Digital Gamification in Secondary Education: a systematic review

Gamificación Digital en la Educación Secundaria: una revisión sistemática

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RESUMEN

Introducción: La Gamificación Digital está tomando cada vez más protagonismo en las aulas de Educación Secundaria. Este estudio ofrece una revisión sistemática de la literatura científica publicada sobre la temática. **Metodología:** Se analizaron las bases de datos de la *Core Collection* de la *Web Of Science* y de *Scopus*. Tras una criba en función de los criterios de inclusión y exclusión establecidos, se analizó una muestra de 29 artículos. En el análisis se tuvieron en cuenta tanto las principales características bibliométricas de la producción científica como las categorías emergentes. **Resultados:** Se observó que la mayoría de la producción científica tiene una naturaleza empírica siguiendo tres patrones temáticos: el estado actual de la Gamificación Digital en la Educación Secundaria; los beneficios que esta comporta; y las propuestas de aplicación y/o mejora. **Conclusiones:** Incluir la Gamificación Digital en la Educación Secundaria presenta múltiples beneficios, pero requiere de la complicidad de todo el profesorado y una amplia comprensión por parte del alumnado.

PALABRAS CLAVE: gamificación; competencia digital; educación secundaria; revisión bibliográfica; tecnología educativa; motivación; emociones.

ABSTRACT

Introduction: The use of Digital Gamification is increasingly popular in High Schools. This study offers a systematic review of the published scientific literature on that subject. Methodology: We analyzed the databases of the Core Collection of the Web of Science and Scopus. A sample of 29 articles was analyzed after a screening based on inclusion and exclusion criteria established. The analysis took into account both the main bibliometric characteristics of scientific production and the emerging categories. Results: It was observed that most of the scientific production has an empirical nature following three thematic patterns: the current state of Digital Gamification in High School; the benefits that this entails; and the proposals for application and/or improvement. Conclusions: Including Digital Gamification in High School has multiple benefits, but it requires the complicity of all teachers and a broad understanding by students.

KEYWORDS: gamification; digital competence; high education; literature review; educational technology; motivation; emotions.

CONTENIDO

CONTENT

Translation by **Paula González** (Universidad Católica Andrés Bello, Venezuela)

1. Introduction

Digital Gamification is a widespread practice among adolescents today. The spectacular increase in its use, the expansion of formats, the proliferation of Wi-Fi networks and smartphones, as well as its variety of possibilities, platforms, and resources make digital gaming a tool with great potential (O'Riley, 2016). Among its uses, beyond fun and entertainment, are didactic apps and their use in Secondary Education (SE from here on) as an educational complement or to increase the motivation of students in the face of certain content that can be complex and boring. Their implementation in educational settings promotes the teaching of content, as well as the development of abstract thinking and argumentation, promoting the development of multiple skills from a didactic and playful dimension (Herrero et al., 2020). Learning based on digital games, besides providing opportunities to improve learning, also allows students to develop information and communication technology (ICT) skills (Samaniego Erazo et al., 2015; del Blanco et al., 2010).

The relevance of the theme rests on the pedagogical approaches that see in games a way, if not the way par excellence, to learn. These approaches have their roots in the pioneering work of Piaget, Vygotsky, and Montessori (Lohmann, 1988), among others, on the role of play in the development of the individual and learning, and maintain their renewed strength in the hands of pedagogies centered on the student which defend that meaningful learning at its best must be: autonomous and self-directed; experimental; relevant and goal-directed, and heuristic (Knowles, 1990). According to Gee (2003), digital games, by their very nature, provide high-quality learning, teaching players numerous skills through play, although the content is not necessarily of a traditional educational nature. In this way, digital games provide effective learning in three areas: empowerment, problem-solving, and

understanding (Gee, 2003). Likewise, parallel to this development of video games, there has been a growing interest in exploring their impact on education, as well as the advantages and risks that their possible use in school learning entails. Despite the considerable volume of publications on the subject, the controversy between supporters and detractors of the use of digital games as a means of learning remains open. The persistence of the controversy must be found in the fact that the knowledge of the effect of digital games on student learning is still very limited, especially in the case of non-university education (O'Riley, 2016).

Given the multitude of offers and experiences linked to digital games, it is essential to know the most recent background and the findings that guide the future and help overcome existing limitations. Thus, a systematic review of this topic would allow us to synthesize the contributions within this field of knowledge (Siddaway et al., 2019).

Thus, this article aims to analyze the possibilities of the use of digital games in SE based on the results of the works published in the last decade in the scientific databases of Scopus and the Core Collection of the Web of Science. We defend that a systematic review of the studies on the role and functions of digital gamification in the SE environment is essential for the following reasons. In the first place, since the academic focus on Digital Gamification in Secondary Education (DGSE from here on) has increased considerably in recent years, due to the successive digital and pedagogical technological transformations and the growing calls for greater ICT literacy in students (Samaniego Erazo et al., 2015), we denote a growing need to systematize and provide a global vision of the findings and different research currents in this regard. On the other hand, given the multiple research communities focused on shedding light and dealing with the problems posed by the main pedagogical, social, and technological challenges of the DGSE, the need arises to research their study traditions and provide lines of research that address methodological and thematic shortcomings that may have been overlooked. The objective of this work is to delve into these research gaps and provide a holistic view of the current state of research on digital gamification in the field of SE. From here arise the two research questions that will be answered in detail in the results section: What are the main characteristics of the studies that analyze the DGSE? And what are the main themes and thematic patterns of the studies that analyze the DGSE? Finally, it is hoped that this review will contribute to future research in this field.

2. Methodology

2.1. Sample selection

The articles analyzed in this bibliographical review have been compiled through a systematic search in two different databases, following the guidelines of the PRISMA methodology, which were established to retrieve relevant articles and "improve the transparency, precision, integrity, and frequency of the documented systematic review and meta-analysis protocols" (Shamseer et al. 2015, p. 1). The bibliographic search was carried out in February 2022 using the Scopus and Core Collection of the Web of Science databases, commonly used in the field of scientific communications. Although digital gamification research began decades ago, articles published since 2010 were selected because we are interested in providing an up-to-date perspective on how digital gamification has evolved in the Secondary Education environment, including research trends in digital gamification in recent academic discourses, issues, and problems. To identify relevant articles, different keyword searches were implemented: ("gamification" OR "game-based learning") AND ("secondary" OR "high") AND ("digital") AND ("video games" OR "videogames"). The search was performed in All Fields in the case of the Core Collection of the Web of Science and between the Article title, Abstract, and Keywords in the case of Scopus.

Table 1 shows the inclusion and exclusion criteria used to assess the eligibility of each of the articles.

Inclusion criteria	Exclusion criteria
Belong to the categories of Articles or Reviews	Belong to categories other than Articles or Reviews
Published between 2010 and 2021	Published before 2010 or after 2021
Published in English or Spanish (languages used by the authors of this research)	Published in languages other than English or Spanish
Belonging to the field under study	Not belonging to the main field of study

Table 1: Inclusion and exclusion criteria

Thus, the initial search identified 93 articles, which were subsequently screened for possible duplication. After the suppression of repeated articles, 78 articles were collected. The titles and abstracts were read to detect the articles that, despite containing the proposed descriptors, did not belong to the field of study, thus leaving 40 articles. Finally, a detailed study of each article in its entirety made it possible to identify those that did not treat DGSE as a central topic. In this way, the sample analyzed was 29 articles (the total sample that met the established inclusion criteria). Figure 1 shows the summary of the process carried out.
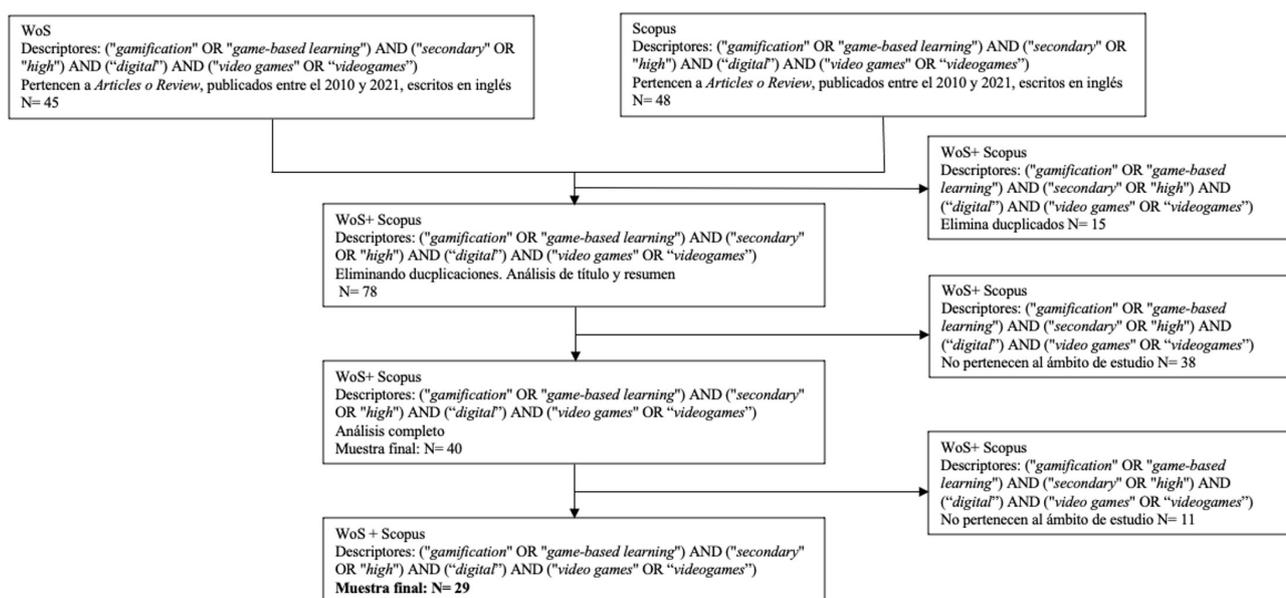

Figure 1: Search procedure

2.2. Procedure and data analysis

A standardized form was used, previously tested and used in earlier systematic reviews (Gil-Fernández and Calderón-Garrido, 2021), in which the extrinsic, substantive, methodological, and dependent variables were reflected to extract the data of the articles chosen through the characteristics of each study and the synthesis of evidence. The extracted information was grouped into the following variables: journal, date, type of article, discipline from which it is studied, objectives, place of data collection, the sample under analysis, analytical approach, and main results. Therefore, a qualitative research synthesis was followed, grouping the data according to the previously identified variables.

After identifying the above data, a thematic analysis was carried out to extract the common patterns that emerge in the documents to be reviewed. This technique involves the detection of discussion points and common ideas, within the texts, to identify and categorize areas of similarity (Crabtree and Miller, 1992). Thus, the documents were analyzed and coded into sections related to each resulting theme. To do this, both an inductive and deductive analysis approach was used, which provides an initial framework for the coding process and, simultaneously, allows the development of themes through an iterative reflection process on the common elements identified (Fereday and Muir -Cochrane, 2006).

3. Results

The results obtained from the two research questions are shown below.

RQ1. What are the main characteristics of the studies that analyze the DGSE?

In total, the studies analyzed were published in 20 different journals, the most frequent being *Computers & Education* (n=3), *Education Sciences* (n=2), and *Frontiers in Psychology* (n=2). Although articles carried out in any country were considered, many studies focused on Europe (n=11) and the United States (n=7) which, as will be seen, implies a Western predominance that is not very pluralistic and addresses the importance of delving into other geographical and cultural areas. Even so, Asia –especially China– also has a relevant representation (n=6). Regarding the publication date, the vast majority of studies were carried out between 2017 and 2019 (n=12) and 2020 (n=7).

Regarding the number of countries used as the first data source, only 2 were carried out in more than one country: the United Kingdom (n=1), Portugal (n=1), Norway (n=1), and Spain (n=1). As for studies focused on a single country, the main source is the United States (n=7), followed by Australia (n=4) and China (n=4). Although the analyzed articles cover 14 different countries, the majority were industrialized European countries, the United States, Australia, and China. This implies that either DGSE research continues to be poorly developed in the rest of the territories, or researchers from the rest of the countries do not publish in journals indexed in the described databases with the inclusion criteria that have been used in this research.

Concerning the discipline from which the studies have been proposed, 11 different perspectives have been distinguished, with educational technologies being the most prevalent (n=8), followed by teaching/ learning strategies (n=4), and video game design (n=3). Educational technologies differ from teaching/ learning strategies in that the former only refer to the technological resources available for education and their application in the classroom. However, teaching/learning strategies imply the design and implementation of different educational methodologies, among which the use of technology is also contemplated. The second main research setting was video game design, focused exclusively on video games developed for SE (n=3); Even so, commercial video games and their possible use in education have also been contemplated in 4 of the analyzed research works.

About the types of methodologies present in the articles, the vast majority of works were of an empirical nature (n=26), based on evidence, and only three were of a conceptual type where the existing bibliography on digital game-based learning was reviewed. Qualitative methods were the main methodological approach (n=14), while 9 studies implemented quantitative methods and 3 applied mixed methods, combining qualitative and quantitative data. The main methodological procedure was the combination of different techniques (n=8), followed by Single Case studies (n= 7), the Survey or Questionnaire (n=5), Interviews (n=4), Content Analysis (n=3), and the Comparative method (n=1).

RQ2. What are the main themes and thematic patterns of the studies that analyze the DGSE?

Regarding the main thematic patterns, three different lines of research were identified: 1) current status of the DGSE, 2) benefits of the DGSE, and 3) proposals for the application and/or improvement of the DGSE. The research questions described below illustrate the main research interests of each of these topics.

Current status of the DGSE: the questions on this research topic deal with some of the following issues: What are the limits, difficulties, and shortcomings of the DGSE at present? What social consideration does the DGSE enjoy among students, teachers, and families? What degree of digital competence must the DGSE face, depending on whether it is students, teachers, or families? What is the level of demand for the DGSE in the classroom? Is it possible to combine teaching content with fun in the DGSE? Can the use of the DGSE imply the alienation of part of the teaching staff among their colleagues derived from the generation gap? Are digital games too focused on the individual experience to use in the DGSE? Why do teachers associate DGSE with the success of their classes? Are there video games that are preferred by families to use in the DGSE?

Benefits of the DGSE: the questions in this line of research deal with the practical and theoretical benefits of the DGSE, its possible complement to the more traditional methodologies, DGSE's promotion of the motivation, enjoyment, commitment, and performance of the students... There is concern about what subjects are more suitable for the use of the DGSE and if it is capable of generating educational spaces regarding social problems, cooperative work, education in values, and critical or argumentative capacity. In general, it is intended to seek the contribution of the DGSE to specific skills such as attention, effort persistence, problem-solving, mental speed, literacy, and learning of second languages. When dealing with studies with adolescents, one of the concerns is to research whether the DGSE can contribute to the collaborative construction of the personal meaning and identity of this evolutionary moment of the students.

Proposals for the application and/or improvement of the DGSE: The questions on this line of research include the following: What challenges should digital game designer companies consider to benefit the DGSE? What are the most suitable selection criteria for the choice of games in a DGSE environment? What recommendations for the use of games can be made for the DGSE? In which disciplines is the DGSE most beneficial? How to evaluate the activities of the DGSE? How to incorporate the DGSE into the Secondary Education curricula? What recommendations can be made about digital game design to improve the DGSE? What recommendations can be made about the design of digital games for their integration and acceptance in the SE environment? How important is the customization of the games for the success of the DGSE? Can the use of digital badges favor the DGSE?

Figure 2 shows the main emerging categories that appeared and their interrelation.
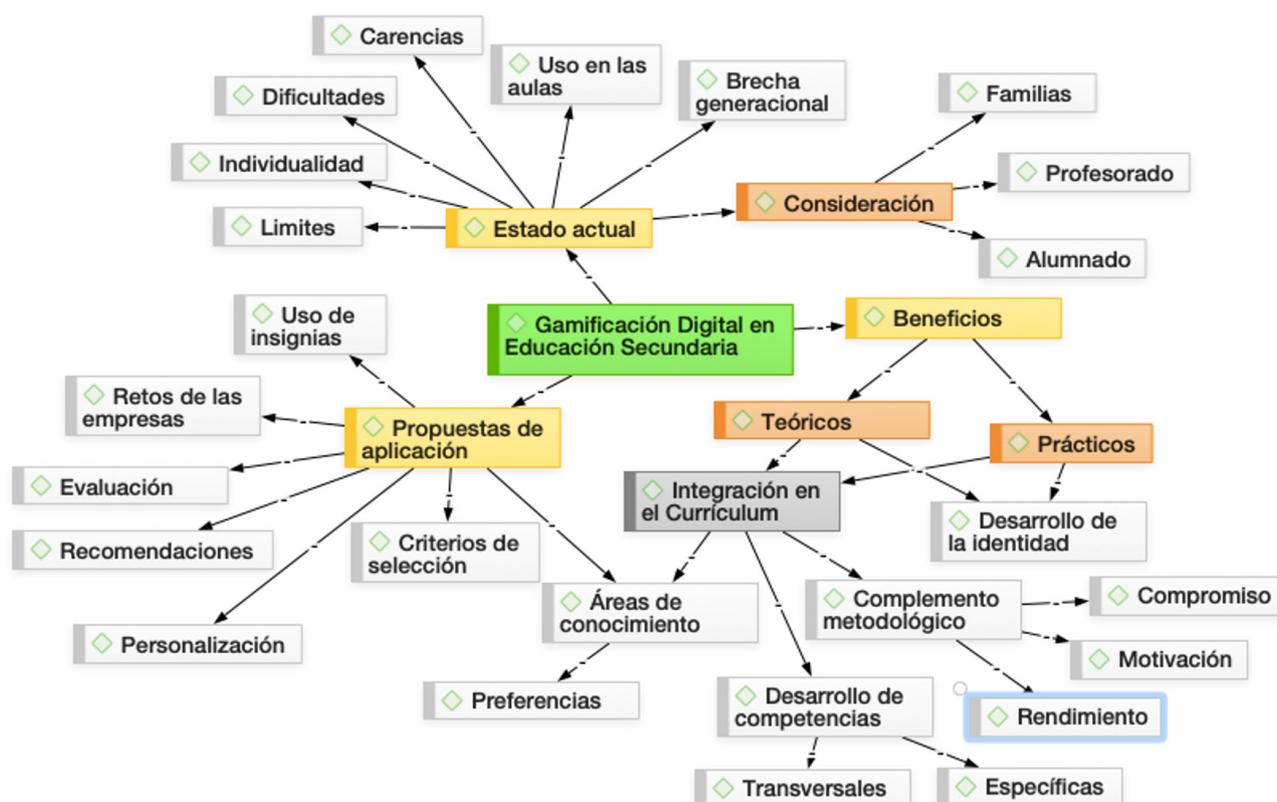
Figure 2: Emerging categories

For each thematic group, the following themes have been identified:

3.1. Current status of the DGSE

3.1.1. Scenario: digital games in SE

Three articles analyze the social consideration of the use of digital games in SE, whether by teachers, students, or families (Bourgonjon et al., 2011; Ramírez et al., 2010; Stieler-Hunt and Jones, 2015).

Regarding the opinion that teachers have regarding the use of digital games in the classroom, Stieler-Hunt and Jones (2015) interviewed 13 secondary school teachers in Australia. The results showed a very strong belief that digital games could be beneficial for learning, which derived from experiencing their own form of subjective success, as teachers, thanks to the use of such games in the classroom. In a way, it is concluded that teachers need to experience their own form of subjective success to find the use of the DGSE valuable.

Regarding the consideration that students have, in terms of the DGSE, Ramírez et al. (2010) conducted a combination of functional tests and qualitative tests with adolescent students in the Philippines. The qualitative evaluations of the digital games used were higher than expected and it was possible to observe how all the students who participated enjoyed playing the games. Interviews with players also showed that they were very interested in learning through games and were even excited about having games integrated into their educational curriculum.

To explain and predict the acceptance of the DGSE by families, Bourgonjon et al. (2011) conducted a study with 858 parents of secondary school students in Belgium. The results show that the preference of parents for some video games or others can be explained by the learning opportunities assigned to them, the negative effects perceived in the games, and the personal experience of family members with video games.

Regarding the digital competence of teachers, Hsu et al. (2021) analyze the knowledge of pedagogical technological content (specifically, in digital games) of 376 high school teachers in Taiwan. Through the differences between their perceptions and attitudes regarding the use of video games in the classroom, it is concluded that there is a generational gap in which younger teachers have greater knowledge than older teachers, of both the games as well as the content of the games and their pedagogical content.

3.1.2. Limits and shortcomings of the DGSE

To analyze the application difficulties faced by the DGSE, Miralles-Martínez et al. (2019) conducted a study with 506 future SE teachers at 22 universities –13 Spanish and 9 British ones–. The results showed important interclass differences in methodological (traditional and innovative practices) and epistemological issues.

For their part, Stieler-Hunt and Jones (2017) focused on the use of immersive digital games in the classroom; in this case, 13 teachers in Australia were interviewed. Here, it was found that teachers using immersive digital games in the classroom may experience varying degrees of alienation from their fellow teachers. Resentment from some colleagues and concerns about curriculum and classroom management all contribute to alienating teachers who strongly believe in the value of using immersive digital games. The study concludes that as long as teachers' negative attitudes towards the use of this type of resource in the classroom persist, the potential impact of immersive digital games will not be fully implemented.

Regarding the internal characteristics of digital games, Coleman and Money (2020) carried out a systematic review, based on 50 articles, to establish the level at which student learning through digital video games is being focused. Results showed a preponderance of games focused on single-player experiences and that social aspects of learning, such as mutual respect, received comparatively less attention.

On the other hand, Beavis et al. (2015) researched this through a study with 270 secondary school students in Australia. It aimed to explore the implications for literacy, learning, curriculum, pedagogy, and assessment when digital games are introduced as part of formal learning and curriculum in school. It was concluded that the connections between 'fun' and 'learning' were highly valued and there was a clear statement that games were good for teaching, although not all game-based activities can be described as 'fun' or 'educational'.

3.2. Benefits of the DGSE

3.2.1. Educational benefits

Deater-Deckard et al. (2014), through a study with 97 adolescents in the United States, examined students' ability to engage – sustained attention, and persistence – in mathematics classes, using a serious digital game. The results showed how the majority of students were highly engaged, which resulted in better performance in the skills taught by the game, although this engagement decreased as the semester progressed and as they gained more experience in the games. It was concluded that

previous gaming experience is an important modulator of students' response and should therefore be taken into account when evaluating the influence of serious digital games – digital games expressly designed for education – on learning results.

Ye et al. (2018) conducted a study with 87 secondary school students in China where they described a learning strategy based on flipped game-based learning (FGBL) focused on general learning outcomes before class. Its objective was to determine the effects of the FGBL strategy on learning efficiency. Results indicated that digital games had a positive effect on pre-class learning outcomes and that students with FGBL achieved better overall learning outcomes than their peers. On the other hand, the need to provide additional teaching materials, or technical support, was observed when introducing video games to cooperative learning activities in the classroom.

3.2.2. Cognitive benefits

Yang's (2012) work researches the effectiveness of Digital Game-Based Learning (DGBL) in problem-solving, learning motivation, and academic performance of 44 adolescent students in Taiwan. The results show that DGBL is especially effective for students' problem-solving skills. It also shows its effectiveness in learning motivation for students. It is concluded that the DGBL is a useful and productive tool to support students in effective learning while promoting an improvement in the classroom environment.

Khalid et al. (2019) conducted a study with adolescents in Pakistan to research what adolescents learn while playing video games in their free time in terms of academic learning and information literacy skills. The results showed that playing video games has a positive impact on adolescent learning and promotes quick thinking. It also increases their capacity for effort and acceptance of challenges and improves their social communication and problem-solving skills.

3.2.3. Benefits for the acquisition of basic skills and specific content

Regarding the acquisition of specific knowledge, Gerber et al. (2014) conducted a case study with two high school students in the United States to examine the influence of commercial video games on student literacy. Findings indicated that a digital game-based curriculum created through a connected learning framework—across digital media, traditional texts, peers, and teachers—significantly enhances student literacy.

Continuing with the research around literacy, Spires (2015) reviewed the existing literature, to explore the importance of digital gamification for education and the relationship between game-based learning and literacy. The results showed a clear positive value of digital games for learning and literacy.

Also, in the field of language learning, Calvo-Ferrer and Belda-Medina (2021) carried out research work with 54 students of English as a foreign language in SE in Spain. It aimed to explore the effect of playing an online multiplayer social deduction game on incidental and intentional second language (L2) vocabulary learning. The results showed that players who used new L2 words in the game retained more vocabulary than players who only found them and that intentionally-entered vocabulary helped other users trigger incidental vocabulary learning and that repetition had a positive effect on L2 vocabulary learning.

For their part, Seidel et al. (2020) carried out a study with 8 high school students in Germany, to discover the potential of video games for teaching geopolitics. The results demonstrated the potential of digital strategy games for political education in geography subjects in SE.

Regarding the acquisition of basic skills, Martínez (2019) carried out a study with 10 adolescents and 10 secondary school teachers in Chile to analyze the perceptions of skill learning that students and teachers had when they played video games. The results show how young people, through video games, develop a series of skills that are inherent and necessary in the virtual world, but very relevant in the real world. Likewise, teachers reaffirm many of the skills that young people highlight, contributing from their vision as educators the meaning and usefulness that these skills entail.

Going towards a more specific content, Rüth and Kaspar (2021) carried out a study with 29 adolescents in Germany to research the reflection processes of students who use commercial video games in SE. The results showed the educational value of the use of commercial videogames as objects of reflection, and their benefits for reasoning about gaming experiences, the curricular topic to be addressed, and critical capacity concerning the media.

Regarding the teaching of values, de Sousa et al. (2018) conducted a study with 40 SE students, in Portugal and Norway, to analyze how teachers in these two countries used a commercial videogame to teach ethical theories. The results showed that, in both cases, the video games facilitated the understanding of these theories by the students. It was also observed that, in both cases, the dialogic approach of the teacher was key to mediating the relationships between the theoretical content and the narrative of the game, opening dialogic spaces for multiple perspectives and the collaborative construction of meaning, and linking the dilemmas of the game with identity issues and personal learning experiences.

Fjællingsdal and Klöckner (2019) conducted a study with 59 SE students in Norway. They aimed to examine the educational potential of the simulated digital ecosystem known as Eco, to reveal how digital games could promote environmental awareness in adolescents. The findings indicate that Eco is a viable tool to promote some aspects of students' environmental awareness.

3.3. Proposals for the application and/or improvement of the DGSE

3.3.1. Video game design

In 2017, Kao et al. conducted a study with 126 high school students in Taiwan to research the design of digital games and assess their effects on learning. The results showed that personalized digital games have the potential to meet specific teaching objectives and that adequate scaffolding (support that a student receives during their learning) also contributes to improving knowledge acquisition and creativity. Therefore, it is concluded that the scaffolding and personalization of digital games should be considered for the improvement of the DGSE.

Glover and Bodzin (2020) conducted a study with 8 high school students in the United States. Their main objective was to research how the values, attitudes, and beliefs of secondary school students are related to the characteristics of serious games. With results similar to those of Kao et al. (2017), regarding the personalization of games, it was concluded that serious games must be designed taking into account the personality profile of the players to be more effective.

To improve student motivation in SE, Biles et al. (2018) conducted two case studies to research the impact of digital badges – rewards in digital games – on students' motivational and cognitive learning outcomes. The results showed that students who received performance badges performed better than students awarded proficiency badges. It was concluded that digital badges help motivation, but they must be personalized to be more effective.

Finally, the literature review carried out by Barach (2021) showed that maximizing the effectiveness of learning, in the DGSE, requires that digital games make sense to the student and act as a catalyst for the gradual increase of their knowledge and responsibility in learning. This implies that more research on digital game design is needed to advance testable theories of DGSE-based learning improvement.

3.3.2. Introduction of video games in secondary education

Facing the so-called transfer problem –inherent tension between a digital game and school learning objectives, which mitigates students' ability to transfer the knowledge acquired in a video game to the real-world context–, Brom et al. (2010) propose an empirical study with a sample of 220 students from the Czech Republic. The results demonstrate that the Augmented Learning Environment (ALE) framework isolates the key principles of digital games that contribute to their success and condenses them into a coherent methodological structure. This allows a successful integration of digital games in the classroom and their acceptance by teachers and students, which paves the way for better exploitation of the DGSE.

From a more technical point of view, Alves-Fernandes et al. (2016) researched the use of virtual reality to improve learning, through a study with 437 secondary school students and teachers in Portugal. The results demonstrated a clear potential for games in the context of multi-user virtual learning. It is concluded that their implications in improving learning must go through the multimodal interaction between humans and computers.

Concerning the game selection criteria in the DGSE, Lux and Budke (2020) analyzed a sample of 18 digital games to develop a framework to assess the complexity of game systems. The results allowed making a compendium of recommendations for the selection and use of different games in the context of formal learning.

On the other hand, Cassidy and Paisley (2013) propose, through a single case study, the benefits that musical digital games could bring to SE. The results of their study demonstrate that these types of games use digital musical participation as a tool to create new opportunities to inspire and engage students in formal and informal learning contexts, taking advantage of music-game synergy.

As a summary, Table 2 condenses the main results of this review:

Current status of the DGSE
(Stieler-Hunt and Jones, 2015; Ramírez et al., 2010; Bourgonjon et al., 2011; Hsu et al., 2021; Miralles-Martínez et al., 2019; Stieler-Hunt and Jones, 2017; Coleman and Money, 2020; Beavis et al., 2015)

Social consideration of the DGSE			Limits and shortcomings of the DGSE	
The teachers consider that the DGSE is: - beneficial for learning - a reason for the success of the teacher in the classroom	The students consider that the DGSE is: - enjoyable - interesting - necessary	Families consider that the DGSE is: - beneficial for learning	Application difficulties: - methodological and epistemological interclass differences - the alienation of teachers using the DGSE - the generational gap in the digital competence of teachers	Internal characteristics of digital games: - focused on individual experience - little attention to the social aspects of learning - fun, but not always educational - inherent tension digital games and school learning objectives

Benefits of the DGSE
(Deater-Deckard et al., 2014; Ye et al., 2018; Yang, 2012; Khalid et al., 2019; Gerber et al., 2014; Spires, 2015; Calvo-Ferrer and Belda-Medina, 2021; Seidel et al., 2020; Martínez, 2019; Rüth and Kaspar, 2021; de Sousa et al., 2018; Fjællingsdal and Klöckner, 2019; Kao et al., 2017; Cassidy and Paisley, 2013)

Educational	Cognitive	Basic skills	Specific content
- commitment - motivation - responsibility - involvement - inspiration - improvement in the classroom environment - better overall learning outcomes - knowledge acquisition	- problem-solving skills - effective learning - quick thinking - collaborative construction of meaning	- capacity for effort and acceptance of challenges - social communication skills - development of inherent and necessary skills in the virtual world - critical and reflective capacity - construction of identity - creativity	- increased performance in skills that games teach - literacy - incidental and intentional vocabulary learning - political education - understanding of ethical theories - environmental awareness

Proposals for the application and/or improvement of the DGSE
(Deater-Deckard et al., 2014; Ye et al., 2018; Kao et al., 2017; Glover and Bodzin, 2020; Biles et al., 2018; Barach, 2021; Brom et al., 2010; Alves-Fernandes et al., 2016; Lux and Budke, 2020; Cassidy and Paisley, 2013)

Video game design	Introduction to SE
- customize video games by taking into account the personality profile of the players - consider the scaffolding of digital games - use digital badges - provide meaning, for students, to digital games	- take into account previous experience to assess the influence of digital games on learning - the need for additional teaching materials, or technical support, to introduce video games in the classroom - the ALE framework enables the successful integration of digital games in classrooms - virtual reality and multimodal human-computer interaction for multi-user virtual learning - review game selection criteria - enhance the musical element

Table 2: Summary of results

4. Conclusions

The results presented in this review allow us to treat games as key elements to take into account when designing educational scenarios in SE. Their motivational, playful, and at the same time educational value, makes them a highly effective discourse if we follow the advice of Cicero's rhetoric: delectare, docere et movere. However, according to Tang et al. (2009), as with traditional teaching techniques, there is a need for a pedagogical basis on which to base the design and use of educational games.

It has been observed how researchers have dealt with establishing how games were introduced and how they should continue to be introduced in SE, their current use, existing limits, and shortcomings, but also the cognitive benefits and the acquisition of skills and content learning. There is no doubt about their broad benefits in terms of competencies and specific abilities present in most academic learning in SE (attention, persistence, memory, speed, problem-solving, etc.), although there are still many academic gaps that are difficult to fill with digital games right now.

The individual dimension of the game is something that makes it attractive to highlight previous individual differences, but in adolescence, the use of collaborative games would be highly advisable, since belonging to the group is a key factor in the construction of adolescent identity. This aspect is currently little developed in the catalog of digital games.

Experts suggest that games are more effective if they can be customized for each player in some way, which represents a significant added difficulty. Likewise, the games need a parallel scaffolding by the teachers, texts, and classmates, which complements the educational facet of the game, which frequently lacks social aspects and focuses mainly on individual acts. To educate, you have to accompany the game.

Including digital games in SE requires the complicity of all the teaching staff and a broad understanding on the part of the families of these students, to overcome reluctance about the attentional deviation that they can represent and the generational gap between the teaching staff: digital natives and the "digital immigrants" (Núñez-Gómez et al., 2012). This need to promote digital competence among teachers becomes even more evident when new technological-pedagogical frameworks are introduced, such as ALE, which contributes to the successful integration of digital games in the classroom, or virtual reality and multimodal interaction between humans and computers, which benefit multi-user virtual learning. Furthermore, we must be alert to episodes of phubbing derived from the abusive and uncontrolled use of the digital world.

Education mediated by digital technologies and its aspect in gamification requires a serious and rigorous study of such practices in SE, a counterpoint to the emotion aroused by the virtual world that is presented to young people. Despite the changes and technological advances, the great challenges of the human being are still present and education must try to find the best answers to such challenges.

5. References

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