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Gamification and workers' training: A systematic mapping review

Brigitta Pia Alioto*, Donatella Persico**

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Abstract

Gamification is often adopted to increase motivation and engagement in staff development. This mapping review covers 25 papers on gamification in the corporate and public sector, focusing on their geographical and temporal distribution, research methodology, training context, and adopted playful approach. The study highlights that during the pandemic years there was a significant increase in online staff development initiatives where gamification was employed, concentrated especially in Europe, Asia and the USA. As to research methodology, case studies are prevalent (N=12), followed by theoretical or descriptive studies (N=6), experimental or quasi-experimental studies (N=5) and literature reviews (N=2). The training context was mostly online (N=18), and the aims largely consisted in developing know-how (N=7), know-what (N=4) and know-why (N=4). As to the approach adopted, there is a predominance of competitive (N=7) approaches over collaborative (N=4) and mixed (N=3), with a strong emphasis on the use of Points, Badges and Leaderboards (PBL) (N=16), while alternative approaches are in the minority (N=6). While PBL may be functional in the short to medium term, it fosters competition rather than collaboration and lends itself better to knowledge acquisition rather than developing competence. Hence, the approach to gamification design adopted in the reviewed initiatives rarely centres on enhancing intrinsic motivation. That said, interesting trends emerge,

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including exploration of approaches based on narratives, avatars and tangibles.

Keywords: Gamification, Corporate training, Staff Development, Adult Learning, Points Badges and Leaderboards (PBL), Narratives in gamification

Introduction

The transition into the world of smart machines has been redefining working processes and related skills by creating a continuous demand for advanced skills (Gentilini & Filosa, 2023). In our rapidly evolving work ecosystems, the needs addressed by staff development initiatives often include competence development, rather than mere knowledge acquisition, as the training often aims to change working behaviours. If employees are to become agents of change within their organizations, their training should leverage community-building practices and develop lifelong learning skills. Hence, learners' engagement and motivation are of paramount importance, not only during training, but also when it comes to adopting the desired behaviors on the job (Pellerey, 2021).

At the beginning of 2020, the rapid increase of teleworking and online training caused by the Covid-19 pandemic clashed with workers' often insufficient technological skills (OECD, 2021). In addition, learners' isolation boosted the need to redefine training models with a view to building lifelong and self-determined learning skills¹. This entails designing training interventions that aim to develop transversal competences in the quest to keep up with and even anticipate societal development.

¹ Self-determined learning, or heutagogy, is the ability to determine one's own learning. It is an approach that, seen as the continuity of the andragogical approach, focuses on the learning process, rather than on the content itself, and on the agency of the learner. In order to determine their own learning, adults must be motivated, feel self-efficacious, and have the ability to decide what to learn and how (Blaschke & Hase, 2019).

In this context, the concept of “gamification” has attracted attention, mostly due to its promise in terms of motivation and engagement (Alsawaier, 2018). One of the most popular definitions of gamification is “the use of game design elements in non-game contexts” (Deterding et al., 2011, p. 10). Gamification has been used in different contexts, from marketing (Zichermann & Linder, 2010) to health and wellness applications (Johnson et al., 2016), and to increase productivity in companies (Aziz et al., 2017). Last but not least, it has been used extensively in education and training to enhance engagement, motivation and ultimately, learning outcomes, both in face-to-face teaching programs and in online learning environments (González-Fernández et al., 2022). Even if its adoption is often advocated when the learners are children, there is a wealth of studies concerning gamification in adults' training, with aims spanning across a wide range, from acquisition of knowledge, know-how and professional competences up to transversal skills that empower lifelong learning (Dicheva et al., 2015). Although these studies also include some literature reviews, there is a clear need for an updated picture of the research landscape in the field. This is because some reviews are based exclusively on datasets of pre-pandemic studies (Mahat et al., 2022), some also focus on Game-Based Learning (GBL) and hence the picture they provide is compounded with data about GBL (Larson, 2020), and yet others are oriented towards specific research aims (Krath & von Korflesch, 2021).

Hence, the main purpose of this review is to draw an updated and multifaceted map of the landscape of gamification studies in the professional development of staff in public and private organizations, including large and small companies, but also public and not-for-profit organizations providing services in fields such as health or transport. Due to its peculiarities and to the fact that it has been the object of dedicated reviews (Meredith, 2016; Pozzi et al., 2023), the field of teacher education and professional development is not covered.

The overarching aim is to understand how gamification has been used and studied, focusing on where, when, how, to what purposes, in what types of contexts, and what gamification approaches were adopted. Specifically, the study seeks to delineate current mac-

ro-trends and identify any under-investigated and promising research strands. Whenever possible, comparison of results with pre-pandemic studies will be considered. Hence, the research questions addressed in this paper are the following:

- Q1: What is the temporal and geographical distribution of the publications?
- Q2: What research methodologies were used in the selected studies?
- Q3: What are the training contexts of use, in terms of work sector, training modes and types of learning aims?
- Q4: What approaches to gamification were used, in terms of theoretical principles implemented, playful approach and game elements adopted?

Related works

Although the above-mentioned definition by Deterding et al. (2011) is perhaps the most well known, it has been regarded as problematic because, even if it succeeds in drawing a clear line of distinction between gamification and GBL, it is not clear what “game elements” actually means (Thibault, 2019). Examples of game elements are very heterogeneous, including points, badges, leaderboards (collectively identified as PBL in the following), progression bars, avatars, narratives and tangible objects. While most of these elements have a quantitative nature, others, like avatars, narratives, and tangibles have a different nature: Avatars have a digital, interactive nature, tangibles (like Lego or cards) have a physical component, and narratives (or plots) have been defined as follows (Palomino et al., 2019, p. 99):

“The gamification narrative element can be understood as the process in which the user builds his own experience through a given content, exercising their freedom of choice in a given space and period of time, bounded by the systems’ logic”.

Narratives can be used both online and in face-to-face contexts (Passarelli et al., 2022), have a qualitative nature, and can be regard-

ed as “content gamification” rather than “structural gamification”, according to a well-known distinction proposed by Kapp (2012), whereby content gamification requires a change in the content of training, while structural gamification is achieved by applying a layer of gamification on top of content without requiring any change to it. As a consequence, content gamification requires alignment of learning aims and gamification features, while in structural gamification the two aims may remain separate. Of course, the design of structural gamification is generally less complex and labor intensive than the design of content gamification, and this explains why it is more frequently adopted. However, narrative is gaining momentum in game development and, according to some authors, also deserves attention within gamification studies because it is one of the main ways for humans to make sense of the world (Palomino et al., 2019; Thibault, 2019). Notably, the potential narrative offers for stimulating epistemic curiosity (Berlyne, 1954) holds promise for triggering intrinsic motivation. Narratives, often built on top of metaphorical representation of content, have shown great potential for encouraging trainees to share knowledge and metacognitive reflections, and in some cases feelings as well (Bartolomé et al., 2010; Persico et al., 2023).

Regarding motivation and complexity management, it becomes crucial to consider Kapp’s definition of gamification, namely “using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning and solve problems”(Kapp, 2012, p.10). Here, the goal of gamification is recognized as integral to the concept. Indeed, gamification can be effective in developing both intrinsic and extrinsic motivation (Deci & Ryan, 1985), as well as in conditioning and modifying certain behaviors. However, simple structures of gamification, based on theories of behaviorism and systems of reinforcement (both positive and negative), such as rewards, scores, wins, losses, etc., are in some cases counterproductive (Nicholson, 2015) because they tend to foster extrinsic rather than intrinsic motivation. The case of competence development and lifelong learning skills is exemplary, because they are better fostered through intrinsic motivation (Hellberg & Moll, 2023).

Originally, gamification was used primarily in the marketing field “as a practice of marketers and consultants in order to construct and then exploit an opportunity for benefit” (Bogost, 2015, p. 65). Later, the same practices were extended to the field of education and training with the aim of increasing commitment and results in learning processes. However, some researchers in the educational field have expressed concerns that the mere use of points, badges and leaderboards (PBL) clashes with the need to achieve higher level and longer-term educational goals, so much so that they started to address the need to identify the conditions that make gamification “meaningful”. “Meaningful gamification” is “the use of gameful and playful layers to help a user find personal connections that motivate engagement with a specific context for long-term change” (Nicholson, 2015, p. 1). According to Bogost (2015), not only does PBL primarily tend to increase extrinsic motivation, but it also raises some ethical issues because it promotes a form of productivity education and/or worker manipulation (Bogost, 2015). While it has been found that, in some cases, extrinsic motivation promoted with PBL can lead to learning of a skill whose practice can later become intrinsically motivating (Hellberg & Moll, 2023), PBL can also kill interest and motivation when mastery is the aim. Another risk of structural gamification is reducing critical thinking. In the words of Thibault (2019, p. 63):

[...] While gamified learning could be more effective in increasing the knowledge of a person around a certain topic, it could also lead said person to accept uncritically that knowledge instead of questioning it.

Thibault’s conclusions are in favor of gamification approaches based on freedom to experiment, act and be creative, but also to critically question oneself, in a process of continuous reflection and meta-reflection, instead of reinforcing the status quo.

Against this backdrop, several researchers (Krath et al., 2021; Nicholson, 2015) have sought to identify the conditions that make gamification effective. In this regard, Krath and colleagues (2021) conducted an extensive literature review aimed at identifying the

main theoretical principles explaining the effects of gamification. They summed these up by grouping them in three categories: Principles that guide towards the intended behavioral outcomes; principles that foster individual relevance; and principles that enable social interaction and positive social effects (Krath et al., 2021). The first category includes providing clear and relevant goals, immediate feedback, positive reinforcement, guided paths, and an easy user experience. This category is related to a behaviorist view of learning. The second comprises fostering the pursuit of individual goals, making available adaptive content, and providing several options as to the “what” and “how” of learning. This is inspired by self-regulated learning theories (Persico, 2022). The third category concerns learning in a community, based on social comparison or social norming, and it is underpinned by socio-constructivist theories.

In the following, this categorization will underpin our analysis of the gamification approaches adopted in the reviewed studies in the effort to answer the fourth research question.

Method

This study follows the mapping review method (Campbell et al., 2023). Mapping reviews, like scoping reviews, are well suited to addressing broad research questions rather than specific questions about intervention effectiveness. Their purpose is to describe the big picture of a research field, identifying current research strands and possible future avenues by charting predominantly quantitative data through tabular or visual plots. Even though some authors suggest that mapping reviews can be carried out in a non-systematic way (Gough et al., 2012), in this study a systematic procedure was followed, basically in line with the PRISMA guidelines².

² PRISMA, “Preferred Reporting Items for Systematic Reviews and Meta-Analyses” <http://www.prisma-statement.org/>.

Procedure and tools

A search query using the two strings shown in Figure 1 was carried out in May 2023 on Scopus and Web of Science (WoS) respectively. As mentioned above, the aim was to identify studies concerning the use of gamification in training initiatives for adult workers in small or large organizations, excluding school and higher education teachers. The search covered English-language articles in peer-reviewed journals and conference papers, and also book chapters.

Figure 1.

Search strings on Scopus and WoS

SCOPUS

((TITLE-ABS-KEY (gamification) OR TITLE-ABS-KEY ("playful approach")) AND (TITLE-ABS-KEY ("adult learn*") OR TITLE-ABS-KEY ("Professional learn*") OR TITLE-ABS-KEY ("Corporate learn*") OR TITLE-ABS-KEY ("business learn*") OR TITLE-ABS-KEY ("adult train*") OR TITLE-ABS-KEY ("Professional train*") OR TITLE-ABS-KEY ("Corporate train*") OR TITLE-ABS-KEY ("business train*") OR TITLE-ABS-KEY ("Professional develop*")))

WOS

(TS=(gamification) OR TS=("playful approach")) AND (TS=("adult learn*") OR TS=("professional learn*") OR TS=("corporate learn*") OR TS=("business learn*") OR TS=("adult train*") OR TS=("professional train*") OR TS=("corporate train*") OR TS=("business train*") OR TS=("professional develop*"))

Data analysis

Results from the two queries were merged and, after deleting duplicates, a dataset of 278 records was obtained. This underwent initial screening based on reading title, abstract, and keywords, adopting the exclusion criteria in Table 1. From this step, 253 articles were excluded, while 25 were retained for full-text reading (Figure 2). These 25 papers (see Appendix 1) were read in full and coded according to the criteria shown in Table 2, corresponding to the four research questions of the study. The dataset includes two literature reviews (LR) (Larson, 2020; Mahat et al., 2022).

Table 1.
Exclusion criteria

Criterion number	Criterion description
ExC1	focus on training of school or higher education teacher
ExC2	focus on gamification for academic and school students
ExC3	focus on techniques other than gamification (i.e. Augmented Reality, Virtual Reality, Game-Based Learning)
ExC4	focus on the use of gamification as therapy (i.e. cognitive rehabilitation)
ExC5	language different from English

Figure 2.
The process of identifying relevant items

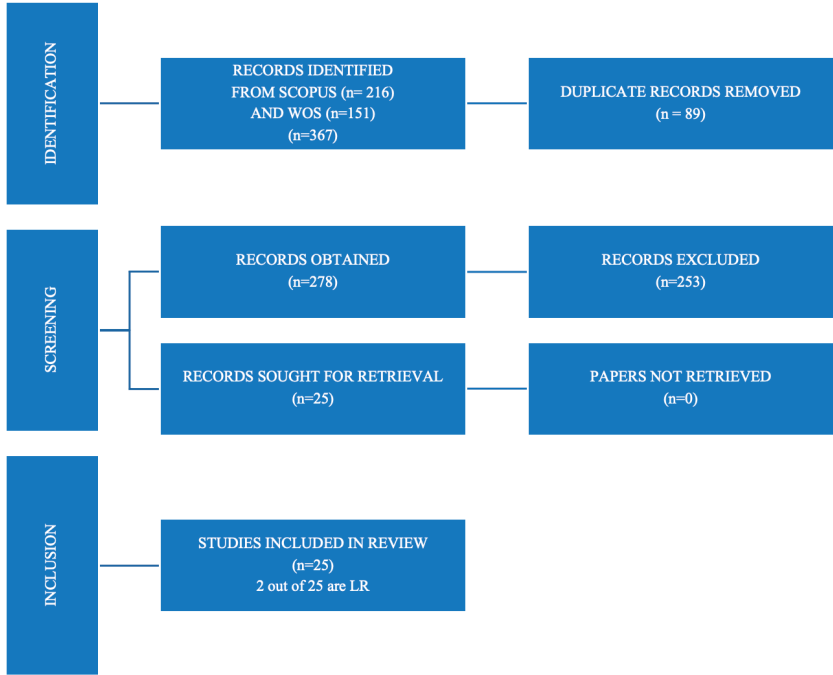


Table 2.
Criteria for encoding the studies

Study characteristics	Gamification characteristics
Q1. Temporal and geographical distribution of publications Q1.1 publication year Q1.2 geographical location of the first author's affiliation	Q4. Approach to gamification Q4.1 theoretical principles underpinning gamification (Krath et al, 2021) Q4.2 playful approach adopted Q4.3 game elements used (PBL, avatars, narratives etc.) Q4.4 technologies used
Q2. Research methodology Q2.1 research method (literature review, theoretical, descriptive, case studies, experimental or quasi-experimental) Q2.2 data analysis method (qualitative, quantitative, mixed)	
Q3. Training context Q3.1 working sector Q3.2 training model (online, blended, face to face) Q3.3 types of learning objectives (know what, know how, know why)	

Results and discussion

In the following, the two literature reviews have been included in the analysed dataset to address RQ1 and RQ2; for RQ3 and RQ4, only the primary studies were analysed, as the nature of the variables investigated is not applicable to literature reviews.

Results for RQ1 – What is the temporal and geographical distribution of publications?

Although application of gamification in learning contexts has been under the lens of researchers since Deterding and colleagues’ definition (Dicheva et al., 2015), the temporal distribution (RQ1.1) of selected papers (Figure 3) – with the first study dating back to 2016 – suggests that applications to adult training are a more recent but fast increasing field of study. Between 2016 and 2019, i.e. before the COVID-19 pandemic, we find 10 studies (40%), while between 2020 and 2023 there are 15 (i.e. 60%). The most recent systematic literature review is the one by Mahat and colleagues (2022), but, in spite of the publication date, this review is based on a dataset of pre-pan-

demographic studies. Hence, a new literature review is now fully justified. In the following, Mahat's results will serve as a reference to compare the current state of the art with the pre-pandemic situation.

Figure 3.
Temporal distribution of articles

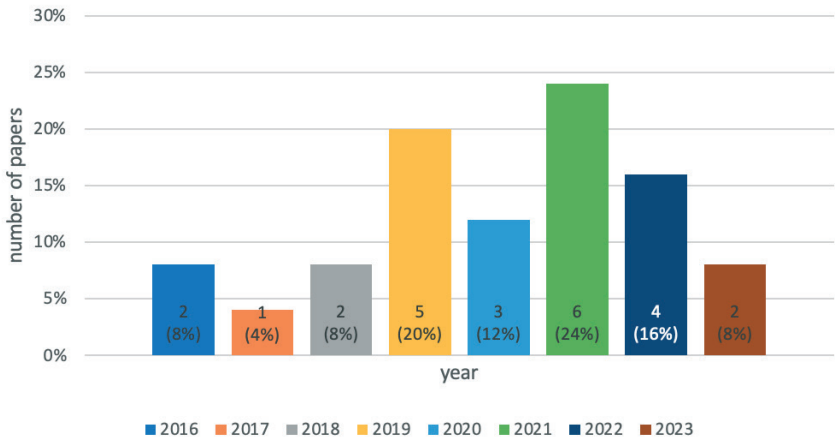
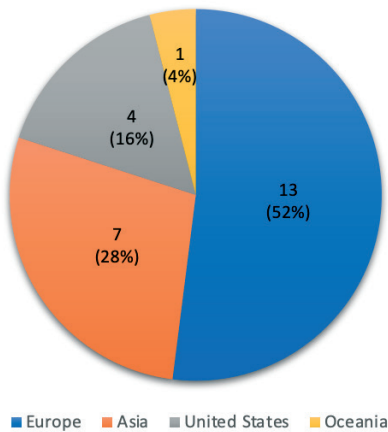


Figure 4.
Geographical distribution of articles



The geographical distribution (RQ1.2) of publications (Figure 4) shows that most studies (52%) come from Europe, with Asia second (28%), the USA third (16%) and Oceania last (4%). This is in contrast with Mahat's results, where Europe already had the largest share (44%), but the USA followed with 32% and Asia had only 12%. We conclude that in Asia there has been a recent spurt of interest that reverted the order of the two countries.

Results for RQ2 – What research methodologies were used in the selected studies?

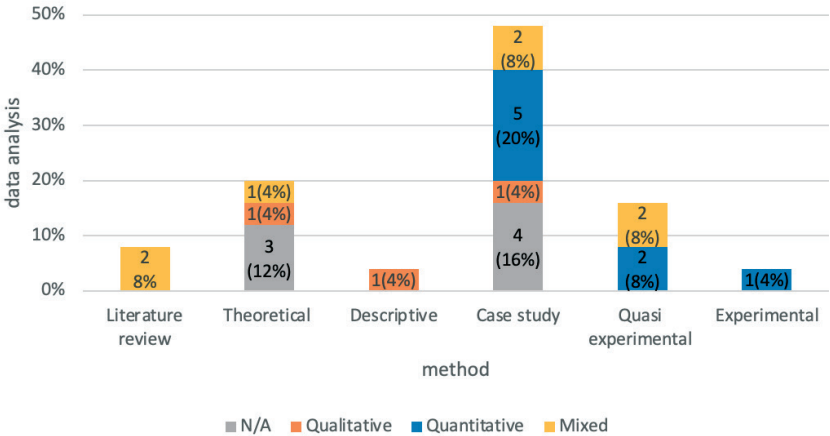
To classify the research methodology, in line with Cohen et al. (2007), we distinguish between research and data analysis methods. The former include literature reviews, theoretical studies, descriptive studies, case studies and experimental or quasi-experimental studies³.

As shown in Figure 5, the most widely used research method (RQ2.1) is the case study (48%), with 12 cases. The experimental (1 case) or quasi-experimental method (4 cases) follow (totaling 20% of the distribution), at the same level as theoretical studies (5 cases, 20%). Only one study used a descriptive method (4%). Two studies (8%) are literature reviews, but only one is systematic (Mahat et al., 2022), and this covers only empirical studies published in the time-span 2015-2019. Our work covers the whole pandemic and post-pandemic period up until May 2023 and also includes theoretical and descriptive studies. All in all, this distribution of research methods indicates a low degree of maturity in the field.

As to the data analysis method (RQ2.2), we distinguish between qualitative, quantitative and mixed. Figure 5 shows that quantitative methods prevail (N=8, 32%), followed by mixed (N=7, 28%) and qualitative ones (N=3, 12%)

³ Definitions used to classify the studies according to these categories are provided in the appendix 1

Figure 5.
Research method and data analysis merged



Results for RQ3 – What are the training contexts of gamification use?

The working sectors (RQ3.1) of the analyzed studies are varied. Where specified, they include healthcare (N=3, 12%), sales (N=2, 8%), online safety (N=2, 8%), sustainability (N=1, 4%), customer service (N=1, 4%), and communication (N=1, 4%). To be noted that the healthcare sector was prevalent also before the pandemic (Mahat et al., 2022).

The prevailing training model (RQ3.2) adopted in the studies is online training (N=18, 78%), followed only residually by face-to-face training (N=4, 18%) (Figure 6). One of the studies (4%) did not provide this information and was therefore labelled “N/A”, which stands for “not applicable or not available”⁴. While in Mahat et al. (2022) there was a small but not insignificant proportion of studies regarding blended training, in our sample no study was carried out in a blended context. This difference may be due to two factors: Firstly, Mahat’s paper includes teacher training interventions; secondly, our study covers the pandemic years, when all training had to be moved online.

⁴ The label “N/A” is henceforth used when either the datum is not provided or the information does not apply to the specific study.

Figure 6.
Training model

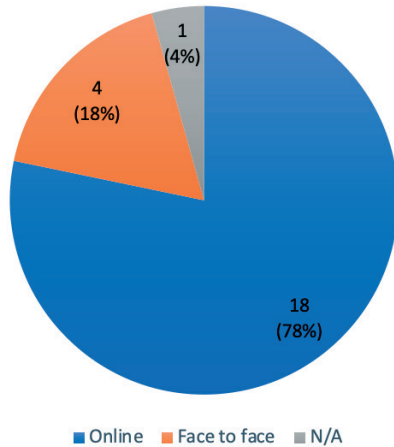
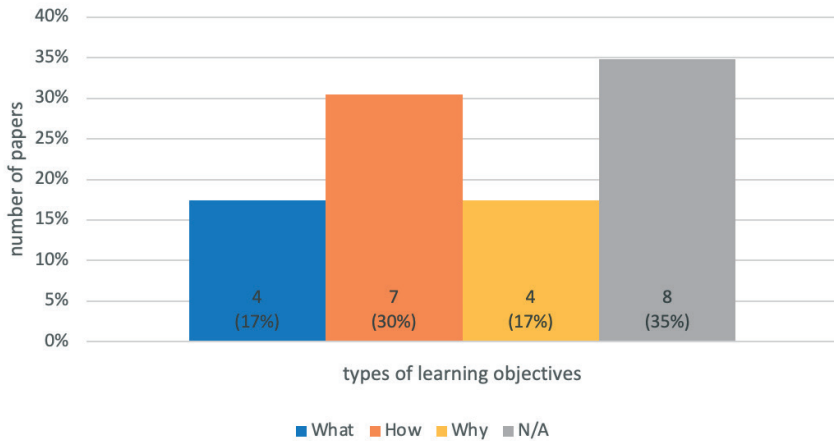


Figure 7.
Types of learning objectives



Several studies did not describe the types of learning objectives (RQ3.3) in detail but, in most cases, a rough distinction could be made between three macro-aims: Know-what (factual knowledge),

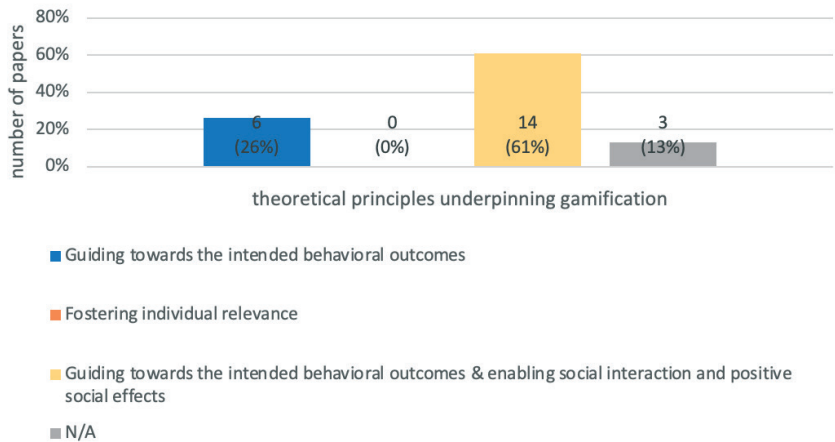
know-how (procedural knowledge), and know-why (competence). This categorisation was made manually by the first author of this paper, based on Garud's distinction (Garud, 1997). Blurred cases were discussed with the second author. The distribution of the studies (Figure 7) shows that know-how is pursued more frequently (N=7, 30%) than know-what and know-why (N=4, 17% each). This suggests that organizations value know-how very highly, possibly because they underestimate the importance of empowering their staff with higher level competence (know-why).

Results for RQ4 – What approaches to gamification are used?

In order to better describe the gamification approaches adopted, the classification of theoretical principles as per Krath et al. (2021) was adopted (RQ4.1). The studies were coded according to the three categories: Principles that guide towards the intended behavioral outcomes; principles that foster individual relevance; and principles that enable social interaction and positive social effects.

Figure 8 shows that the most frequent case is a combination of the first and third one (N=14, 61%), followed by the first (N=6, 26%).

Figure 8.
Theoretical principles underpinning gamification

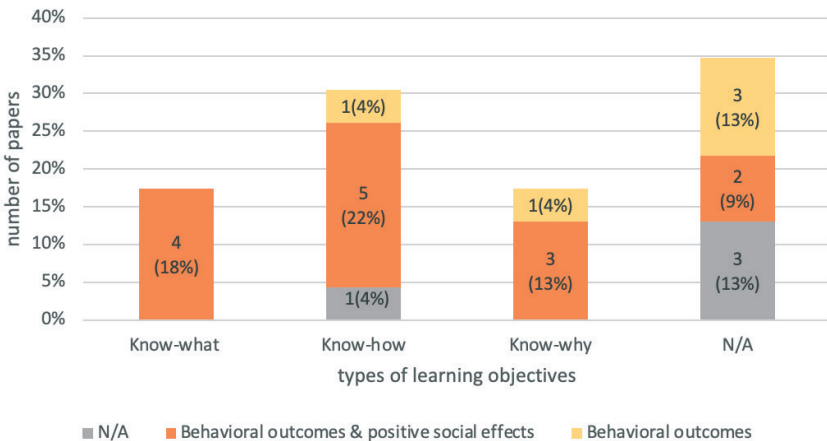


Surprisingly, the category “principles that foster individual relevance” does not seem to be represented by any of the selected studies. This finding substantiates that, in gamified professional training outside education, individual relevance is not pursued, even though it is essential for fostering intrinsic motivation.

These data are also interesting when compared with data about the types of learning objectives. The merged data (Figure 9) show that behavioral outcomes and positive social effects are, together, the most frequent principal category, even when deeper learning outcomes like “know why” and “know how”, are pursued. This suggests that the gamification principles are adopted regardless of the types of learning objectives, as if different learning aims did not require different gamification principles. This is in contrast with previous findings according to which gamification should be designed in line with learning needs (Antonaci, 2019).

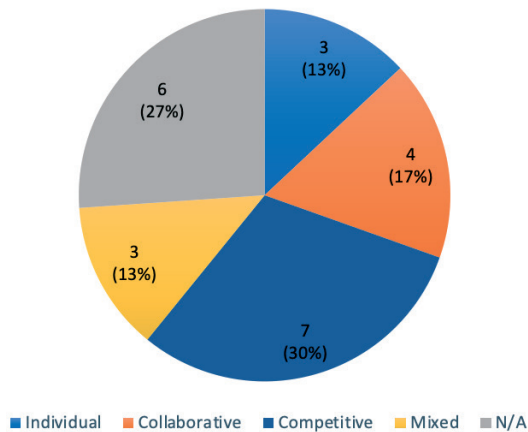
Figure 9.

Types of learning objectives and adopted theoretical principles merged



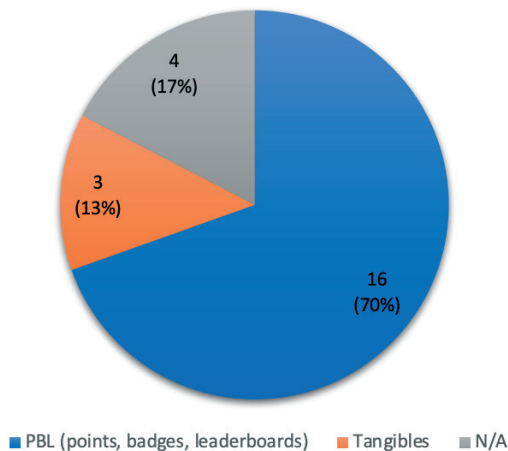
The playful approach most frequently proposed (RQ4.2), where explicitly stated, is competition (N=7, 30%), followed by collaborative approaches (N=4, 17%) and, equally, by mixed (N=3, 13%) and individual (N=3, 13%) playful approaches (Figure 10).

Figure 10.
Type of playful approach used



This result is in line with the choice of the main game elements (RQ4.3), where PBL is adopted by 70% of the studies (N=16), with a small percentage (N=3, 13 %) of approaches based on tangibles such as cards, Lego Serious Play, or a physical escape room (Figure 11).

Figure 11.
Use of game elements



PBL alone is rarely enough to create a game dynamic that Nicholson (2015) would call “meaningful”, i.e. a gamified environment helping users to find personal connections that motivate engagement. In fact, in several papers (9 cases) other game elements, such as challenges, scores, rewards, progress bars, etc. are used in conjunction with the PBL structure without significantly changing the approach. Mostly, these are related to behavioral psychology theories of reinforcement, punishment, and reward. However, there are some notable exceptions: Three cases where tangibles were the main game element; two cases where avatars were used in conjunction with PBL; two cases where narratives were used in conjunction with PBL; and one case where narratives were used in conjunction with avatars. These data are reported in Appendix 1, last column.

Even if none of the selected studies refers to Kapp’s distinction between content gamification and structural gamification (2012), the above-described distribution of gamification elements suggests that structural gamification must have prevailed over content gamification. This is confirmed by the range of technologies adopted (RQ4.4). Where mentioned, we can see the use of Quizzis & Kahoot!; various plug-ins for MOOCs or for Learning Management Systems (LMS) such as Moodle; and apps for Self-Regulated Learning (SRL) such as KnowledgePulse and Axonify. These are all content-independent, while so-called content gamification (Kapp, 2012) would require bespoke technologies, such as simulations and/or playful elements like a metaphoric narrative thread. In this regard, it is interesting to note that only three documents mention the use of narratives. According to Demetrio (2012), the narrative element facilitates exploration of individual and collective experiences, fields and courses of action, and problematic situations of difficult interpretation, allowing people to understand and deconstruct/reconstruct their cultural and social significance. Moreover, the metaphorical component of this gamification element has proved effective in favouring personal disclosure and metacognitive reasoning in different, but similar contexts (Passarelli et al., 2022).

Conclusions

This review provides a broad picture of studies concerning gamification in the professional development field, in public and private organizations of all sizes outside the education sector. The results reveal that studies in this field started later than those in K-12 and higher education (Dicheva et al., 2015) and that interest in this field increased during the COVID pandemic. The prevalent research method is the case study, with several quasi-experimental and theoretical studies. Data analysis is most often quantitative, with a good proportion of quali-quantitative studies. The two literature reviews we found were either unsystematic (Larson, 2020) or based on a dataset of pre-pandemic studies (Mahat et al., 2022). This suggests the view that it is time to take stock of the state of the art, and that research in the field is not as mature as one might hope.

This study also analyzes some features that are not always easy to identify and extract from the selected papers, namely the training context and the approach to gamification. In the former case the health sector is most commonly involved, online modalities are more frequent than face-to-face, and procedural knowledge (know-how) as the type of learning objectives prevails over know-what (factual knowledge) and know-why (competences). The theoretical principles underpinning gamification (Krath, 2021) are behaviouristic and socio-constructivist, with no study following principles that foster individual relevance. Regarding the playful approach, competition outweighs collaboration and individual play. Game elements almost always include PBL, although in some studies elements like challenges, progress bars, and rewards are also leveraged. Some exceptions appear that point to interesting emerging trends, namely the adoption of narratives, avatars, and tangibles (Lego Serious Play, cards and escape rooms). These are signs that there is interest in alternative gamification approaches. Finally, the technology used reflects the tendency to encourage competition among trainees.

This panorama suggests that, when it comes to gamification, the context of staff development in companies and other organizations is rediscovering the wheel somewhat. The widespread use of PBL com-

bined with competitive approaches reveals a vision of learning as a product, rather than as an intrinsically social process with strong individual relevance, one capable of fostering intrinsic motivation, which is now more widely accepted in pedagogically advanced applications. The critique of the phenomenon of pointsification (Hellberg & Moll, 2023) has led to the conclusion that this type of gamification does not allow for deep and/or long-term learning, neither does it foster development of lifelong learning skills, the skills necessary for achieving competence. At the same time, several authors (Krath et al., 2021; Mahat et al., 2022) have also countered Bogost's iconic phrase "gamification is bullshit" by showing that gamification, if carefully designed, can be of help in achieving meaningful learning. Gamification can change behavior, but to develop self-determined learning a "punk gamification" (Thibault, 2019) is required, i.e. one that does not use PBL and adopts playful approaches to achieve virtuous results that give the worker autonomy. The theory of self-determination, self-efficacy, reflection, adult learning methods (to sum up, heutagogy) and social presence theory must be leveraged when designing gamified training.

In addition, some authors (Antonaci et al., 2018; Riva & Mancini, 2023) claim that playful approaches, especially collaborative ones, may be very helpful, especially in online training (Gaggioli et al., 2024), because they favor a sense of social presence and the creation of communities of practice. If workplaces, as well as learning environments, become virtual and interactions are increasingly mediated by technology, people will experience "presence in multiple places" (Riva, 2023). Hence, gamification can foster social presence and the creation of communities of practice by allowing the worker to feel emotionally involved in online practices (Riva & Mancini, 2023).

Based on these considerations, we believe that narratives are only one example of a gamification element that should and could be employed to pursue more ambitious learning aims (not just know-how, but also competence): Designers should use gamification principles that foster intrinsic, rather than extrinsic motivation. Further research should explore this type of gamification.

In addition, as the mapping review method does not shed light on the causes of the state-of-the-art, another possible future step would

be the investigation of such causes. In particular, when dealing with the corporate sector, a possible reason for privileging PBL may lie in the costs of implementing content gamification.

Among the limitations of this study, we should mention that, given the well-known reluctance of many private organizations to make public their internal processes, it is possible that the analyzed studies do not provide a full picture of the state of the art. In addition, the process of codifying the studies was not straightforward, as information about the training context and the gamification approach were not always explicitly stated but had to be elicited by the researchers. Therefore, there could be some degree of subjectivity in the way the papers were coded, although an effort was made to apply the criteria consistently across the papers.

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