Game Design Concepts: A Tertiary Literature Review

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Abstract

Over the years, gamification design has become widely discussed in design, services, and human-computer interaction, due to the possibility that experience-centered design can lead to positive user experiences. Consequently, various secondary studies (*e.g.*, systematic mappings, literature reviews, and scoping reviews) were conducted to comprehend how gamification has been designed and implemented. Due to the considerable number of secondary studies, understanding design aspects related to gamification can be challenging. To address this problem, we conducted a tertiary literature review to answer three research questions: *i)* How many game design concepts have been used in literature?; *ii)* How are the game design concepts classified?; and *iii)* What are the characteristics of these game design concepts? The results indicated *i)* a wide variation in the researched concepts, *ii)* a noticeable variation in the definition of the concepts, and *iii)* that these concepts can be divided into two distinct but complementary design classes. Our study contributes to gamification with a classification and categorization system for game design concepts, seeking to improve gamification design methods.

CCS Concepts

• **Human-centered computing** → **Contextual design**.

Keywords

Gamification, Gamification Design, Game Design, User-centered Design, Tertiary Review

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1 Introduction

Gamification, *i.e.*, "the process where services, activities, and systems are designed to promote motivational benefits as those found in games" [12, 17], has garnered significant attention in recent years for its potential to enhance user engagement, motivation, and overall user experience [16, 19, 23]. As technology continues to play an increasingly integral role in various domains, the application of gamification design has become a focal point for researchers and practitioners [15, 16, 20]. Thus, providing well-crafted gamification can directly influence the effectiveness of the gamified system and, consequently, the users' experience [10, 23, 28].

In gamification design, providing a positive experience has emerged as a central theme [6, 13, 16]. Well-executed gamification strategies can capture users' attention, increase engagement, and encourage sustained participation, fostering a sense of accomplishment and achievement [15, 23, 28]. However, as the discourse surrounding gamification design has expanded, it has become apparent that a multitude of secondary studies has contributed to the understanding of its implementation (*e.g.*, [4, 16–18, 23]). While these studies are valuable to the community in understanding specific sub-fields, they have led to a fragmentation of knowledge, making it difficult to obtain comprehensive insights into the nuanced aspects of gamification design.

Facing the gap, this research endeavors to address a more direct and in-depth exploration of gamification design by offering a more nuanced perspective, by conducting a tertiary literature review to answer the following questions: *i)* How many game design concepts[1] have been used in literature?; *ii)* How are the game design concepts classified?; *iii)* What are the characteristics of these game design concepts?; This tertiary review goes beyond the surface level provided by secondary studies, aiming to uncover the underlying gamification design methods employed in the literature.

The main results demonstrated a *i)* wide variation in the researched concepts, *ii)* noticeable variation in the definition of the concepts, and *iii)* the possibility of dividing these concepts into two complementary design classes. Based on that, we provide a new classification system, which divides the game design concepts into two distinct but complementary classes: Gamification Design Concepts (GDC) and Gamification Elements (GE). The GDC reunites more broad and open design concepts, which are more potentially

[1] In our study, "game design concept" was selected as a general term to categorize every type of game element or game design element. Other common terms are: game design principles, game design elements, game mechanics, game dynamics, gamification elements, gamification principles, and others.

suitable for "ideation" processes, and the GE reunites more close and specific design concepts, potentially more suitable for definition and development processes. This study contributes to the gamification field with a classification and categorization system for using game design concepts in gamification design methods.

2 Background

In this section, we present the main topics addressed in this paper, *i.e.*, gamification design, and game design concepts.

2.1 Gamification and game design concepts

Over the years, the application and research on gamification have expanded [1, 16, 17] to several branches, including education and training, business, marketing, and services, health and lifestyle, transportation, politics, information science, communication, computing, engineering, technology, and methodology, among others [16]. Thus, despite being a relatively recent area of research [4], gamification has already been considered a well-established technique in Human-Computer Interaction (HCI) [26].

Gamification design can be complex to implement, due to the several factors involving the user's behavior, motivation, and experiences [21]. Aspects such as individual differences and motivations, technologies used, and contexts of use can have an important role in gamification design effectiveness [7]. Recent results identified that, while gamification can foster enthusiasm and fulfill the need for recognition, it also can cause competition, anxiety, and jealousy [4, 17]. Therefore, identifying the set of proper game elements to be used in each strategy can be tricky, and is an important part of gamification design. Researchers and designers have been moving towards an understanding of how game design concepts would affect the users' responses [2, 3, 5, 11, 15].

To lead to positive outcomes, the game design concepts should induce users' behavior change [25]. An important problem in the field is that there is not a consensus or clear definition about what would be such a concept or a universal list of them and how they should be applied in gamified settings [9]. When selecting the game design concepts, most studies choose deliberately or rely on literature reviews, which can bring some limitations (*e.g.*, the use of concepts correlated and with the same purpose, or the exclusion of game design concepts that would be suitable for the context) [16, 27, 28].

3 Method

The study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol [24]. Next, we present the steps followed in the study. The subjective definitions (*e.g.*, search string, and data collection) were made by one researcher with about 11 years of experience in game design and gamification studies.

3.1 Research questions and eligibility criteria

This study aims to understand how gamification design has been implemented through the use of game design concepts. The review was conducted to address the following research questions:

- **RQ 1**: How many game design concepts have been used in literature?
- **RQ 2**: How are the game design concepts classified?
- **RQ 3**: What are the characteristics of these game design concepts?

The main **inclusion criteria** is secondary studies (*e.g.*, literature reviews or systematic mappings over gamification elements), with descriptions about characteristics or functionalities of these elements, published until 2022. The main **exclusion criteria** are studies with missing appropriate descriptions of game design concepts; not supported by academic studies; from related areas (*e.g.*, Serious Games and Edutainment); and in languages other than English.

3.2 Information sources and search strategy

We used Scopus[2], as it is a base that encompasses all other bases in the area (*e.g.*, ACM, IEEE Xplore, and Springer) and is widely used in secondary studies of different areas. The theoretical currents are Gamification, Game Design, and Gamification Design, working together with any other area of knowledge. The delimited search terms were: "literature review", "game design concepts", "game design elements", "game mechanics", "gamification elements" and "gamification principles", which could be located on the title, keyword, and abstract.

Therefore, the string used in this study was: *"literature review" AND "game design concept*" OR "game design element*" OR "game mechanic*" AND "gamification"; and "literature review" AND "gamification element*" OR "gamification principle*"* organized in separated search[3].

3.3 Data selection and data collection process

The data filtering process occurred in the following general steps: *i)* Saving the initial list of collected studies in the Scopus database and an Excel file; *ii)* Evaluation of titles; *iii)* Analysis of abstracts and keywords; *iv)* Recording of remaining studies; *v)* Download the records (full papers) for skimming, with the elimination of missing files; *vi)* Skimming of the remaining records, with the marking and classification of possible relevant ones; *vii)* Cross-sectional articles reading; *viii)* Marking and classification of the relevant studies; *ix)* Full article reading[4].

4 Results

After the search, 311 studies were collected from the Scopus database. Of these, 185 were removed in the first round of analysis (relevance analysis on titles, abstracts, keywords). The 126 remaining were evaluated by cross-sectional reading, with the elimination of studies that were not literature reviews or systematic reviews; studies or concepts not supported by academic studies; and studies from related areas (*e.g.*, Serious Games and Edutainment). From these, 82 were removed, leaving 44 studies for a full evaluation

[2] https://www.scopus.com/home.uri

[3] literature review AND game design concept* AND gamification; literature review AND game design element* AND gamification; literature review AND game mechanic* AND gamification*; literature review AND gamification element*; literature review AND gamification principle*

[4] For the last round, for a more accurate filtering, two additional elimination criteria were adopted: remove studies focused exclusively/almost exclusively on specific gamification elements (*e.g.*, Points, Badges, Avatars, and others) and remove studies with unsatisfactory detailed descriptions of elements.

that were selected for the final round (full reading). With the last elimination of studies without appropriate descriptions of game design concepts, nine studies were selected to compose the game design concepts library. Figure 1 shows the PRISMA flow diagram. The selected studies are listed Table 1.

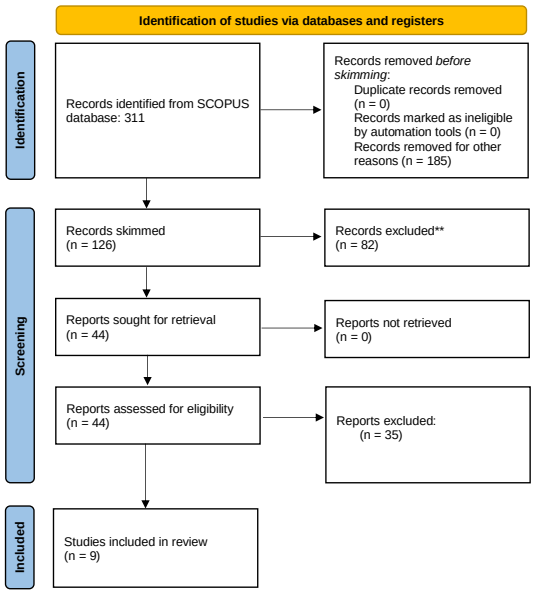

Figure 1: PRISMA flow diagram (adapted from Page *et al.* [24])

The results show a steady evolution in the number of publications over the last few years, until 2020, when it stops. Of the nine selected studies, five are conference papers and four are journal articles. The selected material has been published in four different large domains: Gamification on Information Systems/Computer Sciences (1), Gamification on Education/Learning (5), Gamification on Sustainability (1), and Game Design/Gamification (2). Seven papers came from European institutes, two from Brazilian institutes, and one from American institutes.

4.1 RQ1 - How many game design concepts have been used in literature?

For this RQ, the adopted collection criteria was neutral, *i.e.*, only recording, without any type of interpretation of the named elements declared by the authors in their studies. The range of collected game design concepts varied widely, from 8, in study Id 8, to 103, in study Id 4. Some authors also categorized the game design concepts researched, while others just collected the mass of data, without classifying it accordingly.

4.2 RQ2 - How are the game design concepts classified?

Regarding the RQ 2, there is a noticeable variation in the definition of the concepts: one author used the term game design elements; one author used the term game mechanics and dynamics; five authors used the term game elements; one author used the term game design concepts and one more author used the term game motivators and game design principles. Another notable variation is that while three authors seek to catalog the concepts in isolation, the other six seek to classify them into thematic groups or guidelines. However, even among the majority that sought an aggregation of concepts, there is no consensus, with each author adopting different classification criteria and nomenclatures. Table 2 summarizes the answers to RQ1[5] and RQ2.

4.3 RQ3 - What are the characteristics of these game design concepts?

To answer RQ3, a preliminary analysis and synthesis needed to be carried out. Here, we first describe the steps of this iterative process. After the collection of the game design concepts, its process of analysis and synthesis iteratively took place. While the gathered concepts were evaluated and categorized, the authors progressively realized the need to adopt new classification parameters for the more than three hundred concepts initially collected.

The first step was the organization of similar, equal, or complementary concepts in groups. The main objective was to aggregate similar items and to reduce duplicates. Next, the concepts were classified according to the Game Activity Components Structure [15]. These components, which each group a particular set of game design concepts, are: Voluntariness, Rules, Control, Objective, Feedback, Perception, and Social. According to this classification system, each concept is more conceptually related to a specific component. In this way, we organized each concept under a specific thematic component. As a result, each of the seven components reunited dozens of game design concepts.

However, this classification proved to be insufficient and needed to be refined. During this process of analysis, classification, and synthesis of the concepts, it became evident that the single and unaltered use of this useful, but limited classification system would result in a large volume of data hard to classify and synthesize solely in these terms, making the searching and (posteriorly) using of these concepts exhausting and difficult. After that, the game design concepts were reanalyzed, and two design classes were created, one to deal with more open and general design concepts (Gamification Design Concepts) and the other with more closed and specific ones (Gamification Elements).

Regarding the two classes, while one class brought together the concepts according to the game activity components (Voluntariness, Rules, Control, Objective, Feedback, Social, Perception), another brought them together according to the gamification element (Avatars, Points, Badges, etc.) to which it conceptually belongs. Gamification Design Concepts describe characteristics, elements, parameters, or possible effects related to some game aspect. They have a more 'open' conceptual nature, oriented towards a more generalist design, based on more general development guidelines. Each GDC is grouped into one of the seven components of gaming activity. Gamification Elements, in turn, describe game design concepts bringing together defining and limiting characteristics. Their

[5]Due to the "Work in Progress" size limit, the RQ1 RQ1 results are presented in a quantitative format

Table 1: List of selected studies

Id	Title	Reference
L1	Gamifying information systems - A synthesis of gamification mechanics and dynamics	[30]
L2	How games and game elements facilitate learning and motivation: A literature review	[8]
L3	A method for the design of gamified trainings	[14]
L4	Survey for mapping game elements.	[29]
L5	From game design to service design: a framework to gamify services	[15]
L6	The effects of gamification in online learning environments: A systematic literature review	[3]
L7	Gamification of Education: A Review of Literature	[22]
L8	Tailored gamification: A review of literature	[16]
L9	Designing Engaging Games for Education: A Systematic Literature Review on Game Motivators and Design Principles	[19]

Key: L[number]: study id.

Table 2: Game design concepts (RQ1 and RQ2)

Id	RQ 1	RQ2
L1	21	Five Master M&D: System Design, Challenges, Rewards, Social Influences and User Specifics
L2	10	Tem theory-driven design guidelines over game elements beyond entertainment
L3	28	Educational Game Element Database for education/training with 7 groups: Progression, Rewards, Rules, Social, Competition, Challenge, Communication, and General
L4	103	A mapping over 103 game elements and their conceptual relations with each other
L5	7/73	Review and categorization of game design concepts according to 7 game activity components: voluntariness, rules, control, objective, feedback, social interaction, and perception
L6	24	Gamification affects on users' behavior in learning, in 6 areas: performance, motivation, engagement, attitude towards gamification, collaboration, social awareness
L7	8	Synthesis over game design elements used in gamification of education
L8	36	A standardized terminology of game elements used in tailored gamification, for different users profiles
L9	13/54	56 game motivators in 14 classes; 54 educational game design principles in 13 classes

Table 3: GDC characteristics

Component	Characteristics
Voluntariness	Prerequisite for gamified experiences. It requires active participation and the freedom to enter or exit game activities. Activities should be attractive; give epic meaning; and favor intrinsic motivation. Can favor motivation, engaged participation and learning.
Rules	Can enable/constrain users' actions. Obedience to rules is usually pleasurable. Keep learning manageable, enabling the acquiring/mastering of skills. Game activities should be structured as autotelic/intrinsically motivating. Difficulty must be balanced and errors should be undoable.
Control	Users must feel in control over activities. Controls should enable freedom, and be consistent, accurate, adjustable, familiar, safe, and comfortable. Users must have the freedom to experiment, play, and learn. Activities should be predictable, manageable, and free of danger. Decisions must have consequences and make sense. Control increases motivation. Uncertainty aspects can influence control.
Objective	Goals generate pleasure. Objectives must be clear, understandable, meaningful, and achievable. Should sustain users' interest, commitment, and desire. Can direct users over the activity and provide cognitive challenges. Must be progressive and based on each other.
Feedback	Should be clear, timely, positive, varied, and motivating. A mainly intrinsic motivator. Frequency, intensity, and speed of feedback favor performance, engagement, and learning. Increases motivation allowing users to perceive their actions' effects. Rewards can increase the activity's appeal.
Social	Socialization, competition, and teamwork have motivational and pleasurable effects. Social needs are intrinsic motivators. Social interaction can potentiate emotions related to communication, expression, and interaction. Gamified activities can influence/be influenced by sociocultural contexts.
Perception	Pleasure makes people play. Emotions create positive sensations and can influence actions. Fun relaxes and lessens the effort to learn. A negative balance of emotions demotivates users. Context/meaning is key to pleasure generation. Emotions/feelings can motivate behaviors or generate feedback over experiences. Time sense can vary with intense/focused experiences.

use in gamification is more defined and oriented towards more specific roles within the gamification design. In this class, each game design concept is grouped into a specific GE. Yet, each Gamification Element is also formed by game design concepts. In that way, each game design concept composing a GE, if analyzed individually, can also be related to a component of the game activity.

Table 4: GE characteristics

GE name	Characteristics
Avatars	Game characters/visual representations of users. Visually represent users, mediating its actions and emotional connections. Avatar customization is a motivational factor.
Badges	Virtual goods or effects demarcating achievements/rewards. Can demonstrate status, achievements or qualities. Can increase motivation and engagement through exploration, goals and rewards.
Collaboration	Related to the various dynamics of social collaboration (teams, teamwork, guilds, cooperation, community). It tends to attract social individuals and increase socialization.
Competition	Related to dynamics of competition, challenge and conflict between users. It tends to attract competitive individuals. Competition can increase motivation and engagement.
Creativity	Aspects that stimulate and exercise creativity and strategy. Related to the use of creativity or strategies to solve challenges. Related to content creation within the game/activity.
Challenges	Related to goals, objectives and challenges. Highly motivational, makes results measurable. Can come as varied situations to deal, battles against opponents, actions requiring effort to complete.
Characters	Characters not controlled by users. Can add context and relevance to the activity. Bosses: characters posing difficult challenges, representing barriers marking win states or providing new content.
Goods	Related to economic resources and virtual goods (and their economic aspects) that can be traded or accumulated in gamified environments. Motivational elements social users.
Interaction	Aspects related to user/user or user/activity interaction. Has to do directly with the users' actions in game activities. Directly related to control and feedback aspects.
Levels	Game stages, users' levels, or difficulty levels. Can enable progress, ambiance, and hierarchy. Can provide structure, reduce boredom, keep game space manageable and motivate play.
Leaderboards	Allows direct comparison between different data. Motivate competition, progress and achievement of goals. Extrinsic types of reward, linking progress to feedback.
Luck	Involves luck, chance, surprise or randomness. Pleasant and unexpected surprises are generally welcomed by users. Related to user engagement.
Points	Feedback/numerical data provided as rewards or measures of success. They have high motivational potential, but can also have negative effects on intrinsically engaged users.
Story	Related to game stories/narratives, adapting resources from literature, films, aesthetics, music, etc. to tell stories and engage. Helps to achieve optimal interest, motivating throughout the experience.
Prizes	Award mechanics, tasks rewards or game bonuses. A generally extrinsic motivator. Rewards can generate positive effects on users morale, engagement, motivation and exploration.
Progress bars	Visual aids providing information about progress towards general/specific goals. They have the main function of keeping users motivated and informed about their goals.
Skills	Related to skills acquired through learning. Related to intrinsic motivation, depending on user engagement to be acquired. Abilities are types of intrinsic achievement.
Socialization	Game mechanics and dynamics of socialization between real and virtual users. Strongly motivational and entertaining for socializers. Related to collaboration and competition.
Status	Aspects related to gaining, losing or maintaining reputation and status within game activities. Have a more impact in dynamics involving communities and interactions.
Time	Mechanics related to game rules and/or game experience. Time constraints create challenging and pressure environments and can increase engagement.

Thus, after the synthesis process, in the first class (Gamification Design Concepts), we have a total of 103 concepts, grouped according to its affinity with one of the game activity components, and, in the second class (Gamification Elements), 146 concepts, grouped according to its conceptual affinity with one of the 20 Gamification Elements. In total, this system synthesized and classified 249 different concepts.

So, to answer RQ3, we examined this concept library in two ways: (1) by analyzing the Gamification Design Concepts tables grouped according to the game activity components and grouping its characteristics according to this logical structure; (2) by analyzing the Gamification Elements tables and also grouping its characteristics according to this structure. The idea here is to provide a group of perceived characteristics, collected through the synthesis of references found in the tertiary literature review, to provide a new understanding about the game design concepts. Table 3 lists the characteristics from the GDC grouped according to their components and in Table 4 lists the characteristics of the GE.

4.4 Discussion

In this study, we sought to understand how gamification design has been implemented through the use of game design concepts. Regarding RQ1, we can observe that the number of concepts recorded in each study has a wide variation, from 8 to 103. It is also noted that it is not possible to observe a standardization of nomenclatures in this sample group. Another important peculiarity is that, while some concepts have closed and well-defined design characteristics (*e.g.*, Badges, Goals, and Points), others have comprehensive design characteristics (*e.g.*, Feedback, Aesthetics, and Narrative).

Regarding RQ2, the lack of standardization is also notable in the difference in the description of similar game design concepts in different studies. There is also still a noticeable difference in the way each study uses to describe the concepts researched. While some authors sought to describe what characterizes each concept, others sought to characterize their functions or even possible effects as design objects, or a combination thereof. Four of the nine authors also sought to classify the researched concepts within specific frameworks, all with differences from each other.

While RQ1 and RQ2 sought to better understand an already existing framework, RQ3 sought to analyze and synthesize the data collected to propose a game design concept classification. With 249 different concepts to group, it proved necessary to reorder this mass of data to facilitate design processes. While GDC, due to its characteristics, seems to indicate that it can be used more as open design concepts aimed at ideation, the GE seems to be used aiming at specification.

5 Limitations and Future Studies

Despite the rigorous approach taken in this tertiary literature review, limitations must be acknowledged. First, the search string and data collection were developed and executed by a single researcher, introducing potential biases in the selection and interpretation of relevant studies. The subjective nature of defining search terms, eligibility criteria, and data collection processes might have influenced the results. The review was restricted to studies published in English and available in the Scopus database. This limitation may have excluded relevant research published in other languages or indexed in different databases, thereby potentially reducing the comprehensiveness of the review.

The reliance on secondary studies (*e.g.*, literature reviews, or systematic mappings) might limit the depth of insights derived from the primary data. Additionally, studies that did not provide adequate descriptions of game design concepts were excluded, which could have led to the omission of valuable perspectives or novel game design elements. Finally, the decision to exclude studies focused exclusively on specific gamification elements (*e.g.*, Points, Badges, Avatars) or those with insufficiently detailed descriptions of these elements could have resulted in a narrowed scope, potentially overlooking emerging trends or innovative applications of game design concepts in gamification.

In future work we aim to extend this tertiary review, presenting with more detail each of the identified concepts and their relations. We also aim to propose a framework for classifying gamification designs based on the results found in this review.

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