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Gamification and e-learning for young learners: A systematic literature review, bibliometric analysis, and future research agenda

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ABSTRACT

Over the last few years, gamification has sparked significant interest in both industry and academia. However, the focus of the debate has been mostly on game studies and human-computer interaction (HCI). Even though games are increasingly being supplied as services to customers, few academic works have linked game studies to the service or marketing literature (Dikcius and Urbonavicius, 2020; Dukembay and Zhaksylyk, 2019). This paper presents an examination of the emerging trends of gamification and e-learning for young learners. The first section presents a text-based cluster bibliometric analysis based on 222 qualified articles published between 2015 and 2020. We conducted this analysis to identify the most prominent themes in the literature through cluster identification via the VOS viewer software. As the themes were found to be interlinked, the second section presents a systematic literature review based on a bibliometric analysis performed using the PRISMA method on 32 qualified articles. The findings highlighted the four major future research themes of personalization, game elements, learner styles, and learner engagement. Finally, we provide a future research agenda based on the theory, characteristics, context, and methodology (TCCM) framework. Our findings offer key insights aimed at enabling actors in education policy making and gamification-based software companies and agencies to identify the gamification techniques best suited for e-learning.

1. Introduction

Information systems (IS) analysts have extended their possibilities in regard to the utilitarian estimation of IS—e.g., profitability, adequacy, and helpfulness (Behl and Dutta, 2020; Högberg et al., 2019; Poncin et al., 2017; Suh and Wagner, 2017)—to include their hedonic value (C.-L. Hsu and M.-C. Chen, 2018; Poncin et al., 2017). One of the resulting developments is gamification, which has attracted the attention of several researchers. Gamification refers to the utilization of game plan components and of so-called game dynamics to draw in end clients in non-game settings (Hsu and Chen, 2018; Huotari and Hamari, 2017). Gamification has become increasingly popular in promoting student motivation and learning activities (Bovermann, Weidlich, and Bastiaens, 2018). Compared to more conventional game-based modes of knowledge, distribution techniques are more commonly being used to inspire people in regard to meaningful learning (Bassiouni and Hackley, 2016; Batat, 2020; Jayawardena, 2018; Skinner et al., 2018).

The fundamental components of a gamified application, namely that of "game mechanics" are mechanismsused by agents to interact with the game environment (Deterding et al., 2011; Sicart, 2008). From analysis (Järvinen, 2008) through game design, game researchers and designers have presented a number of definitions of game mechanics that have been employed in various situations (Hunicke et al., 2004). The game mechanics of digital points, badges, or leader boards have been most typically connected with current types of gamification (Deterding et al., 2011; Hamari and Koivisto, 2015). Users can acquire digital points, often known as points, which can be used as status indicators, to enable access to certain material, or to spend on virtual products or gifts

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(Bunchball, 2016). Badges are icon-like tokens that represent an individual's accomplishments. Leader boards are high-score tables that show a user's performance in comparison to other users. Points, badges, and leader boards are all examples of external reward mechanisms because they all give positive reinforcement (Woolfolk and Murphy, 2001) to stimulate a user's behaviour.

Based on educational multiplayer online games aimed at increasing the levels of collaboration amongst students, Paraskeva, Mysirlaki, and Papagianni (2010) developed a theory of operation. Similarly, Ashraf et al. (2014) found that vocabulary acquisition is effective in online games. Many researchers have defined a game-based learning environment suited to help learners acquire skills such as database analysis and programme design (Alabdulakareem and Jamjoom, 2020; Alshammari, 2020; Appiah, 2016; Connolly et al., 2006). Further, games have been found to improve interest and self-confidence amongst learners (Pillai and Sivathanu, 2019; Tajika, 2020).

A substantial body of research supports the use of games as teaching tools (Dikcius and Urbonavicius, 2020; Dukembay and Zhaksylyk, 2019). Klock et al. (2019) proposed a structure that illustrates client-focussed gamification for educational settings. Similarly, several researchers have developed game-based delivery methods aimed at improving student interaction (Bandara and Ioras, 2016; Gulinna and Lee, 2020; Mårell-Olsson, 2019), engagement (Beça, Aresta, Ortet, and Santos, 2020; Emblen-Perry, 2018; Muntean, 2011; Rojas-López, Rincón-Flores, Mena, García-Peñalvo, and Ramírez-Montoya, 2019; Mathupayas Thongmak, 2018) and satisfaction (Sailer, Hense, Mayr, and Mandl, 2017). Gamification has become one of the most popular trends in electronic markets and commerce; understanding it from the perspective of service marketing could result in the application of proven models in the field to the development of 'gamified' services (Bandara and Ioras, 2016; Gulinna and Lee, 2020 ; Mårell-Olsson, 2019), which outlines a gap in regard to the application of e-learning through gamified elements.

Further, Paraskeva et al. (2010) formulated an informative internet gamification hypothesis aimed at advancing joint efforts in understudies. Ashraf et al. (2014) recognized web-based games as viable to jargon procurement as a result of intuitiveness and student inspiration. Additionally, game usage has been seen to enhance confidence in learners (Aguiar, Lidia, Petra, and Pérez, 2020; Jain and Dutta, 2019). Gamification is used as a training tool by companies such as Samsung, Microsoft, Google, Domino's Pizza, and Blue Wolf, which claim that gamification increases customer interaction with, recognition of, and loyalty towards the brand (Patten, 2016; Xi and Hamari, 2020). The term 'gamification' has thus gained popularity amongst researchers (Hamari and Koivisto, 2013, 2015; Hamari, Koivisto, and Sarsa, 2014). Many gamification methods have been established in recent years due to the popularity of the concept, its positive outcomes, and the growing interest in games, especially for educational purposes (Toda, Vida, Miguel, and Fuente, 2019); these are techniques, procedures, and processes that assist learners in deciding how to integrate game fundamentals in a non-game world (Bachtiar et al., 2018). However, a rigors bibliometric study aiming at identifying the most important research themes in the domain of gamification and e-learning for young learners had hitherto been missing from the existing gamification and e-learning literature (Bachtiar et al., 2018).

The e-learning concept, which was popularised at the beginning of the 21st century (Clark and Mayer, 2016), may therefore be viewed as an emerging paradigm in digital education (Sun et al., 2008; Wang and Nunes, 2019). Furthermore, online learning involves a web-based framework that provides users or learners with information or skills regardless of temporal or geographical constraints (Brem, Viardot, and Nylund, 2021; Milićević et al., 2021; Sun et al., 2008; Wan and Niu, 2018). E-learning applies to data engagement and collaboration (Urh, Vukovic, Jereb, and Pintar, 2015), with its related platforms and web-based applications being ubiquitous and enabling users to access data directly through the internet (Zamfiroiu and Sbora, 2014). The concept of using online learning platform games, which involves the use of game design elements in non-game contexts, is not new (Muntean, 2011; Stoffregen et al., 2016), and encourages interaction, inspires learners, and motivates people to engage in healthier behaviours (Orji, Tondello, and Nacke, 2018).

1.1. Psychological mechanisms underlying the ideal of gamification

Gamification is a recently invented phrase that describes a societal phenomenon that has emerged as a result of a generation of technologically literate people (Alsawaier, 2018). Gamification is the use of "game-based mechanics, aesthetics, and game thinking to engage people, encourage action, increase learning, and solve issues," according to the definition (Kapp, 2012). Gamification can raise as well as reduce intrinsic motivation in users (Forde, Mekler, and Opwis, 2015). However, there is still a lack of knowledge as to why gamification is sometimes successful and sometimes not. One cause for this is the lack of a theoretical framework in practical research. Forde et al. (2015) compared how autonomy, competence, and intrinsic motivation differ between an informational and a controlling situation, based on self-determination theory. It was found that, one of the most established theories for discussing gamification research as the self-determination theory underlying the psychological mechanisms (Forde et al., 2015; Ryan and Deci, 2000).

The psychologist Mihaly Csikszentmihalyi explained that, through the learning environments created by games, people usually obtain pleasure, engagement, higher levels of inspiration, and creativity (Csikszentmihalyi and Csikzentmihaly, 1990). Games help increase the release of pleasure-inducing chemicals in the brain and further enhance the learning experience by making it more enjoyable (Gulinna and Lee, 2020). The most recent e-learning literature review on gamification applications (Alshammari, 2020; Hassan et al., 2019; Klock et al., 2019; Pellas, Fotaris, Kazanidis, and Wells, 2018) has further emphasized the value of gamification as a powerful learning tool capable of producing more engaging educational experiences. The most common and influential elements of gamification used in e-learning are points (Alutaybi et al., 2019; Bovermann et al., 2018), leader boards (Dicheva, Irwin, and Dichev, 2018; Ortiz-Rojas, Chiluiza, and Valcke, 2019), virtual badges (Chou, 2019; Dicheva et al., 2018), and virtual levels (Pechenkina et al., 2017; Puritat, 2019).

A bibliometric study and a systematic review of 'gamification and e-learning' for young clients were part of our research. The young learners were selected based on three reasons. Firstly, game-based distribution methods are more effective at motivating individuals to learn than more traditional methods (Bassiouni and Hackley, 2016; Bassiouni, Hackley, and Meshreki, 2019; Batat, 2020; Skinner et al., 2018). For example, the benefit of applying gamification to learning is linked to a physiological process such as attitude change (Akhtar, Hasanati, and Istiqomah, 2019; Alabdulakareem and Jamjoom, 2020; Alafouzou and Lamprinou, 2018; McGonigal, 2011) and motivation (Chebotareva et al., 2020; Hamari and Koivisto, 2013; Khalid, 2017) towards learning process. Secondly, gamification has already been studied in a variety of settings, including health care (Marston and Hall, 2016; Richards and Caldwell, 2017), education (Appiah, 2016; Campbell, 2016; Chebotareva et al., 2020), and the workplace (Awadzi, 2018; Hamari et al., 2014) and limited research on gamification from the view point of young customers. Thirdly, gamification can raise as well as reduce intrinsic motivation in users (Forde et al., 2015) and video games have become an important element of many young people's life (Wilson and McDonagh, 2014). This has resulted in the development of computer games that mix both fun and educational elements to engage people in themes that would otherwise be difficult to express through conventional means (Lieberman, 1997; Wilson and McDonagh, 2014). Computer games have been successfully developed to assist young people with long-term conditions in better understanding their ailment, how it is treated, and acquiring critical self-care skills. Packy & Marlon and Captain Novolin, both

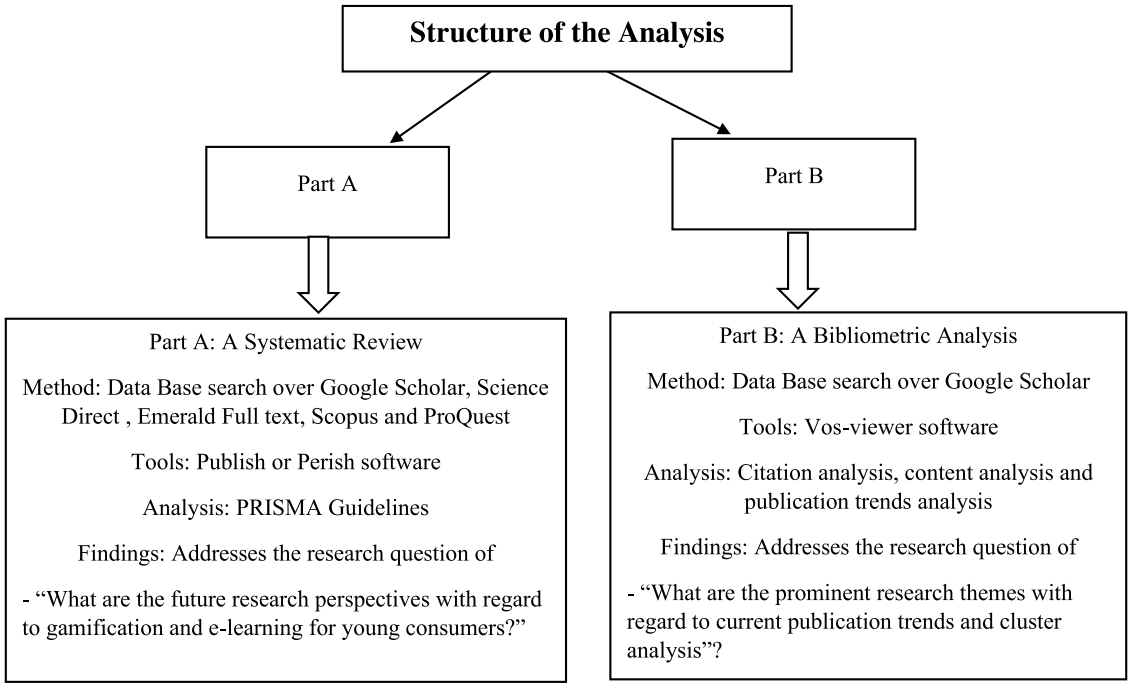

Fig. 1. The research outline.

produced for the Nintendo Entertainment System in the mid-1990s, were targeted at teaching young people how to control their diabetes (Lieberman, 1997). This study extends the existing knowledge on gamification and e-learning applications by further identifying the related future research gaps and most prominent emerging research themes for young learners. This paper includes a bibliometric analysis and a systematic review. The former was performed mainly to identify the most prominent themes in the literature through proper clustering, which formed the basis whereby the latter enabled the identification of future research perspectives.

2. Bibliometric analysis

This paper is split into two primary sections. The first presents our bibliometric analysis, and the second our systematic literature review. We performed the bibliometric analysis by using Google Scholar to identify the most prominent themes in the literature through a clustering process. The first section thus addresses the following research question (RQ1): "What are the prominent research themes pertaining to gamification and e-learning for young learners?" Gamification strategies are methodologies, systems, and components that assist buyers in deciding how to incorporate game elements into non-game contexts. For example, designing process of an advertisement in marketing context. Consequently, under a root metaphor assumption, given that gamified based learning is identified as more interactive and more engaging, we deemed it essential to identify the most prominent research themes in the area of gamification and e-learning for young learners (Raptis, Fidas, and Avouris, 2018; Reiners et al., 2015; Rojas-López et al., 2019).

Fig. 1 further demonstrates the structure of this paper. The first section of the systematic literature review includes a database search over Google Scholar, Scopus, ProQuest, Emerald Full text, and Science Direct using *'Publish or Perish'* software. Gamification applications are diversified, and researchers have unsuccessful attempts on many different games that can promote learning, social engagement styles, and learning arrangements (Sailer et al., 2017). Thus, this paper contributes to existing research by finding the under-researched areas in gamification and e-learning to further facilitate future researchers. Authors adopted a systematic literature review approach using PRISMA guidelines to tackle the issue of study using research question (RQ) one;

RQ 1: "What are the future research perspectives in the area of gamification and e-learning for young consumers?"

Further, to address this research question, the authors utilized quantitative and subjective strategies to collect the current writing and guide future examination. Subsequently, this investigation gets extraordinary by being the main deliberate writing audit cum-bibliometric examination on gamification regarding e-learning for youthful customers. The second part of the bibliometric analysis includes a database search over 'Google Scholar.' The content analysis includes a publication trends analysis, citation analysis, and cluster analysis using Vos-viewer software.

Hence, it is evident that gamification techniques are methodologies, systems, and components that help purchasers decide how to join game essentials in a precise non-game setting. Consequently, under root metaphor assumption, it is essential to identify the most prominent research themes in the area of gamification and e-learning for young consumers as gamified based learning is identified as more interactive and more engaging (Raptis et al., 2018; Reiners et al., 2015; Rojas-López et al., 2019). Based on the bibliometric analysis results and to further facilitate future researchers, we conducted a systematic literature review that included database searches of Google Scholar, Scopus, ProQuest, Emerald Full text, and Science Direct. The second section addressed the following research question two (RQ2):

RQ2: "What are the future research perspectives in the area of gamification and e-learning for young learners?"

We base our study on the principle of problematization methodology (Alvesson and Sandberg, 2011) and recognize that the word 'gamification' is a root metaphor hypothesis associated with wider images of a specific subject. For instance, in management and administration research, it is not unexpected to consider associations to be "societies" regarding a unitary arrangement of qualities and convictions shared by associated individuals. In addition, at the root illustration level, creators have addressed suppositions around solidarity, uniqueness, and agreement, and they have stressed the separation, fracture, irregularity, and equivocalness as critical components of culture (Alvesson and Sandberg, 2011). Furthermore, the term "gamification" also could be used in several fields such as e-learning (Aldecoa and Okada, 2015; Gulinna and

Lee, 2020; Jayawardena, 2020; Kreuzberger, 2015; Krevskiy et al., 2016) and advertising (Eppmann, Bekk, and Klein, 2018; Hofacker et al., 2016).

Further, the authors developed Fig. 1 to illustrate the construction of this study.

This paper serves two purposes. First, the systematic literature review demonstrates the future research perspectives in gamification and young consumers. Secondly, the bibliometric analysis serves to identify the most prominent themes or topics by the researchers. This section presents a summary of the quantitative results of our analysis. To better understand the prominent themes based on the documentary clusters, we conducted a text-based analysis of the title and abstract fields using the VOS viewer software. Out of the 1972 terms examined, 35 met the minimum threshold of 10 occurrences selected by the authors. This analysis yielded a network diagram with five main clusters (Martínez-López et al., 2018; Merigó and Yang, 2017) representing the most prominent themes found in research in the fields of gamification, e-learning, and young learners (Montalto et al., 2019).

We reviewed the current literature by means of the Publish or Perish software across Google Scholar, which was chosen as it is the most comprehensive web-based academic search engine, with records of both academic and grey literature (Haddaway, Collins, Coughlin, and Kirk, 2015). To avoid any outdated content, we limited our review to articles published from 2015 to 2020. The main keywords used were 'gamification', 'e-learning', and 'young learners'. The secondary keywords include adolescents; young age; game elements; e-learner e-learning process; game designs and younger age groups. As the main aim of our review was to investigate the research on gamification in the context of e-learning for young learners, the scope and contribution of the review papers were limited to gamification within the sense of e-learning for young learners. The major strength of a bibliometric analysis is that it uses **mathematical and statistical analysis approach that allows obtaining reliable indicators related to quality** (De Bellis, 2009). Our bibliometric analysis incorporated a systematic, transparent, and reproducible assessment and thereby enhanced the quality of the subsequent review by enabling it to contribute to the current knowledge (De Bellis, 2009). In addition, bibliometric analysis is the most common approach involving statistical methods to analyse bibliographic data from an analytical and quantitative viewpoint in order to coordinate expertise in a specific field of study (De Bellis, 2009). The main weakness of this analysis is the discipline differences. For example, some fields, especially those in the humanities, place a greater emphasis on specific formats for scholarly work, such as books and book chapters. These are not well-tracked in systems like Web of Science and Scopus, and the subject breadth and depth for humanities and social science journals are not as broad and deep. As a result, scholars who publish books may have their impact misrepresented by these methods (Martínez-López et al., 2018; Merigó and Yang, 2017).

We chose Google Scholar as our main academic literature search tool because of its matching algorithm that enables searches for keyword terms in the titles, abstracts, or full texts of articles sourced from many publishers and websites (Bakkalbasi et al., 2006). With the emergence of the internet in the late 1990s, academic search engines and bibliographic databases became more relevant and began to supplant traditional offline information retrieval systems. Existing data suppliers and publishers, such as ProQuest, Ebsco, Thomson Reuters, and Elsevier, moved their information offerings on the internet. Nonetheless, advancements in data access did not revolutionise access to scientific information until the early 2000s. Large crawler-based search engines like Google Scholar, Microsoft Academic, and Scirus began to make massive amounts of scholarly data freely available to anybody (Gusenbauer, 2019; Gusenbauer and Haddaway, 2020).

We then analysed the 2200 articles retrieved from the Google scholar database search to identify potentially influential work, outline the structure of gamification-related studies, and identify any gaps. After removing duplicate documents (175) and non-English ones (23) and making a further selection based on title and abstract, a total of 951 articles were identified as eligible for further review (Gusenbauer, 2019; Hiebl, 2021). The title and abstract of these articles were further screened by the authors based on the above-mentioned inclusion and exclusion criteria., resulting in the removal of 802 further articles. A total of 222 articles were ultimately identified as qualifying for further review. The identification of the most prominent research themes in the area of gamification and e-learning for young learners was essential because gamified-based learning has been found to be highly interactive and engaging (Bachtiar et al., 2018). Due to the popularity of the concept, its positive outcomes, and the growing interest in games, especially for educational purposes, many gamification methods have been established over the past few years (Toda et al., 2019); these are techniques, procedures, and processes that assist learners in deciding how to integrate game fundamentals in a non-game world (Bachtiar et al., 2018). However, what had previously been missing in the current gamification and e-learning literature was a proper bibliometric analysis aimed at identifying the most prominent research themes in the area of gamification and e-learning for young learners (Bachtiar et al., 2018). To fill this gap, we used the VOS viewer software (where VOS stands for 'visualization of similarities') to perform citation, co-citation, and keyword analysis. This which provided us with a citation map in which the relatedness of items could be explained by the distance between them. Eck and Waltman (2010) explained that the shorter the distance between items in a citation map, the more related they are.

The summary of the articles is presented in Table A in the Appendices. In general, decision-makers have expressed a clear desire for any research being carried to be qualified and measured; bibliometric analysis naturally meets this requirement. However, as Merediz-Solà and Bariviera (2019) already discussed, to obtain accurate and observable results, it is necessary to be aware of the methods and standards involved. Table 1 further illustrates the prominent techniques we used for our bibliometric analysis.

Table 1
The prominent techniques used in this study's bibliometric analysis.

Techniques	Key concepts
Analysis based on the number of publications per year	• The publication trend of 2015 – 2020 on gamification in the context of e-learning for young learners shows a slight increase over the recent years. • Researchers became more aware of the field gamification over the recent years of 2017 – 2020. • Authors further investigated the number of research and identified that 2017, 2018, 2019, and 2020 as the years with more gamification-based studies.
Clustering	• To find prominent research themes. • To further categorized any identified themes in relation to individual characteristics, different learning styles, learning approaches, learner outcomes, and factors affecting the learning process.

2.1. Cluster identification

Publication trends on gamification and e-learning for young learners have shown a slight increase over the 2017–2020 period. This further emphasizes the fact that researchers have recently become more aware of this field. We found a total of 29 studies published in 2015, 21 in 2016, and 40, 43, 44, and 45 in 2017, 2018, 2019, and 2020, respectively. This trend is shown in graphic form in Fig. 3.

To conduct our a text-based analysis of our sample papers' titles and abstracts through the VOSviewer software, we set the minimum threshold number of occurrences of the text to 10. Out of the 1972 terms we checked, 35 were found to reach or exceed this threshold.

Table 2
Cluster analysis.

Cluster 1 (9 items): Individual characteristics	Cluster 2 (7 items): Different learning styles	Cluster 3 (6 items): Learning approaches	Cluster 4 (5 items): Leaner outcomes	Cluster 5 (3 items): Factors affecting the learning process
Effect	Computers	Education	Application	Design
Gamification	E-learning	Gamified learning	Child	Engagement
Gamified system	Intention	Higher education	Game	Environment
Impact	Student	Learner	Technology	
Motivation	Study	Learning	Young child	
Person	Teacher	Serious game		
System	Young person			
User				
Video game				

We thus identified five main clusters through the VOSviewer software. Based on these, we identified the most prominent research streams in the field of gamification, e-learning, and young learners. Table 2 further illustrates the clusters yielded by our text-based analysis to further analyse the most prominent research streams in the field.

2.1.1. Cluster 1: individual characteristics

Individual characteristics refers to features that are unique to a person, such as demographic data (gender, education), physical health (subjective health, number of health issues), and psychological components (e.g., motivation, locus of control) (Hartley and Bendixen, 2001; Tracey, Hinkin, Tannenbaum, and Mathieu, 2001). The first identified cluster contained themes on individual characteristics such as effect, impact, motivation, person, system, user, video game, gamification, and gamified system. This cluster showed that most research on gamification and e-learning for young learners had focussed on the e-learners' individual characteristics. For example, teachers' attitudes and proper teacher training for gamification based learning (Akhtar et al., 2019; Beaudin, 2015; Cózar-Gutiérrez and Sáez-López, 2016; Dosunmu, 2020; Figg and Jaipal-Jamani, 2018). Further, another stream of research had focussed on the improvements that gamified systems had enabled e-learners to achieve based on their capabilities, such as their individual executive functions (Alabdulakareem and Jamjoom, 2020), learning management techniques (Almugbel, 2020), strategic decision making skills (Bareicheva and Stepanova, 2019) and motivation levels for self-directed e-learning programs (Beck, 2017).

Gamification learning experience was also found to be a popular research stream in this cluster (Áron and Emma, 2017; Besser and Newby, 2020; Bissoli, Bottes, Perri, and Regolini, 2017; Bugeja and Grech, 2020; Eppmann et al., 2018; Hamari and Koivisto, 2015; Mucollari and Samokhin, 2017; Pellas et al., 2018; Pillai and Sivathanu, 2019) in line with gamification and student motivation (Alafouzou and Lamprinou, 2018; Buil, Catalán, and Martínez, 2020; Chebotareva et al., 2020; Deif, 2019; Ebrahimzadeh and Sepideh, 2017; Khalid, 2017; Liu, Wang, and Lee, 2020; Mawas et al., 2020; Segaran et al., 2019; Topîrceanu, 2017; Woolwine et al., 2019). Few studies appeared to have attempted to address student preferences in gamification-based learning (Mazzo, 2015) gamification for empowerment (Antonaci, Klemke, and Stracke, 2017), and gamification to create awareness (Ardhito, Handayati, and Putranto, 2019).

Several studies were found to have investigated student emotions (Chen, & Husnaini 2020; Göksu, Aslan, and Turgut, 2020; Kenny, Lyons, and Lynn, 2017; Lee, 2019; B. Lee, Jeon, Jang, and Yoo, 2018; Metzger and Paxton, 2016), attitudes and perceptions (Djundubaev, 2017; Gulinna and Lee, 2020; J. Hamari, Malik, Koski, and Johri, 2019; Janakiraman et al., 2018; H.-C. Lin et al., 2017), interaction (Fan and Wang, 2020), digital device addiction (Hoque, 2018), game-based training (Sargent, 2017; Saunders, 2017; Stepanova, Davy, and Bochkov, 2018; Sulphey, 2017), and intentions (Bag, Aich, and Islam, 2020; Dhahak and Huseynov, 2020; Tony et al., 2020).

2.1.2. Cluster 2: different learning styles

Different individuals learn in different ways, which is referred to as a learning style. A person's preferred method of absorbing, processing, comprehending, and remembering knowledge is referred to as their learning style. Visual, auditory, tactile, and kinaesthetic are the four main learning methods (Deng and Yu, 2014). It was evident that most extant studies had been focussed on discussing the technical aspects of game-based teaching and had further illustrated the importance of adapting to new or up to date technology, especially when teaching by means of gamified elements (Aldecoa and Okada, 2015; Arango-López, Collazos, and Velas, 2018; Breyer, 2019; DeWinter and Moeller, 2016; Faustmann et al., 2019; Krevskiy et al., 2016; Morschheuser, Hamari, and Koivisto, 2017; Nguyen et al., 2018; Souza and Marques, 2020; Sukenasa et al., 2020; Urías, Chust, and Carrasco, 2016; Yasin et al., 2018; Ye, Feng, Yang, Yang, and Yang, 2019).

Different learning styles were found to also influence the learning abilities of students. For example, e-learning was found to enhance computer science teaching and learning at tertiary institutions in New Zealand (Aldhahri, 2015), while digital technologies were found to also contribute to teaching by enabling the adoption of various learning theories and methodologies (Altuna and Lareki, 2015; Bellaj, Zekri, and Albugami, 2015; Farhadi, 2019; Jayawardena, 2020; Orr, 2018; Romero et al., 2018). Other studies were found to have been focussed on the use of storyline-based video games in classrooms (Casañ, 2017; Dincelli and Smith, 2020; Oztaysi et al., 2019) and on the visualization of folk dances linked to cultural heritages (Kico et al., 2018). Little research was found to have investigated sustainable tourism through gamification techniques and applications (Jayawardena, 2021; Negruşa et al., 2015), climate change communication through online games (Ouariachi, Olvera-Lobo, and Gutiérrez-Pérez, 2017), and gamification for clinical treatments (Richards and Caldwell, 2017).

2.1.3. Cluster 3: learning approaches

Learning approaches describes the abilities and activities that youngsters utilise to learn. The approaches to learning domain unifies emotional, behavioural, and cognitive self-regulation to guide teaching techniques that promote their growth (Cuthbert, 2005). Several studies had been focussed on identifying different digital game-based learning methods (Elkordy, Keneman, and Dipinto, 2017; Fan and Tan, 2019; Haddad, 2016; Hwa, 2018; Kotini and Tzelepi, 2015; Kreuzberger, 2015; Pace and Dipace, 2015; Signori et al., 2018; Tseas, 2017; Vleeshouwer, 2015). While others had highlighted the application of gamification to the learning of music (Herzig and Learning, 2019; Vets et al., 2017), languages (Alyaz, Spaniel, and Gursoy, 2017; Betaubun and Nasrawati, 2020; Bolliger, Mills, and White, 2015; Chen and Lee, 2018; Dukembay and Zhaksylyk, 2019), engineering (Arenas, 2018; Ashmarina and Nikulina, 2017; Bodnar, Anastasio, and Enszer, 2016), astronomy (Baptista and Oliveira, 2019; Barringer, Plummer, Kregenow, and Palma, 2018), information technology (Baxter and Holderness, 2016), architecture (Escudero and Villagrasa, 2017; Fonseca et al., 2017), and maths for primary school students (Gunawan et al., 2017).

Most of the studies in this cluster had involved research on video games and learning methods (Bayeck, 2020; Carr and Rogers, 2016; Denham and Guyotte, 2018; Gocheva, Somova, Angelova, and Kasakliev, 2020; Gómez-Carrasco et al., 2020; Mulcahy and Zainuddin, 2020; Núnez, 2018; Nunoo, 2019; Ofosu-Ampong and Boateng, 2018; Silva, Rodrigues, and Leal, 2019; Mathupayas Thongmak, 2019). The effects of serious games had been assessed by focussing on diversified areas such as perceived team cohesiveness (Bozanta, Kutlu, and Nowlan, 2016), mental illness (Fitzgerald and Ratcliffe, 2020), early childhood education (Heljakka et al., 2019), higher education (Cerrato, Ferrara,

Ponticorvo, and Sica, 2017; Taylor, Kayis-Kumar, and Bain, 2017; Venter, 2016), pro-environmental behaviours aimed at energy efficiency (Morganti, Pallavicini, Cadel, and Candelieri, 2017; Wu et al., 2020), financial literacy amongst young decision-makers (Rasco et al., 2020), cultural heritage (Escudero and Villagrasa, 2017; Khan et al., 2020; Slavova-Petkova, 2017; Wang and Nunes, 2019), sustainability transition (Stanitsas, Kirytopoulos, and Vareilles, 2019), and the application of game-based techniques for higher education (Dikcius and Urbonavicius, 2020; Gibbens, Gettle, Thompson, and Muller, 2015; Vintimilla--Tapia et al., 2018; Zamora et al., 2018).

2.1.4. Cluster 4: learner outcomes

A learning outcome is a clear declaration of what a learner should be able to accomplish, know about, and/or value at the end of a unit of study, as well as how effectively they should achieve those results. It specifies the content of learning as well as how it will be demonstrated (Lin and Chen, 2017). Several studies in this area had paid much attention to the learner outcomes attained through game-based learning. These works had considered various areas, such as privacy concepts (Alemany and Delval, 2020; Giorgini, Calabrese, and Piras, 2018), personal training levels (Antonio, 2018; Santhanam et al., 2016; Styles, 2018; Timoney, Faghih, Gibney, Korady, and Young, 2018) and higher education (Ashour, 2019; Awadzi, 2018; Bajpai, Biberman, and Sharma, 2019; Chen, 2015; Chisu, 2020; Elequin, 2016; Koivisto, 2017; Kondrashova, 2019; Luch, 2018; Mayer, Warmelink, and Zhou, 2016; McDonald, 2017; Melcer et al., 2015; Nazeer, 2018; Pohjavirta and Penttinen, 2020; Raptis et al., 2018; Schacht and Maedche, 2015; Schöbel and Janson, 2018).

Researchers paid less attention to student outcomes based on the psychological and social impact of the internet and gaming addiction (Bishop, 2015). Few authors had attempted to investigate ways to improve a learner's personality and achievements through gamified techniques (Chamisijatin, Lestari, and Husamah, 2020; Kavanaugh, 2017; Nadolny and Halabi, 2016; Tomaselli, Sanchez, and Brown, 2015; Triantoro et al., 2020). Millennial aspirations to apply technology-based teaching techniques and learning to marketing classes (Martinović and Pirić, 2018), and the increased intranet usage in the banking industry by gamification (Morschheuser, Henzi, and Alt, 2015) were found to be other streams that had accrued limited research attention. Learner outcomes should also be addressed using various gamified apps, such as sustainable consumption and fitness ones (Arshad and Baharun, 2019; Arshad, Zaidin, and Baharun, 2020; Mulcahy, Russell-Bennett, and Iacobucci, 2020; Wei, 2017). The design of gamified transformative and social marketing services was also found to be an under-researched area in this cluster (Mulcahy, Russell-Bennett, and Zainuddin, 2018).

2.1.5. Cluster 5: factors influencing the process of learning

Learning can be defined as a process that results in relatively long-term changes in the learner's behaviour as a result of experience and learning (Akhtar et al., 2019; Aldhahri, 2015; Alshammari, 2020; Reason, 2009; Schiller and Dorner, 2021). This definition may also disclose that the learning process in a certain teaching-learning situation is primarily focused on two factors: Firstly, the learner whose behaviour is to be modified, and secondly the type of experience and training available for the learner's behaviour modification (Reason, 2009). As a result, in a particular teaching-learning situation or setting, success or failure in the work of learning is primarily determined by two types of characteristics, one connected to the learner and the other to the prevailing learning environment (Akhtar et al., 2019; Aldhahri, 2015; Alshammari, 2020).

In the field of gamification and e-learning, few studies were found to have identified the factors influencing the learning process. Instructors were found to agree that students are often not naturally motivated and thus do not immediately experience deep learning in immersive learning environments without adequate teaching support (Annansingh, 2019). This evidenced that, in the absence of qualified instructors, gamification, in itself, is not a good learning technique. Appiah (2016) revealed that gamification has a high potential to improve student engagement, motivation, and interaction in classroom lessons and to make the teaching and learning of mathematics enjoyable. Further, the environment was found to have been identified as a factor affecting the e-learning process. Gamification techniques were found to enhance e-learning environments (Bandara and Ioras, 2016), whereas video games were found to improve family life dynamics (Bassiouni and Hackley, 2016).

Gamified techniques were found to promote student engagement (Beça et al., 2020; Costello, 2020; Emblen-Perry, 2018; Hookham and Nesbitt, 2019; Luca et al., 2015; Marston and Hall, 2016; Orwin et al., 2015; Pechenkina et al., 2017; Rojas-López et al., 2019; Salute, 2015; Simões, Redondo, and Vilas, 2015; Sliwinska, 2019; Mathupayas Thongmak, 2018). Further, gamification elements were also found to improve user satisfaction levels through entertainment (Gui et al., 2019; Khaleel et al., 2015). Within this cluster, several studies were found to have paid attention to the game design features and process when teaching through gamified elements (Bell, 2018; Bharathi, 2015; Campbell, 2016; Gocheva et al., 2020; Gomes et al., 2020; Hansen et al., 2015; Koivisto, 2017; Mårell-Olsson, 2019; Mavroeidi et al., 2019; Parjanen and Hyypiä, 2019; Reiners et al., 2015; Thumlert, Castell, and Jenson, 2018; Troiano et al., 2020; X. Wang and Yao, 2020). Moreover, few studies were found to have investigated the gamified learning environment (Bharathi, Singh, and Tucker, 2016; Dneprovskaya et al., 2016; Kisurina, 2017; Mese and Dursun, 2018; Zahedi, 2019).

Table 3
Initial results from the database search.

Database	Number of articles
Google Scholar	2080
Emerald	57
ProQuest	1054
Science Direct	124

3. Systematic literature review

The first section of this paper presents our systematic literature review performed using the PRISMA guidelines. Tranfield et al. (2003) stated that systematic reviews and meta-analyses are vital to summarize the evidence relating to a particular research topic or field. However, there is considerable evidence that, in systematic reviews, key information is often poorly reported due to a lack of methodology or to an inappropriate structure. Inspired by the guidelines defined by Tranfield et al. (2003), systematic reviews define a subject and classify, summarize, and analyse the results. To summarise the evidence relating to gamification, e-learning, and young learners, we used the strict criteria set out by the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) to emphasize scientific validity with the aim of producing an unbiased analysis (Tranfield et al., 2003).

The main purpose of our study was to identify gaps suited for future research in the area of gamification and e-learning with unique reference to young learners. Along these lines, we efficiently explored the extant literature utilizing the 'Publish or Perish' software across various databases, including Google Scholar, Emerald, ProQuest, and Science Direct. To avoid including obsolete content in the review process, we focussed on the most recent viable six-year period (2015–2020). This was further justified based on previous reviews, which had focussed on five- to six-year review periods to yield findings pertinent to the most current research gaps (Jarquin, Wiggins, Schieve, and Naarden, 2011; Park, Satoh, Miki, Urushihara, and Sawada, 2015; Setati, Chitera, and Essien, 2009). For instance, a multi-disciplinary literature review had yielded 24 peer-reviewed scientific studies published between 2008 and 2013 (Hamari et al., 2014). The initial yield obtained from the various databases are outlined in Table 3.

Table 4
The overview of the key studies reviewed.

	Source	Journal/ Book/ Theses	Key constructs	Theories	Characteristics	Context	Methodology
1	Urh et al. (2015)	Procedia-Social and Behavioural Sciences	The model for the implementation of gamification into the e-learning sector of higher education was introduced. Concepts and distinctions between game mechanics and game dynamics and methods are clarified.	Gamification Theory (Biro, 2013)	-The paper provides a detailed view of the idea of gamification in higher education. -The benefits and drawbacks of the implementation of gamification in e-learning are defined.	E-learning at institutes of higher education	A comprehensive review
2	Bovermann et al. (2018)	International Journal of Educational Technology in Higher Education	As a case study, a distance learning bachelor's degree class was chosen to explore the implementation of a Moodle-based gamification definition and various variables associated with it through a mixed-methods-approach	The self-determination theory (SDT) of (Deci and Ryan, 1985, 1993)	-In the gamified learning environment, students have largely shown that they are inspired and fulfilled. -Strong positive correlations have been found between the readiness of students to learn online in terms of technical skills and both forms of autonomous motivation (identified and intrinsic motivation) -There was also a strong positive association between self-reported attitudes towards gaming and the dimension of coping of study-satisfaction -Reportedly, the acquisition of digital badges felt like an acknowledgement specifically awarded by the teacher of the students. Progress bars have been positively tested and acknowledged as a management instrument for individual learning strategies.	A bachelor's degree class in distance learning	Online surveys, interviews
3	Brøndum et al. (2019)	Journal of Creativity and Business Innovation	Examined the use of a new creativity training delivery method: a gamified embodied e-learning module to teach creative skills necessary for business innovation.	Doblin's taxonomy: configuration (profit model, network, structure, process)	-Embodied gamified e-learning on creativity could improve student motivation and participation and advance the emphasis and student time spent as part of business innovation studies	Students and teachers in an institute of higher education	Interviews, questionnaires
4	Aguiar et al. (2020)	Journal of Hospitality, Leisure, Sport Tourism Education	Examined the aspects that inspire a student's intention to use a gamified app in face-to-face education as a complementary learning strategy	Design and pilot test of an application based on gamification known as HEgameApp	- The findings demonstrate that anticipated hedonic and social benefits affect the intention of a student to use HEgameApp. - The attitude of students towards learning as well as creativity plays a constructive and important role in the decision of a student to use a gamified program. - The results show that the loss of privacy has a moderating impact on the link between the intention to use the gamified app and expected functional benefits	Tourism undergraduate program	Questionnaires
5	Armstrong and Landers (2017)	Simulation & Gaming	This research has shown that modifying game	Constructivist learning theory,	-The use of gamification of narratives is more	Leaners and trainers	Questionnaires

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Table 4 (*continued*)

	Source	Journal/ Book/ Theses	Key constructs	Theories	Characteristics	Context	Methodology
			fiction training material can enhance reactions to training while retaining similar levels of declarative learning compared to unmodified training.	theory of planned behaviour (Azjen, 1991), e theory of gamified learning(Landers, 2014)	complicated than the literature indicates. The influence of training design on learning does not appear to be moderated by attitudes toward game-based learning, but other individual differences can play a major role		
6	Ashraf et al. (2014)	Procedia-Social Behavioural Sciences	The present study explains the utility of online vocabulary learning games for Iranian students	Not applicable	- Due to interactivity and learner encouragement, online games have been successful in vocabulary acquisition	Students who study English at the Khorasan Language Institute	Experiments
7	Barrio, Muñoz, and Soriano (2015)	IEEE Transactions on Emerging Topics in Computing	This paper examined whether the inclusion of both student response systems (SRS) and gaming methods contributes to better outcomes than SRSs alone in motivation, focus, commitment, and learning performance. A new tool has been created to perform an experimental study with students from various subjects and from different academic levels for this purpose.	Not applicable	Students who had lecture sessions with a gamified SRS had more positive views of motivation, focus, and learning success than students who had lecture sessions with a non-gamified SRSS.	Students in the setting of a computer lab	Experiments, Surveys
8	Çakıroğlu, Başıbüyük, Güler, Atabay, and Memiş (2017)	Computers in Human Behaviour	This study aimed to show the impact of the gamified teaching process on student engagement and the correlation between engagement and academic success in a real classroom.	Not applicable	- The use of gamification components indirectly impacted academic achievement because of their positive influence on classroom participation	In an ICT course, undergraduate students	Clinical interviews
9	Chauhan, Taneja, and Goel (2015)	International Conference on MOOCs, Innovation, and Technology in Education	This study examined the positive influence of three techniques in the current learning scenario, namely Virtual Reality, Adaptive Learning, and Gamification, and explores how Massive Open Online Course (MOOC) adopts these techniques to produce interactive and more engaging content	Constructivist learning theory, Malcom Gladwell's theory of success	-Using Virtual Reality, Adaptive Learning and Gamification provides the learner with a beneficial atmosphere that improves student outcomes by engaging them in the learning process. -Some of the main features of these methods are improved visualization, promotion of individualism, and enhancement of the interest factor.	Students of University of California San Diego's Rady School of Management	Technical paper
10	Dias (2017)	The International Journal of Management Education	In an Operations Research/Management Science course taught to undergraduate management students, the experience of implementing gamification will be represented.	Gamification Theory (Biro, 2013)	-The implementation of the most relevant game mechanics and related dynamics was considered using challenges, ratings, personalized reviews, badges, and leader boards. -It was possible to see an increase in the involvement of students in the classroom, an increase in the percentage of students accepted, and a better evaluation of the course by the students.	Undergraduate management students in an Operations Research/ Management Science course	Surveys
11	Dicheva, Dichev, Agre, and Angelova (2015)	Educational Technology & Society	This systematic review presents an analysis of empirical literature conducted on the	Not applicable	-The study revealed that there are several publications on the use of gamification in education, but most identify only	Gamification in higher education	A Literature review

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Table 4 (*continued*)

	Source	Journal/ Book/ Theses	Key constructs	Theories	Characteristics	Context	Methodology
			application of gamification to education.		certain game mechanisms and dynamics and reiterate their potential use in the educational context, while real empirical research is still scarce on the efficacy of integrating game components in learning environments - Although there is mostly a lack of proper assessment, most of the authors of the reviewed papers share the opinion that gamification, if well planned and used correctly, has the potential to enhance learning. To explore the motivational effects of using single game elements in specific educational contexts and for types of learners, more substantial empirical research is therefore required		
12	Fan, Xiao, and Su (2015)	Eurasia Journal of Mathematics, Science Technology Education	Examined the influence of learning styles and meaningful learning on the learning success of gamification curriculum for health education	Experiential Learning Theory, (Kolb, 1976)	- - Divergences in mobile game-based learning styles: the well-designed curriculum in meaningful learning was highly regarded by students with convergent styles; student gender showed no substantial difference in curriculum design and learning achievement in meaningful learning; students with different learning styles showed noticeable differences in learning achievement; and students in the experimental group apparently had a higher learning achievement than the students in the control group, with prominent differences	In biology, junior high school students study the human blood circulation unit	Experiments, Questionnaires
13	Hew, Huang, Chu, and Chiu (2016)	Computers Education	Two longitudinal studies performed at an Asian university documented the impact of game mechanics on student cognitive and behavioural engagements.	The self-determination theory (SDT) of (Deci and Ryan, 1985, 1993)	- The use of game mechanics has had a positive influence on inspiring students to take on more challenging assignments.	Students in an Asian public university	Experiments, Questionnaires
14	Kuo and Chuang (2016)	Computers in Human Behaviour	Gamification was extended to an online context for academic promotion and dissemination in this research.	The self-determination theory (SDT) of (Deci and Ryan, 1985, 1993)	- The positive influence of gamification on the advancement of academic dissemination in an online environment has been shown. - While several theorists and companies have suggested different design options and approaches related to gamification, as stated in the section of the literature review, attention should be paid to the framework in which gamification is implemented (as it is not acceptable for every situation and not every game mechanic or dynamic	Members of the faculty, students, tourists to the internet or website members	Questionnaires, Surveys

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Table 4 (*continued*)

	Source	Journal/ Book/ Theses	Key constructs	Theories	Characteristics	Context	Methodology
					can be effectively applied to each set		
15	Leaning (2015)	Journal of Media Practice	This paper identified the research results of a study examining the efficacy of a learning and teaching project involving the use of games on a media theory module taught at a British university undergraduate degree in Media Studies to assist student learning.	Not applicable	The gamified module influenced the attitude and psychological effort of the students about studying on the module. - It is not possible to conclude that the gamified modules increased the achievement of the students.	Undergraduate Media Studies students in a British university	Experiments
16	Markopoulos, Fragkou, Kasidiaris, and Davim (2015)	International Journal of Mechanical Engineering Education	A systematic literature review reviewing various aspects of this novel concept on the current gamification status	Not applicable	- Researchers generally conclude that gamification has a beneficial impact on engineering education by making challenging subjects more manageable, increasing intrinsic motivation, scientific expertise, cooperation, interest, and reducing or better managing the workload	Engineering education at a pre-graduate level and in a professional practice setting	A Literature review
17	Nakada (2017)	Online database: Frontiers in ICT	This paper gave an example of a typical lecture course focused on instruction, which was revamped using a game-like interface.	Herzberg's theory of motivation, Elaboration Likelihood Model (Petty and Cacioppo, 1986)	The content of the lecture course was enhanced by gamification. - Final achievement test scores showed no change with the gamification of lecture courses	Experiments were done in lecture courses held at the Niigata University of International and Information Studies in Japan	Questionnaires
18	Nour, Rouf, and Allman (2018)	Appetite	Explored young adult perspectives in a mobile forum on the use of gamification and social media to maximize vegetable intake	Behaviour change theory	-The recommended use of social media and mobile gaming has been an appropriate approach in improving vegetable consumption. -To appeal to this population, products should be visually pleasing, clearly crafted, credible, and personally important.	Young adults in Sydney, Australia	Open discussions
19	Reddy (2018)	Master's thesis Unitec Research Bank	The results of a small-scale study aimed at designing, implementing, and evaluating PB4L pedagogy via gamification through persuasion were presented and discussed in this research study.	Teaching as enquiry process (Timperley and Parr, 2007)	Teachers were worried about regularly rewarding and reporting, but most found the Ka Pai app helpful in tracking their consistency. -Most participants thought that their PB4L implementation through the Ka Pai app had improved and this app also helped teachers build positive relationships with students.	Teachers at Wesley Intermediate School	Interviews, Surveys
20	Sailer et al. (2017)	Computers in Human Behaviour	Experimental research on the influence of particular game design elements on the satisfaction of psychological needs	The self-determination theory (SDT) of (Deci and Ryan, 1985, 1993)	-Based on a self-determination theory paradigm, the findings show that badges, leadership boards, and success graphs have a positive effect on competence, satisfaction, and perceived importance of the mission, while avatars, meaningful stories, and teammates have an impact on social relationship experiences. Perceived freedom of choice, however, could not be affected as expected.	Online simulation environment	Questionnaires
21				Not applicable			

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Table 4 (*continued*)

	Source	Journal/ Book/ Theses	Key constructs	Theories	Characteristics	Context	Methodology
	Sailer and Homner (2020)	Educational Psychology Review	This meta-analysis was carried out to systematically synthesize empirical results on the impact of gamification on the results of cognitive, motivational, and behavioural learning.		- The findings indicate that gamification is an effective method of instruction as it is currently operationalized in empirical studies, although factors contributing to successful gamification remain somewhat unresolved, particularly for cognitive learning outcomes.	Impact on cognitive, motivational, and behavioural learning outcomes of gamification	A Literature review
22	Seidlein, Bettin, Franikowski, and Salloch (2020)	BMC medical education	A new learning space was built to better address the individual learning needs of medical students.	Not applicable	- A further advancement of e-learning instruments such as this study's new learning space seems promising and should be followed by larger and more intricate analytical assessment studies.	A new learning area, the "TERMInator", was created at Greifswald University Medicine to better meet the individual learning needs of medical students.	Questionnaires
23	Skinner et al. (2018)	Convention of the Study of Artificial Intelligence and Simulation of Behaviour	- Discuss methodologies that can be incorporated into online learning platforms to embed text, video clips, gamification, and quizzes to facilitate improvements in observable cyber security behaviour.	Social Cognitive Theory, The Cognitive Moral Development (CMD) theory (Kohlberg 1981)	- Discussed that partnership between technology companies and researchers in psychology enhances the standard of education in cybersecurity and changes in behaviour amongst end-users - Illustrated that a combination of distribution methods is important through knowledge-based awareness, video dramas, and gamification strategies to enable behavioural change in cyber security practices in end users. - Applying analytics to the responses of a workforce to eLearning will make it possible to better understand where sections of organizations are vulnerable in cyber security areas. -Tailored eLearning systems may then be modified to help deter cyber-attacks by teams or individuals. Collaboration between academics and businesses will undertake more research into the pacing and delivery of sporadic learning methods to continue and sustain behavioural improvement.	Computer business (Lime tools) and psychology academics	Discussion
24	Stansbury and Earnest (2017)	Teaching of Psychology	The present study examined the degree to which a learning environment designed by an industrial-organizational psychology course produced with meaningful gamification elements would enhance student perceptions of learning, course experience, and learning results compared to a conventional course.	The self-determination theory (SDT) of (Deci and Ryan, 1985, 1993)	-This study encourages students to report greater enjoyment, commitment, and motivation in learning compared to conventional courses through the introduction of some significant gamification elements (e.g., exposition, play, choice).	The campus of a large metropolitan university during the first academic year	Experiments, Surveys
25	Strmečki, Bernik, and	Journal of Computer Science	The development phases of the implementation of gamification into e-	Universal Design for Learning (UDL) theory, The self-	-Several elements of gamified nature are considered suitable for e-	A comparison of an informatics online course with the	Experiments

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Table 4 (*continued*)

	Source	Journal/ Book/ Theses	Key constructs	Theories	Characteristics	Context	Methodology
	Radošević (2015)		learning systems, different elements of gamification design, and their suitability for use in e-learning systems were addressed.	determination theory (SDT) of (Deci and Ryan, 1985, 1993)	learning (including points, badges, trophies, customization, leader boards, levels, progress tracking, challenges, feedback, social engagement loops, and the freedom to fail)	conventional presentation of online learning	
26	Subhash and Cudney (2018)	Computers in Human Behaviour	This paper provides a systematic literature review of game-based learning systems, mechanisms that incorporate elements of game design, and different gamification implementations in higher education.	Not applicable	-The results of this literature review encourage universities of higher education to use and explore successful gamified learning and teaching systems to enhance student involvement, motivation and success.	Gamification in higher education	A Literature review
27	Weiser, Bucher, Cellina, and Luca (2015)	29th International Conference on Informatics for Environmental Protection	This research examined the circumstances in which components such as feedback and game elements (e.g. rewards) provide user motivation.	Not applicable	-User skills can be improved by directing and teaching how to use the site and its functionality by gamification.	A case study from the domain of sustainable mobility behaviour (the project GoEco!)	Experiments
28	Wiggins (2016)	International Journal of Game-Based Learning	This paper explored the use in tertiary education of both game-based learning (GBL) and gamification.	Not applicable	- Present gamification techniques tend to be a repackaging of existing instructional strategies, based on the findings.	Gamification in tertiary education	Surveys
29	Wongso, Rosmansyah, and Bandung (2014)	International Conference on Technology, Informatics, Management, Engineering & Environment	This paper analysed similar works on e-learning 2.0, the gamification paradigm, and then developed a conceptual process design focused on social participation in Web 2.0 technology and gamification using the methodology of the Design Science Research Model. The use of this platform design can be a reference for individuals who want to incorporate e-learning system gamification and Web 2.0 technology.	Piffer's Design Science Research Methodology (DSRM) for Information System as procedure and guidelines	- Gamification and Web 2.0 technology have the same approach that uses social functions to inspire and engage learners in the use of the e-learning framework. - This proposed structure supports individuals who wish to study and incorporate gamification and Web 2.0 technologies not only in the e-learning system but also for further advancements, such as mobile learning.	Student's engagement in using e-learning, Indonesia	Surveys
30	Yildirim (2017)	The Internet Higher Education	The goal of the current study is to evaluate the effects of gamification-based teaching practices on student success and their lesson attitudes. The study of the influence of gamification on educational processes and outcomes is expected to add to the related literature since it is a relatively new mechanism.	Not applicable	-Gamification-based teaching approaches have a positive effect on student success and the attitudes of students towards lessons.	Department of Elementary Mathematics Education at Southern Turkey State University	Experiments
31	Zainuddin, Chu, Shujahat, and Perera (2020)	Educational Research Review	This research is an effort to present a review of the empirical results of state-of-the-art literature in the new area of gamification in the field of learning and teaching education.	Not applicable	-In this report, the review showed the emergence of three key positive themes (engagement and motivation, academic achievement, interaction, and socialization) as the beneficial effects of research on gamification. -The analysis shows that in this current digital age, gaming innovations have a direct impact on learning	Theoretical foundations of gamification are re-examined	A Literature review

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Table 4 (*continued*)

	Source	Journal/ Book/ Theses	Key constructs	Theories	Characteristics	Context	Methodology
					and on the ability to modernize the education landscape. Further studies are therefore required to gamify the learning experiences of students and investigate the impact of gamified concepts on course topics.		
32	Olsson et al. (2015)	Electronic Journal of E-Learning	This paper introduced and addressed visualization as a channel for enhancing learner control and comprehension of programming concepts and gamification in virtual learning environments to improve research motivation.	Multimodal design theory, The self-determination theory (SDT) of (Deci and Ryan, 1985, 1993)	-Progress bar visualization is a good way to enhance the overview of course participants in online environments with rich and multifaceted content. It is difficult to estimate to what extent visualization encourages the completion of the course, and because students have different learning styles, they often seem to have different needs for visualization. -Gamification by digital badges seems to have different motivating effects in different research groups and conventional grades tend to be the key carrots in traditional university programs.	Game-based Bachelor's Degree Course learning program	Questionnaires and group discussions

We limited the scope of our search to English-language peer-reviewed studies, and we used 'gamification', 'e-learning', and 'young learners' as keywords. As shown in table 4, a total of 3315 studies were initially returned. A total of 2835 papers were excluded from the process by eliminating the duplicates documents and reviewing their scope and contribution. For example, some studies were found to have focussed on the gamification of e-learning without considering young learners. The remaining 480 articles were classified as suitable for further study. Further this analysis includes the papers focused on e-learning and gamification with special reference to young learners. The contribution is limited towards gamification and e-learning context.

In addition, any papers published in high-quality ranking journals were included to ensure the quality of the study. For example, we considered any papers published in journals ranked A or above in the Australian Business Deans Council (ABDC) ranking, or Q3 or above in the SCImago Journal ranking. Other than these rankings, the papers' contributions, as assessed in various reports, were also considered. A total of 448 papers were thus eliminated from the process based on quality, which left a total of 32 studies identified as suitable.

The final 32 studies included journal papers, book reviews, and thesis projects. In addition, these papers were arranged according to the key theories, characteristics, context, and methodologies (TCCM) used in the field to advance the science and practice of gamification and e-learning disciplines from its inception. For example, those studies that had applied the TCCM method had contributed to several fields—such as cause-related and social marketing (Singh and Dhir, 2019), and service innovation (Singh et al., 2020)—and had extended and discussed the existing hypotheses formulated in previous studies in the field of responsiveness (Sharma et al., 2020). Therefore, these studies were categorized under the TCCM framework as follows

Our systematic literature review, which encompassed articles published and reviewed in high-ranking management, education, and psychology journals, was intended to establish potential research perspectives on gamification for young learners in the e-learning discipline. As a result, we identified four major research themes—personalization, game elements, learner styles, and learner engagement—which will be analysed below.

3.1. Personalization in e-learning amongst adolescents

Different types of e-learning are not equally accepted, reliable, or effective (Urh et al., 2015). E-learning personalisation enables young learners demands to be satisfied to their full potential, increasing their satisfaction (Urh et al., 2015). Teachers, on the other hand, may utilise artificial intelligence to recognise e-learning behaviours amongst adolescents (Urh et al., 2015). These data would allow e-learning orders to be tailored, allowing students' preferences to be met through gamification (Urh et al., 2015). A greater incorporation of personalization, artificial intelligence, and gamification point at future research to be conducted with a greater emphasis on e-learning. E-learning makes use of technology to provide education. Similarly, the features of various technological e-learning platforms—such as student answer systems (Barrio et al., 2015), Immense Open Online Courses (Chauhan et al., 2015), and gamification tools (Seidlein et al., 2020; Skinner et al., 2018; Wongso et al., 2014)—need attention in order to further enhance their effectiveness (Barrio et al., 2015). In addition, longitudinal studies could be carried out to investigate the effectiveness of gamified courses on long-term student performance (Dias, 2017).

The two approaches identified are customised gamification designs and technical skills.

3.1.1. Customised gamification designs

Customized gamification adapts the gamification design based on user input especially the adolescents by reducing the success rate of universal gamification (Alafouzou and Lamprinou, 2018; Alshammari, 2020; Antonaci et al., 2017; Appiah, 2016). The tailoring process should consider both user and contextual variables (e.g., activity to be completed and geographic location), resulting in many customization opportunities (Alafouzou and Lamprinou, 2018; Alshammari, 2020; Antonaci et al., 2017; Appiah, 2016; Armstrong and Landers, 2017;

Rodrigues et al., 2021). As a result, gamification personalisation technologies that automate the process are required (Rodrigues et al., 2021). The difficulties stem from recognising which of those features are important and how to adjust them, as well as a lack of automated tools. It's important to think about how crucial features interact. When a single attribute (such as nation) changes, the game aspects that individuals prefer are likely to shift as well. Even if all other criteria are the similar (e.g., gender, weekly playing time), the recommended game features for the same LAT will be different for Brazilian and American adolescents (Rodrigues et al., 2021; Seidlein et al., 2020; Skinner et al., 2018).

3.1.2. Technical skills

The human factor is a significant part of the software development process, particularly in agile development, where teams have more freedom in their actions (Rodrigues et al., 2021; Seidlein et al., 2020; Skinner et al., 2018). Through the evolution of developer communities, the social aspect of the human factor has become a decisive factor for project progress. As a result, reviewing the abilities and expertise of software engineers is critical for evaluating various elements of development and community involvement performance. In this pursuit, both technical (e.g., understanding of specific programming) and non-technical abilities are important which lacks significant attention now (Bareicheva and Stepanova, 2019; McDonald, 2017; Núnez, 2018; Zamora et al., 2018).

3.2. Game elements in e-learning amongst adolescents

The numerous components included in gamification platforms serve a variety of functions. Tutor rewards in e-learning situations, for example, can include virtual presents, virtual levels, and favourable remarks or feedback. Therefore, future studies on gamification and e-learning should separately assess game elements such as leader boards, virtual scores, virtual feedback, comments, badges, and levels (Brøndum et al., 2019; Strmečki et al., 2015; Weiser et al., 2015) to gain a more detailed understanding of its effectiveness (Aguiar et al., 2020; Bovermann et al., 2018). Furthermore, different research lines with diverse research techniques may be required to understand the dynamic interaction between narrative- and learning-focused education amongst adolescents (Armstrong and Landers, 2017). According to the theory of gamified learning, the relationship between game features and learning outcomes is facilitated by behaviours and attitudes. For instance, academic performance suffers when students are not interested in their schoolwork (Carini et al., 2006). The addition of game elements, such as game fiction, to a course increases student interaction with its content, which then facilitates academic success (Armstrong and Landers, 2017).

Çakıroğlu et al. (2017) distinguished the various impacts of the implementation of gamification facets such as leader boards, reputation, real gifts, points, and quests, and found that a mix of such elements may have a significant positive persuasive effect on commitment (Çakıroğlu et al., 2017). Further, Kuo and Chuang (2016) highlighted the importance of conducting more empirical research on gamification strategies—e.g., tangible gift exchange behaviours involving the use of gift points as a virtual currency, human experiences with gift price marking, etc. To account for the various ways in which learners engage with gamified environments, the human-environment relationship could be used as the research unit for future primary studies (Landers et al., 2017). Further, the investigation of unique gamification elements to determine their effect on students could also be another significant future research avenue (Subhash and Cudney, 2018).

3.3. Learner styles used in e-learning amongst adolescents

Higher education e-learning through gamification differs from other sectors due to its user characteristics (Urh et al., 2015). For example, online games have been shown to be highly effective in improving the English vocabulary of Iranian students (Ashraf et al., 2014). The development of word games for classroom uses as a gamification learning strategy necessitates consideration of various learner styles amongst young people. Digital games have been considered by certain scholars as a future learning style (Hsiao, 2007). In addition, another stream of research has shown that games, on their own, cannot contribute to learning, but need the aid of teaching techniques to improve outcomes (Fan and Tan, 2019). While several studies are devoted to the use of gamification in the context of education, most are specifically focussed on game mechanisms and dynamics and reiterate their potential use in the educational setting; however, empirical research on the efficacy of the integration of game components in learning environments is still scarce (Dicheva et al., 2015).

Despite the lack of rigour in evaluation, many academics feel that if properly planned and conducted, gamification has the potential to promote learning. More research is needed to look at the motivational effects of using single game components in specific educational scenarios while taking into account the various types of young learners (Dicheva et al., 2015; Leaning, 2015). Therefore, game mechanics and the principles of gamification design for individual learning styles are still under researched (Dicheva et al., 2015; Leaning, 2015; Wiggins, 2016). Future gamification and learner ability levels study should further take into account the gamification climate and distinctive game design characteristics, as well as the learners' competitive skill levels (Sailer et al., 2017). Landers et al. (2017), for example, illustrated how leadership boards used to increase competitiveness can be viewed as objectives, meaning that leader boards with simple goals are less likely to succeed than those with complex goals.

3.4. Learner engagement in e-learning amongst adolescents

Student engagement is vital for successful learning (Olsson et al., 2015). Hew et al. (2016) gave empirical proof of the impact of game mechanics in an Asian environment, and advocated investigating what it means for potential researchers to use various game mechanics, such as stories or simulations, and how game mechanics can impact long-term student engagement. Therefore, when considering gamification in relation to engineering education, the extant studies have been largely theoretical and experimental; it would thus be important to report on participant experience in future research (Markopoulos et al., 2015). Nakada (2017) performed an empirical analysis of the redesign of instruction-based lectures into a gamified one. The findings demonstrated the importance of defining gamification elements before constructing gamification platforms. Similarly, Nour et al. (2018) indicated the significance of developing gamification systems that have a strong effect on students' ability to learn.

Yildirim (2017) measured the impact of gamification-based teaching practices on the achievements of students and on their attitudes towards the lectures; an impact that research has been shown to be difficult to gauge. The findings clearly showed that the gamification structure—produced for internet use in the form of a blended learning process—had statistically positive effects on student achievement and attitudes towards the lectures (Yildirim, 2017). Reddy (2018) suggested measuring student engagement levels via their feedback on different gamification platforms and suggested that greater attention needs to be paid to mobile apps and gamification. In the context of the various game design elements, future game-playing behaviour is still an under-researched area (Sailer et al., 2017). However, future research is needed to examine how each aspect of gamification influences student learning expectations and whether these elements can promote long-term learning, as suggested by theoretical research (Stansbury and Earnest, 2017).

4. Future research agenda on gamification and e-learning for young learners

By performing a bibliometric analysis, our study examined and

uncovered the growth in scholarly interest in the new concept of gamification in regard to young consumer e-learning between 2015 and 2020. The first section of this paper presented the systematic review we conducted using the PRISMA guidelines to identify future research perspectives on gamification and e-learning for young learners. Over the past five years, the abovementioned growth has generated a vast body of knowledge aimed at examining various aspects under the TCCM framework. Classic literature reviews aid in the advancement of a field (Paul and Criado, 2020; Paul, Merchant, Dwivedi, and Rose, 2021). According to Paul et al. (2021) framework-based reviews, such as TCCM (Theory, Context, Characteristics, Methods), are more influential than other forms of reviews, such as bibliometric reviews or narrative reviews, when it comes to theme-based evaluations. Therefore, we used the TCCM based future research analysis in this study to improve the value of our study.

4.1. Future directions – theory

When considering the scholarly literature, researchers have assessed the gamification and e-learning of young learners by taking two main theoretical approaches: behavioural psychology theories and communication theories.

4.1.1. Behavioural psychology theories

Gamification into the e-learning sector of higher education has been assessed through various behavioural psychology theories—such as Deci and Ryan's (1985, 1993) self-determination theory (SDT)—to evaluate the use of its attributes in regard to distance learning (Bovermann et al., 2018). Similarly, two longitudinal studies conducted at an Asian university have documented the impact of game mechanics on student cognitive and behavioural engagement (Hew et al., 2016) and in an online context for academic promotion and dissemination (Kuo and Chuang, 2016) through SDT. Furthermore, Sailer et al. (2017) conducted experimental research on the influence of particular game design elements on the satisfaction of psychological needs by using the theoretical attributes of SDT. Through the theoretical attributes of SDT, Stansbury and Earnest (2017) examined the degree to which a learning environment designed by an industrial-organizational psychology course with meaningful gamification elements would enhance student perceptions of learning, course experience, and learning results compared to a conventional course. Moreover, SDT has contributed to the gamification and e-learning literature by facilitating visualization as a channel suited to enhance learner control and comprehension of programming concepts and gamification in virtual learning environments in order to improve research motivation (Olsson et al., 2015).

Biro, (2013) gamification theory has been used as a model for the implementation of gamification in the higher education e-learning sector (Dias, 2017; Urh et al., 2015). Constructivist learning theory and theory of planned behaviour have been used to design gamified-based training programmes (Armstrong and Landers, 2017) and virtual reality based adaptive learning techniques (Chauhan et al., 2015). Kolb's (1976) experiential learning theory has been used to examine the influence of learning styles and meaningful learning on the success of gamification curriculum for health education (Fan et al., 2015). Herzberg's theory of motivation and Petty and Cacioppo's (1986) elaboration likelihood model have been used in the academic literature as a foundation in designing online course curricula (Nakada, 2017). Nour et al. (2018) explored young adult perspectives in a mobile forum on the use of gamification and social media to maximize vegetable intake through behavioural change theories. By using Bandura's (1986) social cognitive theory and Kohlberg's (1981) cognitive moral development theory, Skinner et al. (2018) examined methodologies that could be incorporated into online learning platforms to embed text, video clips, gamification, and quizzes in order to facilitate improvements in observable cyber security behaviours.

4.1.2. Communication theories

Piffer's design science research methodology for information systems (Wongso et al., 2014) has been used as a procedure and guideline to analyse e-learning 2.0, the gamification paradigm, and to develop conceptual process designs focussed on social participation in Web 2.0 technology and gamification. The use of this platform design can be a reference for those who wish to incorporate e-learning system gamification and Web 2.0 technology (Wongso et al., 2014). Universal design for learning theory has also been used in the literature for the development phases of the implementation of gamification into e-learning systems, different elements of gamification design, and their suitability for use in e-learning systems (Strmečki et al., 2015). Additionally, media communication theories have been used by gamification research scholars to develop gamification-based marketing communication strategies (Haddad, 2016).

4.2. Future directions – context

The literature highlights three major contexts used in current scholarship. First, most studies have focussed on gamification in the university context (Aguiar et al., 2020; Ashraf et al., 2014; Bovermann et al., 2018; Brøndum et al., 2019; Çakıroğlu et al., 2017; Chauhan et al., 2015; Dias, 2017; Dicheva et al., 2015; Hew et al., 2016; Leaning, 2015; Subhash and Cudney, 2018; Urh et al., 2015). The tertiary education context has been used to focus on exploring the use of both game-based learning and gamification (Wiggins, 2016). Second, few researchers have worked on the design of secondary school curricula with gamification elements (Fan et al., 2015; Nour et al., 2018; Reddy, 2018; Yildirim, 2017). Third, we found only a single empirical study that used behavioural psychology theories to investigate the design of distance learning curricula through gamification elements for young learners (Sailer et al., 2017). Further, we identified aspects of online learning using gamification elements to be an under-researched area (Sailer and Homner, 2020; Urh et al., 2015; Wongso et al., 2014; Zainuddin et al., 2020).

4.3. Future directions – characteristics

Urh et al. (2015) provided a detailed view of the concept of gamification in higher education, defining the benefits and drawbacks of the implementation of gamification in e-learning. Further, in the gamified learning environment, students have been largely shown to be inspired and fulfilled, with strong positive correlations having been found between the readiness of students to learn online—in terms of their technical skills—and both forms of autonomous motivation (Bovermann et al., 2018). Further, Bovermann et al. (2018) discovered a robust link between self-reported gaming attitudes and study satisfaction. For example, the awarding of digital badges was perceived by students as a specific teacher acknowledgement, and progress bars have been positively tested and acknowledged as a management instrument for individual learning strategies (Bovermann et al., 2018).

Brøndum et al. (2019) examined the use of new delivery methods for creativity training. Similarly, Aguiar et al. (2020) examined the aspects that inspire student intentions to use gamified apps as a complementary learning strategy in face-to-face education. The use of the gamification of narratives is more complex than the extant literature has hitherto indicate. The influence of training design on learning does not appear to be moderated by attitudes towards game-based learning, but other individual differences have been shown to play a major role (Armstrong and Landers, 2017). Due to interactivity and learner encouragement, online games have been successful in facilitating vocabulary acquisition (Ashraf et al., 2014). Students engaged in lecture sessions with gamified response systems have been found to hold more positive views of motivation, focus, and learning success (Barrio et al., 2015). When considering the classroom setting, the use of gamification components has been shown to indirectly affect academic achievement because of

their positive influence on classroom participation (Çakıroğlu et al., 2017). This aspect has been further supported in regard to the use of virtual reality technologies. Virtual reality, adaptive learning, and gamification provide learners with a beneficial environment that improves their outcomes by involving them in the learning process (Chauhan et al., 2015).

Dicheva et al. (2015) identified several studies on the use of gamification in education; however, most of these were found to focus only on specific game mechanisms and dynamics and to reiterate their potential use in the educational context. Conversely, there is still a dearth of real empirical research on the efficacy of integrating game components in learning environments. Fan et al. (2015) examined the influence of learning styles and meaningful learning on the success of gamified curricula in health education. Their findings indicate that divergences in mobile game-based learning styles, such as well-designed curricula in meaningful learning, are highly regarded by students with convergent styles. Student gender has been shown to have no substantial effect on curriculum design and learning achievement in meaningful learning; students with different learning styles were shown to exhibit noticeable differences in their learning achievements, and the students in the experimental group appeared to be able to attain higher learning achievements than those in the control group, with prominent differences (Fan et al., 2015). The use of game mechanics has been found to positively inspire students to take on more challenging assignments (Hew et al., 2016). One study (Kuo and Chuang, 2016) was found to have extended gamification to the online context for academic promotion and dissemination.

Further studies revealed the use of social media and mobile gaming as an appropriate approach to improving vegetable consumption amongst young adults (Nour et al., 2018). By using SDT, Sailer et al. (2017) conducted experimental research on the influence of particular game design elements on the satisfaction of psychological needs. Their findings showed that badges, leadership boards, and success graphs have a positive effect on competency, satisfaction, and perceived importance of the mission, while avatars, meaningful stories, and teammates have an impact on social relationship experiences. Perceived freedom of choice, however, was not affected as expected (Sailer et al., 2017). Similarly, Sailer and Homner (2020) stated that gamification, as currently operationalized in empirical studies, is an effective method of instruction, although the factors contributing to its success remain somewhat unresolved, particularly for cognitive learning outcomes.

Several elements of gamification are considered suitable for e-learning (including points, badges, trophies, customization, leader boards, levels, progress tracking, challenges, feedback, social engagement loops, and the freedom to fail) (Strmečki et al., 2015). Accordingly, Wongso et al. (2014) found that gamification and Web 2.0 technology take a similar approach that involves the use of social functions to inspire and engage students in the use of the e-learning framework. Their findings were further confirmed by (Yildirim, 2017), who concluded that gamification-based teaching approaches have a positive effect on student success and attitudes towards lessons. Finally, Olsson et al. (2015) introduced and addressed visualization as a channel suited to enhance learner control and comprehension of programming concepts and gamification in virtual learning environments to improve research motivation. Progress bar visualization is a good way to enhance the overview of course participants in online environments with rich and multifaceted content (Olsson et al., 2015). It is difficult to estimate the extent to which visualization encourages course completion and, as students have different learning styles, they often seem to have different needs for visualization (Olsson et al., 2015). Further, Olsson et al. (2015) indicated that gamification by digital badges seems to have different motivating effects in different research groups, and that conventional grades still tend to be the key carrots in traditional university courses.

Table 5
Summary of key findings and managerial implications.

Identified trends	Managerial implications
Limited literature reviews on gamification and e-learning with special reference to young learners	-Review of literature specifically focusing on gamification and e-learning with special reference to young learners may contribute to the existing knowledge by providing directions to the future researchers and firms which are designing gamified-based course curriculum.
New tools and methods are needed to offer an assessment tool	-Currently, gamification and e-learning are combined only with virtual reality. More attention is needed to combine gamification and e-learning with augmented reality and mixed reality technologies

4.4. Future directions – methodology

Our study identified two major gaps in gamification and e-learning research methodology. First, most of the studies reviewed had used qualitative data collection methods (Table 3) involving online surveys, interviews, questionnaires, and experimental approaches. Most empirical studies had used questionnaire and survey-based data collection methods, this raises questions concerning their longevity and the fact that they may not have explored the actual experiences of gamification in the e-learning context. Therefore, it would be necessary to adopt qualitative data collection techniques—such as the Delphi method, focus groups, and semi-structured interviews—that are less represented in the current literature. Second, we could not find any longitudinal study conducted with special reference to young learners. Therefore, we would highly recommend that future researchers adopt qualitative techniques with more longitudinal associations.

5. Implications and conclusion

Our study exposed the development in scholarly interest in the novel concept of gamification in reference to young consumer e-learning between 2015 and 2020 using bibliometric analysis. The first half of this study detailed the systematic review we conducted using the PRISMA criteria to identify future research directions in gamification and e-learning for young learners. The above-mentioned increase has resulted in a significant amount of knowledge focused at investigating various facets of the TCCM framework over the last five years. The major theoretical contribution of our study lies in its use of the TCCM framework to systematically review the literature and to identify any under-researched areas. Our study is the first to attempt a thematic analysis of the research gaps and most prominent research topics in the context of gamification and e-learning for the young learners through a systematic literature review and a bibliometric analysis. Further, our findings offer education policymakers, higher education administration bodies, gamification-based software developing companies, and agencies key insights suited to identify the gamification techniques most appropriate to e-learning aspects. Table 5 further shows the summary of our key findings and managerial implications.

Taken together of this analysis, the e-learning personalisation enables users' demands to be satisfied to their full potential, increasing their satisfaction. Teachers, on the other hand, may utilise artificial intelligence to recognise their students' e-learning behaviours. These data would allow e-learning orders to be tailored, allowing students' preferences to be met through gamification (Urh et al., 2015). The two approaches identified are customised gamification designs and technical skills. Firstly, customized gamification tailor's gamification designs based on user input, making one-size-fits-all gamification less successful (Alafouzou and Lamprinou, 2018; Alshammari, 2020; Antonaci et al., 2017; Appiah, 2016). The tailoring process should consider both user

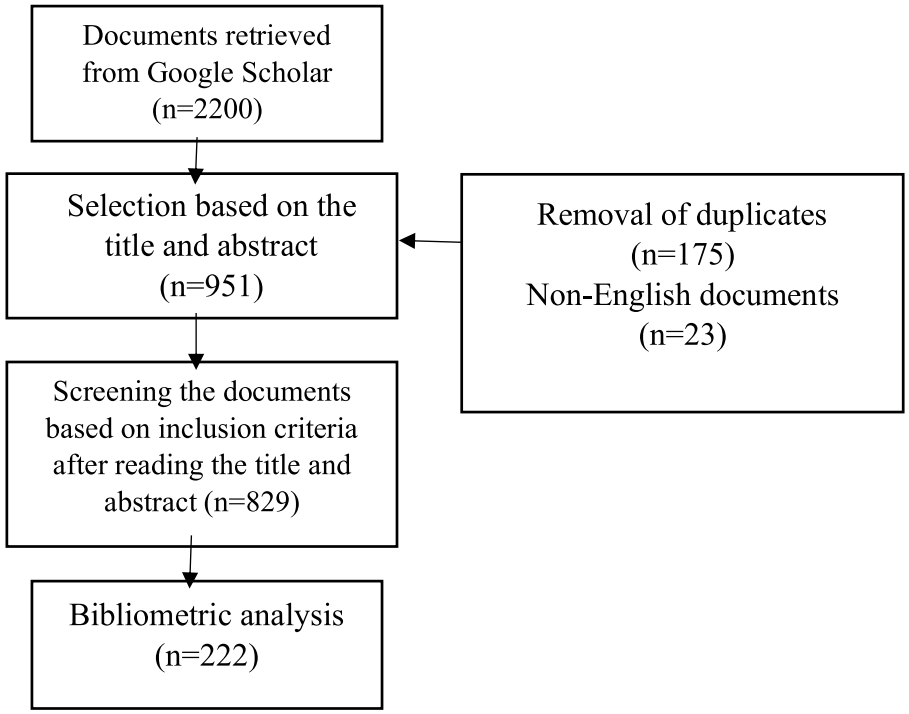

Fig. 2. The data retrieval process.

and contextual characteristics (for example, the activity to be accomplished and the geographic location), resulting in numerous customization options (Alafouzou and Lamprinou, 2018; Alshammari, 2020; Antonaci et al., 2017; Appiah, 2016; Armstrong and Landers, 2017; Rodrigues et al., 2021). As a result, tools that automate the gamification personalisation process are required (Rodrigues et al., 2021). Secondly, social aspect of the human factor has become a significant factor for project progress as developer communities have evolved. As a result, assessing software engineers' abilities and competence is crucial for assessing many aspects of development and community involvement performance. Both technical (e.g., comprehension of specific programming) and non-technical qualities are crucial in this endeavour, yet they are currently undervalued (Rodrigues et al., 2021; Seidlein et al., 2020; Skinner et al., 2018).

The numerous components included in gamification platforms serve a variety of functions. Tutor rewards in e-learning situations, for example, can include virtual presents, virtual levels, and favourable remarks or feedback. To acquire a more complete knowledge of its effectiveness, future studies on gamification and e-learning should individually examine game features such as leader boards, virtual scores, virtual feedback, comments, badges, and levels (Brndum et al., 2019; Strmeki et al., 2015; Weiser et al., 2015). (Aguiar et al., 2020; Bovermann et al., 2018). Higher education e-learning through gamification differs from other sectors due to its user characteristics (Urh et al., 2015). Online games, for example, have been proved to be very helpful in helping Iranian students improve their English vocabulary (Ashraf et al., 2014). The development of word games for classroom use as a gamification learning strategy necessitates consideration of various learner styles. Digital games have been considered by certain scholars as a future learning style (Hsiao, 2007). Despite the lack of rigour in evaluation, many academics feel that if properly planned and conducted, gamification has the potential to promote learning. More research is

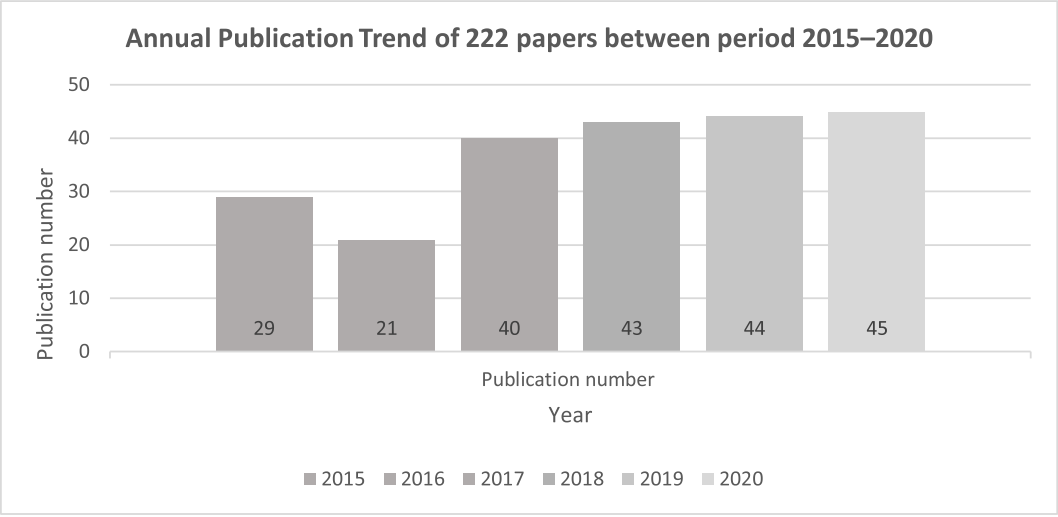

Fig. 3. The annual publication trend of our 222 sample papers over the 2015–2020 period.

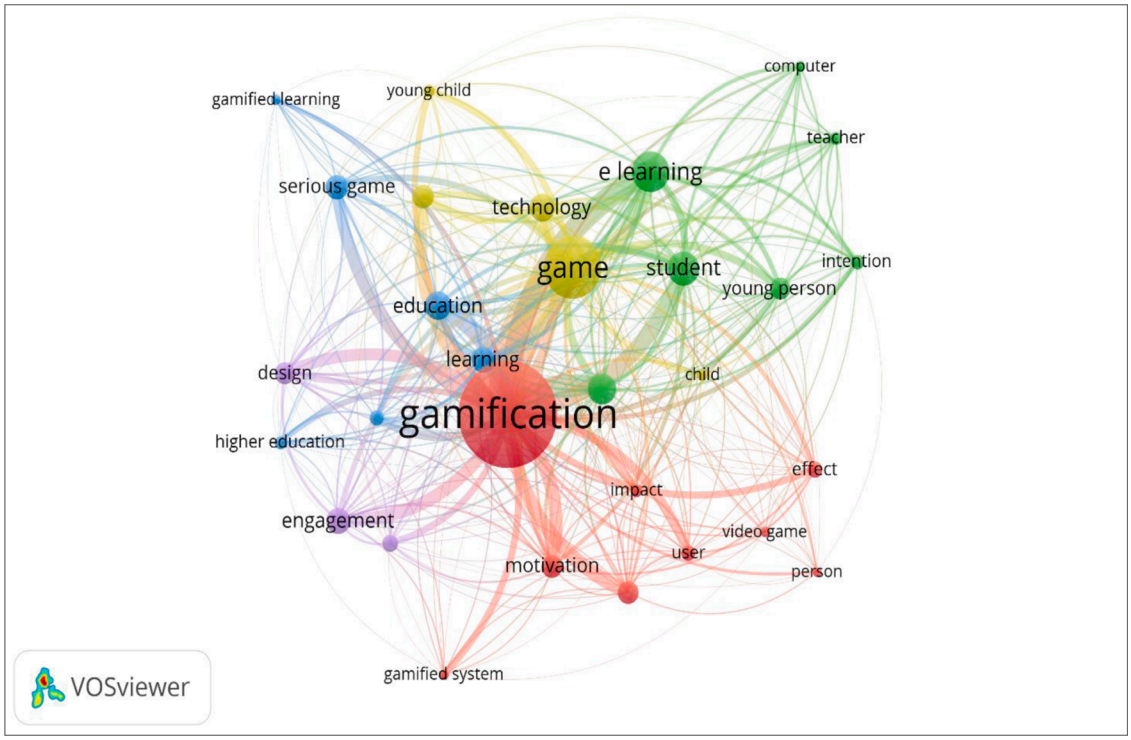

Fig. 4. The network cluster diagram.

needed to look at the motivational effects of using single game components in specific educational scenarios while considering the various types of learners (Dicheva et al., 2015; Leaning, 2015).

When considering the learner engagement, student engagement is critical to learning achievement (Olsson et al., 2015). (Hew et al., 2016) gave empirical proof of the impact of game mechanics in an Asian environment, and advocated investigating what it means for potential researchers to use various game mechanics, such as stories or

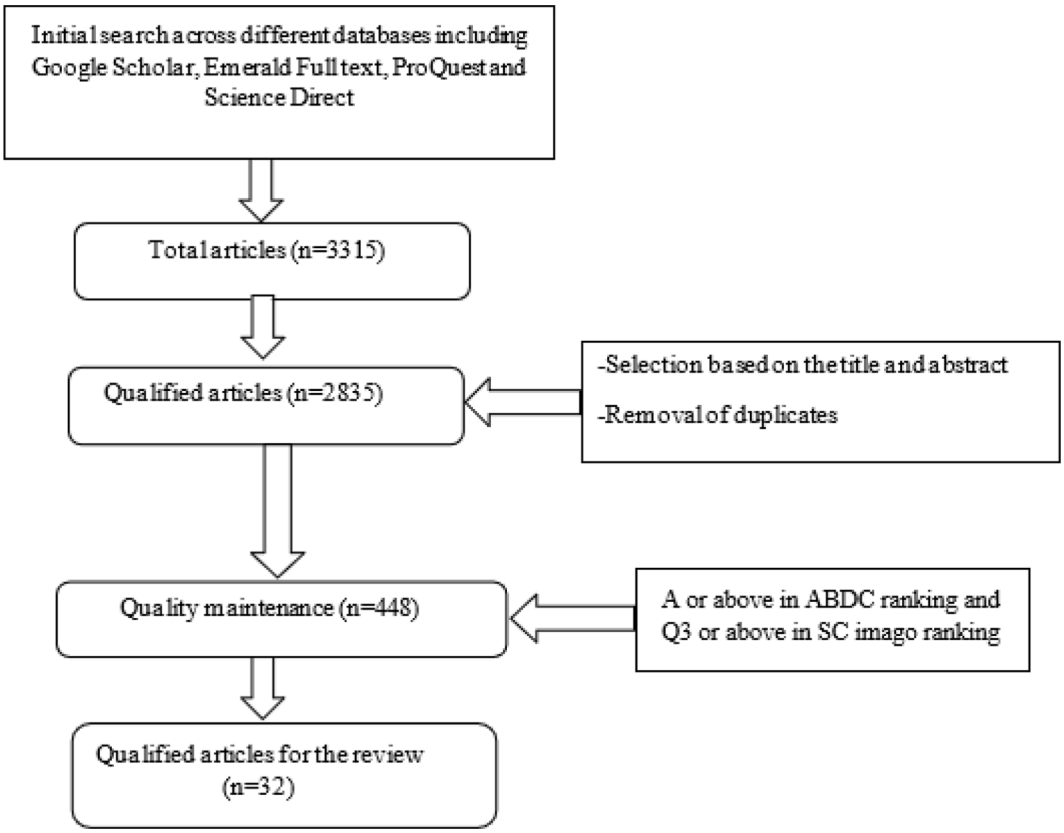

Fig. 5. Flow chart of the literature search process.

simulations, and how game mechanics can impact long-term student engagement. As a result, current research on gamification in engineering education has mostly been theoretical and experimental; it would be vital to report on participant experience in future research (Markopoulos et al., 2015). Reddy (2018) proposed evaluating student engagement levels through feedback on various gamification platforms, as well as emphasising the importance of mobile apps and gamification. Future game-playing behaviour is still an under-researched issue in the context of the numerous game design features (Sailer et al., 2017). Future research is needed to see how each facet of gamification affects student learning expectations and whether these elements can increase long-term learning, as theoretical research suggests (Stansbury and Earnest, 2017).

The findings of our review may assist firms and designers involved in gamified-based course curriculum. As our study involved both a systematic review and a bibliometric analysis approach, future researchers are encouraged to conduct more research into gamified social functions to inspire and engage learners in the use of gamification-based e-learning frameworks. Our study examined and revealed the growth of the new concept of gamification regarding e-learning for young students between 2015 and 2020. The first section of this paper offered a bibliometric analysis which was performed to identify the most prominent themes in gamification in the context of e-learning for young students. The second section of this paper presented a systematic review conducted using the PRISMA guidelines to identify future research perspectives regarding gamification and e-learning for young students. Our study does have some shortcomings. For example, its scope was limited to gamification and e-learning for young students. This could be further extended to adults, employees, and trainees in diverse disciplines. Moreover, its scope was limited to a time frame spanning six years. (Figs. 2,4,5)

6. Authors statement

Abhishek Behl: Conceptualization, Methodology, Data Curation, Formal analysis, Writing – Original Draft

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Manlio Del Giudice: Review & Editing

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