure to authentic content and culture*", which could facilitate also the exposure to authentic language; 2) "*Visualization, contextualization and simulation: the production and reproduction of inaccessible content*" in real life, which could facilitate the comprehensible and compelling input; 3) "*Extended or rich interactions, identity play and community*

presence: opportunities for social interaction between individuals and communities, human-object interaction and also intelligent interaction between artefacts”, which could help learners use the language for negotiation of meaning; 4) *“Immersion in a 3D environment where the augmented sense of presence, through virtual embodiment in the form of an avatar and extensive modes of communication, can impact on the affective, empathic and motivational aspects of the experience”*, thus could enable learners to experience the language in its very authentic and natural environment; 5) *“Content production: opportunities for creation and ownership of the learning environment and objects within it that are both individual and owned”*, this could help learners with the personalization of the communication and autonomy in learning the target language. When these affordances are integrated into games and the affordances of games, the games in 3D VLEs may become an invaluable tool for language learning.

However the use of games in 3D VLEs for learning languages do not come without its drawbacks. Van Eck (2006) posits that “DGBL approach is clearly the future of DGBL , we are not likely to see widespread development of these games until we demonstrate that DGBL is more than just a fad and until we can point to persuasive examples that show games are being used effectively in education and that educators and parents view them as they now view textbooks and other instructional media” (pp. 22). The summary of the drawbacks for using games in 3D VLEs for learning are as follows:

- Choosing a suitable game
- Aligning the game with the curriculum
- Aligning the game with the content
- Designing and evaluating the game
- Institutional IT support
- Documentation and training support
- Technical support
- Financial support
- Infrastructure support
- Research and development support

On top of these challenges teachers also have to deal with drawbacks of 3D VLEs.

Warburton (2009), for example, reports on a survey of newsgroups, blog posts and the extant literature from Warburton and Perez-Garcia (2010, pp. 422-423) which discovered eight broad categories of issues: 1) technical, 2) identity, 3) culture, 4) collaboration, 5) time, 6) economic, 7) standards, and 8) scaffolding persistence and social discovery. *Technical issues* are either computer related like bandwidth, hardware and firewalls or server issues like down time and lag, or use-related issues like navigation, creating objects, manipulating one’s avatar. *Identity issues* concern freedom to play with identity and manage reputation

can become an issue of concern, and accountability for actions becomes displaced. *Culture issues* involve sets of codes, norms and etiquette for joining communities. *Collaboration issues* relate to the need to build trust and authenticity while cooperating and co-construction and because of a minimal social network scheme within the virtual learning environments, external services such as wikis, blogs or a virtual learning environment (VLE) are often needed to support the interactions between avatars. *Time constraints* could occur by validating, running and teaching activities. Checking object permissions, intellectual property rights and accessibility also requires a lot of time. *Economic issues* involve costs. Even though the basic account to access Second Life is free, anything else costs money like buying land to build and create teaching spaces or uploading images and textures. *Standardization* is a problem in that there is no interoperability between various virtual platforms, yet. *Scaffolding persistence* and *social discovery issues* like each avatar remains trapped at the center of its own community and in-world profiles associated with each avatar provide a limited mechanism for the social discovery of other people, unlike other social networking services.

6.3 3DVLEs: Current trends and initiatives

It is clear that 3D Virtual Worlds have gained popularity in the recent years. The use of 3D virtual learning environments has also extended variation in the online and distance education. Another remarkable concept that influences the current educational practices is gamification. Games have been influential in creating relaxing and motivational contexts that facilitate learning. Playing with educational content scaffolds learners to construct knowledge, enables better retention of knowledge, creates the necessary social environment for learning, and helps in application of that knowledge in novel situations. Thus, using educational games that are designed in 3D virtual learning environments with learners in various levels and educational contexts is also gaining prominence.

Creating games for users of such environments is another main concern of this study. The term gamification is taking over in the education field as well. Designing games for such 3D virtual worlds is actually extending the possible uses of those virtual environments. Through educational games or game-like applications these virtual worlds could be exploited much better by learners and by educators. Given the interest of the students towards games in real life, this aspect could be transferred into education through these new environments. Game designers are working very hard to employ principles to engage and keep children on games, the very principles could be used by educators for engaging and keeping learners involved with learning. In this context, Gee (2003) states that "Education researchers are now seeking to understand these principles, so that they can understand how to make education more effective". Jahson et al. (2005) also contends that

“there is increasing interest in serious games, programs that obey solid game design principles but whose purpose is other than to entertain, e.g., to educate or train”.

Games or game-like applications that were created in 3D environments could enable learners to immerse in play individually or together in collaboration. The contexts in which 3D games could be used varies according to the need and interest of the learners. For instance, vocabulary games or game-like games like role plays with avatars could be used for foreign language learning. Rankin et al. (2006) support that “game play experiences foster learning in the virtual world as players accomplish game tasks”. Other educational games could be designed and used for learners with other specific areas like mathematics or science education.

Gamification has been defined as ‘the use of game design elements in nongame contexts’ (Deterding et al., 2011, p. 9) and has been applied to different contexts such as business, health care, and education. Although gamification is not limited to the use of technology-driven games for educational purposes (for example educational video games in the shape of serious games) video games account for a high percentage of all gamification efforts in education. Van Eck (2006) summarizes the use of video games in education in three main strategies: a) the use of commercial off-the-shelf videogames (COTS) that take advantage of the existence of contents in these games that can be used for educational purposes, b) the use of serious games –a type of video games developed with non-recreational purposes where learning is the primary goal, and c) to make students build their own games allowing the development of problem-solving abilities, programming skills and game design skills.

7. Conclusion

This review found that empirical research is still limited when it comes to analysing the effectiveness of gamification in educational settings and practices. Many empirical gamification studies focus in fact on the usefulness of specific game elements in particular learning contexts (Dicheva, Dichev, Agre, & Angelova, 2015), however, the scope of the elements being explored is still limited (points, badges or levels, leaderboards), as well as the relation to specific theories (SDT, for example). Further research is indeed to address the most and least effective game elements and their implementation in relation to specific contexts and end-users (Seaborn and Fels, 2015).

In addition, research analysing students’ attitudes towards gamification in online learning environments is still limited. As Ortiz, Chiluiza and Valcke (2016) pointed out, there is a lack of validated psychometric measurements created according to rigorous research methodologies. In relation to game design, further research should be conducted to understand how gamification design elements and methods function and how they interact

with individual dispositions, situational circumstances, and the features of particular target activities, as indicated also by Hamari et al. (2016). In relation to this, empirical research studies are needed to inform both theories and practices.

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Appendix I Summary of the studies analysed on Gamification and SLA

Publication	Subject of the article	Empirical study	Non-empirical study	Methodology	Participants/Sample	Target Language/s
Lan, Fang, Legault, & Li, (2015)	Games and Learning Environments	Empirical		Quantitative (experimental)	n.31 (undergraduate students)	Mandarin Chinese
Young , MF, et al., 2012	Games and Learning Environments		Non-empirical	Literature Review (content analysis)	300+ articles analysed	n/a
Udjaja, & Sari, (2017)	Games and Learning Environments	Empirical		Qualitative (experimental)	n.16 (lectures, undergraduate students and college students)	Indonesian as first language + English as FL
Wang & Vásquez, (2012)	Web 2.0 and SLA		Non-empirical	Literature Review (meta-analysis)	85 articles analysed	n/a

Sykes, (2018).	Gamification and Language Learning		Non-empirical	Literature Review	Not specified	n/a
Si, (2015)	3DVLEs and SLA	Empirical		Quantitative (experimental)	n.20 Primary Education students (6-8 years old)	Mandarin Chinese
da Rocha Seixas, Gomes, & de Melo Filho, (2016)	Gamification	Empirical		Quantitative + Qualitative (triangulation)	n.61 Primary Education students (8 years old)	n/a
Seaborn, & Fels, (2015)	Gamification		Non-empirical	Literature Review	n.60 articles analysed (over n.769 search results)	n/a
Homer, Hew & Tan, (2018).	Gamification and SLA	Empirical		Quantitative (experimental)	n. 120 Primary Education students (age range 6-11)	Chinese as first language)+ English as FL
Rieber, (1996)	Games and Learning Environments		Non-empirical	Literature Review	Not specified	n/a

Rawendy, Ying, Arifin & Rosalin, (2017)	Gamification and Language Learning	Empirical	Quantitative (experimental)	n. 30 Primary Education students (age range 6-12)	Chinese
Parreno & Mas, (2016)	Gamification and Learning	Empirical	Quantitative (non-experimental, scanning)	n.98 teachers serving in higher education	n/a
Pasfield-Neofitou, Huang & Grant, (2015)	3DVLEs and Language Learning	Empirical	Qualitative (n. 2 case studies)	Case study 1: n. 14 higher education students (age range 18-45) Case study 2: n. 11 higher education students (age range 18-25)	Chinese
Mekler, Brühlman, Tuch, & Opwis, (2017)	Gamification and Learning	Empirical	Quantitative (true-experimental)	Between 100-300 participants (age range 17-68)	n/a
de-Marcos, Garcia-Lopez, & Garcia-Cabot (2016).	Games and Learning Environments	Empirical	Quantitative (quasi-experimental research)	n.379 undergraduate students	n/a

Lu & Kharrazi, (2018)	Games for health		Non-empirical	Literature Review (content analysis)	n. 1743 health games analysed	n/a
Landers, & Armstrong, (2017)	Games and Learning Environments	Empirical		Quantitative (quasi-experimental research)	n.262 undergraduate students	n/a
Kuo, & Chuang, (2016)	Gamification	Empirical		Quantitative +Qualitative (triangulation)	n. 31-100 faculty members + internet visitors	n/a
Kuhn & Stevens, (2017)	Game design	Empirical		Qualitative (case study)	n. ? Language teachers	
Ku, Huang & Hus, (2015)	Games and Learning Environments	Empirical		Quantitative (quasi-experimental research)	n.31-100 students (10-11 years old)	Chinese
Koivisto & Hamari, 2014)	Gamification	Empirical		Quantitative (non-experimental, comparative and correlational)	n. 195 responses gathered through a discussion forum	n/a

Kayımbaşıoğlu, Oktekin & Hacı, (2016)	Games Design and Learning Environments	Empirical		Quantitative (pre-experimental)	n.60 pre-school students (5 years old)	n/a
Jee, (2014)	3DVLEs and Language Learning	Empirical		Qualitative (Case Study)	n.34 higher education institute	English
Jackson, (2016)	Games and Learning Environments		Non-empirical	Literature Review	Not specified	n/a
İliç & Arıkan, (2016)	Gamification and Language Learning	Empirical		Qualitative (Case Study)	n.24 undergraduate students	English
Ibáñez, Di-Serio & Delgado-Kloos, (2014)	Games and Learning Environments	Empirical		Quantitative +Qualitative (explanatory)	n. 22 undergraduate students	(C-programming language)
Hanson-Smith, (2016)	Games and Learning		Non-empirical	Literature Review	Not specified	n/a

Gafni, Achituv & Rahmani,(2017)	Games and Learning Environments	Empirical		Quantitative (quasi-experimental research)	n. 107 secondary education students	English and French as foreign languages
de Freitas, (2018)	Games and Learning Environments		Non-empirical	Literature Review (grounded theory)	Not specified	n/a
Flores, (2015)	Gamification and Language Learning		Non-empirical	Literature Review	Not specified	n/a
Dickey, (2015)	Games and Learning Environments		Non-Empirical	Literature Review	Not specified	n/a
Galbis Córdova, Martí Parreño & Currás Pérez, (2017)	Gamification and Learning	Empirical		Quantitative (non-experimental, scanning)	n. 128 undergraduate students	n/a
Amoia, et al. (2012)	Game design	Empirical		Quantitative (experimental)	French speakers (n. not specified)	French

Uusi-Mäkelä, (2015)	Gamification and Language Learning	Empirical	Quantitative + Qualitative (case study, triangulation)	n. 19 secondary education students	English
Slovak, Salen, Ta, & Fitzpatric(2018)	Games and Learning Environments	Empirical	Qualitative (case study)	Students 8-13 years old (n. not specified)	n/a

Appendix II List of key definitions in relation to the GUINEVERE project

- Game: “the term game is usually understood to imply the following situational components: a goal, which has to be achieved; limiting rules which determine how to reach the goal; a feedback system which provides information about progress towards the goal; and the fact that participation is voluntary” (Sailer, Hense, Mandl, and Klevers, 2017, p. 29).
- Game context: “game context can be understood as the context represented by the game narratives around the rules (i.e. the context-in-the-game of abstractions), as well as the cultural and situational context of where, when, and by whom the game is played (i.e. the context-of-the-game)” (Reinhardt and Steven Thorne, 2016, p.426)
- Gamification: “game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems” (Kapp, 2012, p. 42)
- Serious games: “games designed for a specific purpose related to training, not just for fun. They possess all game elements, they look like games, but their objective is to achieve something that is predetermined” (Kiryakova et al., 2014, p. 1)
- Game element: “The term element helps to distinguish the concept of gamification from serious games, which describe full-fledged games for non-entertainment purposes. Gamification on the other hand refers to the explicit use of particular elements of games in non-gaming contexts” (Sailer, Hense, Mandl, and Klevers, 2017, p. 29).
- Motivation in game design theory: “[it is] emerging from the balance between challenge and reward or accomplishment. Game designers try to keep players engaged by providing challenges and rewards through goal and feedback systems targeted at, or just beyond, a player’s level” (Reinhardt and Thorne, 2017, p. 426).
- Models of motivation: Process models of motivation implicate providing choice and agency to students, and explicitly incorporating executive processes like planning, decision-making and critical evaluation into learning activities” (Reinhardt & Thorne 2016, pp. 426-427)
- VLE: “virtual environment that is based on a certain pedagogical model, and incorporates or implies one or more didactic objectives, provides users with experiences they would otherwise not be able to experience in the physical world and redounds specific learning outcomes” (Mikropoulos & Natsis, 2011, p.769).
- 3DVE: “[is an environment that] capitalizes upon natural aspects of human perception by extending visual information in three spatial dimensions,

may supplement this information with other stimuli and temporal changes [and] enables the user to interact with the displayed data” (Wann & Mon-Williams, 1996, p. 833).