

# FABLE: A New Horizon in Digital Learning and Serious Game Design

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## Abstract

Serious games have stood out as a new pedagogical format capable of motivating students through interactive learning. The lack of standards in the conception of these video games has led to the creation of different models, where the ludic aspects often prevail over the educational ones. This research analyzes the models present in the literature to identify those key elements in the design of serious games and to determine the presence of ludic-pedagogical elements. A systematic review is carried out following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement to identify the existing models for creating serious games. A qualitative analysis of the selected models is carried out to extract the key elements that should be present when creating a guide for designing serious games and to evaluate a ludic-pedagogical approach. Finally, a directed content analysis is performed to evaluate the presence of ludic-pedagogical elements in the selected models. The results show a lack of attention paid to the elements of the pedagogical dimension of the game in the studies reviewed. Other elements, such as the format or the audience, are not specified, and most models prove incomplete. From this study emerges FABLE (Fun And Balanced Learning Experience), a model that incorporates both the playful and pedagogical dimensions of the serious game.

## Keywords

educational technology; game-based learning; ICT; interactive learning; serious games; video games

## 1. Introduction

The last decade has witnessed the transformation of learning through new tools and methods that have revolutionized traditional education. According to recent studies, the adoption of educational technologies

has improved not only access to information but also the motivation and engagement of students in their learning process (Bedenlier et al., 2020; Kowitlawakul et al., 2022; Wei, 2022). This scenario has opened the door to new ways of teaching that go beyond conventional methods, employing innovative tools inside and outside the classroom. Consequently, digital resources in education have become prominent tools, bridging emerging pedagogical needs with the expectations of current generations. This transformation has prompted educators and researchers to explore new teaching strategies (Chung & Pan, 2023), such as gamification, escape rooms, or video games, framed in the educational paradigm 4.0, that emphasizes personalized and flexible learning, utilizing adaptive systems powered by advanced technologies such as artificial intelligence, big data, and cloud computing to meet the specific needs of each student in interactive and immersive virtual learning environments (Almeida & Simoes, 2019). In this context, educational games have begun to gain ground in education, understood as a tool capable of offering a combination of entertainment and learning that appeals to today's generations (Min et al., 2022). The success and recognition are such that teachers are starting to integrate them into classrooms (Egea-Vivancos & Arias-Ferrer, 2021), while, in parallel, this expansion has led the scientific community to investigate the educational potential of this format (Ashinoff, 2014; Coroller & Flinois, 2023; Sousa & Costa, 2018; Toh & Kirschner, 2020).

Known as serious games, these games are designed with specific pedagogical objectives combining entertainment and educational aspects (Juan et al., 2017). To achieve their teaching purpose, they take advantage of the very nature of the format to expose students to different simulated scenarios and involve them in learning (Amzalag, 2021; Gao et al., 2020), placing them at the center of the process (Konopka et al., 2015). Recent studies have shown that educational video games can effectively improve students' academic performance and motivation (Manzano-León et al., 2021; Obodo et al., 2020). Thanks to their potential, serious games offer an innovative approach to enhancing traditional learning methods. From the earliest educational levels (Chang & Yen, 2023) to higher education (Artal-Sevil, 2020), integrating these narratives yields various benefits (Pérez-Colado et al., 2019). Firstly, video games positively impact players' emotional states, fostering interest and motivating them to persist in the game. Furthermore, some studies indicate that serious games promote the cognitive processes associated with the emergence of intrinsic motivation (Leitão et al., 2022), encouraging learning for its own sake rather than solely for grades. Secondly, as virtual tools, video games provide immersive training, allowing safe skill acquisition through simulated real-world scenarios (Chanchí-Golondrino et al., 2022), such as problem-solving (Pacheco-Velázquez et al., 2023), critical thinking (Elvsaaas et al., 2023), and teamwork (Wong et al., 2022). Moreover, by immersing students in interactive environments, serious games present challenges that enhance educational engagement, effectively countering the burnout phenomenon in contemporary education (Reyes-de-Cózar et al., 2023).

However, these advantages are accompanied by some uncertainties. Several studies have concluded that learning outcomes from serious games are not consistently met, and engagement doesn't always increase (Imlig-Iten & Petko, 2018). Additionally, designing educational video games presents a complex challenge: ensuring knowledge transfer while maintaining entertainment and enjoyment for players (Andreoli et al., 2018). Striking the right balance between the "game" and "serious" dimensions is crucial (Gros, 2017). If educational content dominates, motivation may decline; if entertainment dominates, learning opportunities may be limited (Ravyse et al., 2017). Therefore, efforts to overcome these challenges and to compensate ludic and pedagogical elements in serious games are crucial for their effectiveness in education. Achieving this is complex and demands attention to pedagogical theories, learning mechanisms, game

elements, player experience, and various outcomes (Natucci & Borges, 2021). An educational video game with ludic and pedagogical elements present in its design can enhance learning (Lamrani et al., 2019) and student motivation (Westera, 2019). Also, categorizing those game design elements into fundamental educational game design principles can provide a more precise overview for application (Ahmad, 2019). Overall, integrating educational elements in serious game design is essential for creating effective and engaging learning experiences.

From this standpoint, theorists propose models for video game creation from two angles: ludic and educational. Within the ludic approach, a prominent model is Mechanics Dynamics Aesthetics by Hunicke et al. (2004), comprising an iterative framework based on three components: mechanics, which involves the rules of the video game; dynamics, related to the responses provided by the system; and aesthetics, addressing the visual and emotional aspects of the game. Other models, such as Nitsche's (2008), construct the video game around five conceptual planes: the rule-based space, the mediated space (the technological medium), the fictional space, the play space, and the social space. Authors like Green (2017) emphasize narrative, arguing that video games should integrate gameplay and narrative, supported by immersion, world-building, and agency.

From an educational perspective, Gee (2007) introduces elements such as interactivity, adapting the game to the student's learning style, game identity (personalization of characters), ordering problems/challenges by complexity, providing challenges according to difficulty, incorporating repetition for learning reinforcement, and ensuring depth and fairness to achieve objectives. These concepts form the basis for subsequent models, such as Klopfer et al.'s (2018), who propose design principles for educational games focused on creating meaningful learning experiences aligned with educational contexts. Their principles cover both preliminary and evaluative aspects, including the necessity of focus groups and game testing to ensure effective learning in the target audience and the importance of collecting relevant data to assess educational intervention effectiveness.

In this scenario of booming gamified learning environments, and amid theoretical advancements in the field, there's a rising community demand for a unified guide on serious game creation to establish a standardized approach (All et al., 2016; Ávila-Pesántez et al., 2017). Many of the shortcomings of video game-based learning may stem from the absence of consensus regarding creating high-quality serious games (De-Lope et al., 2017). To address this, researchers are endeavoring to find solutions by developing models, guidelines, or methodologies that guide the future of serious games.

On one side, some theoretical frameworks aim to guide designers in creating educational video games (Barianos et al., 2022), while others focus on the game's actual creation or implementation (Tseklevs et al., 2016). Additionally, some authors present methodologies focusing on technical aspects (Silva, 2020). Given these divergent approaches, it becomes crucial to unify models for designing educational video games (Mestadi et al., 2018). This emphasis should encompass educational elements and communicative and game components for a more cohesive approach. For the stated purpose, this study addresses the following research questions:

RQ1: Is it feasible to identify common characteristics in models for serious game design?

RQ2: What are the main elements in the models studied for developing serious games?

RQ3: How are the ludic and pedagogical dimensions represented in the models reviewed?

## 2. Method

### 2.1. Research Design

The methodology followed for this research, which follows a qualitative design, is carried out in three stages. Initially, a systematic literature review on serious game design models is conducted, adhering to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement criteria for validity and accuracy (Hutton et al., 2016). Eligibility, inclusion, and exclusion criteria, as well as search strategies, are defined through the structure of the PICO (Participants, Intervention, Comparator, Outcomes) model. In the second phase, a qualitative analysis of the selected studies is performed to identify the key elements in the design and development of serious games. Finally, a directed content analysis (Hsieh & Shannon, 2005) is carried out to check whether the created model improves those selected in the review.

#### 2.1.1. Phase 1: Systematic Review

The initial search began in February 2023 using the combination of the terms “serious games” and “educational video games” in the Web of Science and Scopus databases, as the most representative in the field of social sciences since the object of study of this research is framed in education and communication. Subsequently, the search was broadened using the Boolean operators AND and OR with descriptors like “model”, “education,” “pedagogical,” and “framework,” among others. These searches yielded a substantial number of scientific publications, providing an overview of the research object and existing models in serious games literature, and highlighting the importance of conducting a systematic review.

The final systematic search was concluded in March 2023, covering a 10-year period from 2014 to 2023. The final combination of terms was:

(Model OR guidelines OR principles OR dimensions) AND (Development OR design OR evaluation) AND ((educational AND games) OR (serious AND games) OR (applied AND games) OR (learning AND games) OR (pedagogical AND games))

This search yielded 13,692 results, with 3,985 from Scopus and 9,707 from Web of Science. The inclusion and exclusion criteria utilized are shown in Table 1.

**Table 1.** Inclusion and exclusion criteria according to the PICO model.

	Inclusion criteria	Exclusion criteria
<b>Participants</b>	Any	None
<b>Intervention</b>	Any	None
<b>Context</b>	Published 2014–2023 Articles Published	Published in another year Other than articles Not published
<b>Outcomes</b>	Focused on models or frameworks for designing and developing serious games Educational video games	Others Commercial video games

Note: The Comparator section of the usual PICO format was changed to Context, following Reyes-de-Cózar et al. (2022).

After identifying the 13,692 results, duplicate articles across the two databases ( $n = 2,957$ ) were discarded, leaving 10,735 results. After reading the title,  $n = 10,626$  were discarded because they were not considered relevant to the object of study. Many of these articles focused on isolated game attributes or commercial video games, while others centered on designing classroom interventions rather than providing a framework for serious game design. Upon abstract review,  $n = 4$  articles inaccessible for full-text reading and  $n = 40$  articles not meeting inclusion criteria were excluded, leaving a sample of  $n = 61$ . After reading the full text of the selected articles,  $n = 40$  were discarded because they did not meet some of the above criteria not detected in the previous screening phases. Therefore,  $n = 21$  articles were included in the systematic review (see Figure 1).

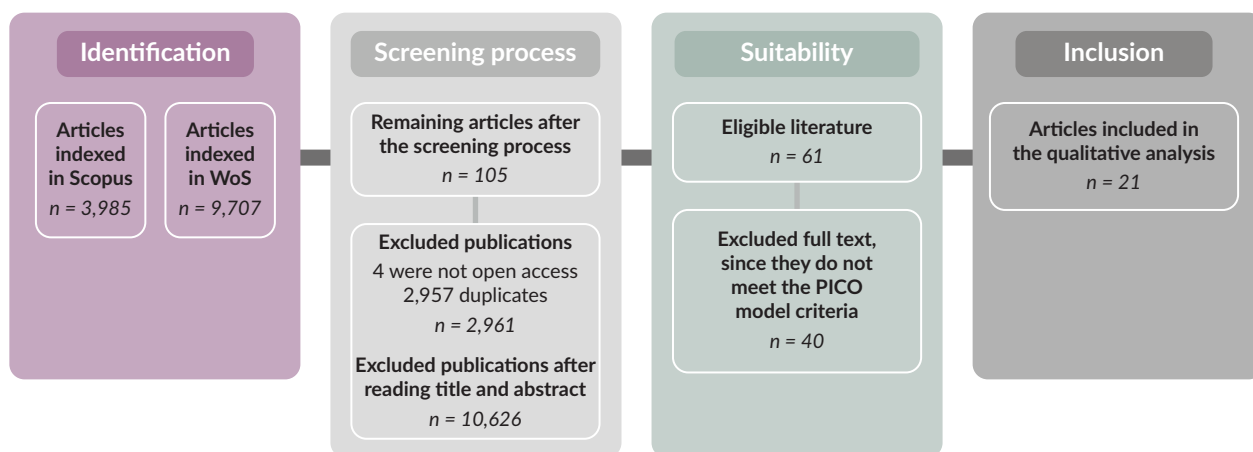
To ensure the level of consensus in the screening phase, the reviewers (the authors of this article) were trained. Initially, 20 randomly selected articles were analyzed to assess agreement levels. Disagreements were resolved through discussion until consensus was achieved. This process was repeated until an adequate agreement level was reached (Cohen's Kappa  $> 0.8$ ). Once reviewer training concluded, all articles were screened. Consensus articles were included in the final selection, while those without consensus were discussed for potential inclusion.

The same procedure was followed for the second phase of the study. Reviewer training involved randomly selecting five articles, assessing consensus, and discussing disagreements. The level of consensus was adequate (Cohen's Kappa  $> 0.8$ ), so the process was not repeated. Finally, reviewers independently categorized the articles, and the final categorization included articles where both reviewers agreed.

### 2.1.2. Phase 2: Qualitative Analysis

First, an analysis of the formal elements of the models (such as target audience, methodology, approach, or format) has been carried out in order to identify the main characteristics.

Secondly, following the conventional content analysis technique proposed by Hsieh and Shannon (2005), the main elements of the models studied have been extracted. The procedure begins with observation by reading the different articles and the models proposed by the authors. After having a global overview, we carefully



**Figure 1.** Planning, identification, and eligibility process workflow. Note: WoS means Web of Science.

read each model, extracting the categories and elements described and tabulating them in a spreadsheet. After finishing the tabulation of the elements, they are grouped by similarity, and preliminary coding is performed. Subsequently, some codes are merged, while others are divided into subcategories. Finally, the final codes are examined to organize the information into a hierarchical structure. The explanation is accompanied below with an example of coding during the data analysis phase:

- After preliminary coding, we proceed to unify the elements found, grouping them by similarity (for example, synonyms such as storytelling, plot, dialogues, storyline, etc.), giving rise to a specific subcategory (“history”);
- These subcategories, together with others of the same hierarchy but with different subject matter (e.g., “scenes” or “characters”), are grouped into a higher-order category (“narrative”);
- Finally, these categories are grouped into higher-level layers according to the nature of their elements (playful, educational, or mixed).

As a result of the analysis and classification of the identified elements emerges FABLE (Fun And Balanced Learning Experience), a model structured in layers, categories, and subcategories that proposes an approach that includes both ludic and pedagogical aspects.

### 2.1.3. Phase 3: Directed Content Analysis

After the emergence of FABLE as a result of conventional content analysis, and following Hsieh and Shannon (2005), the methodological technique of directed content analysis is used in the last phase. This method involves categorizing the selected studies based on a previous model or approach, provided they are justified. Therefore, FABLE is compared with the selected models to determine whether the creation improves on the models studied.

## 3. Analysis and Results

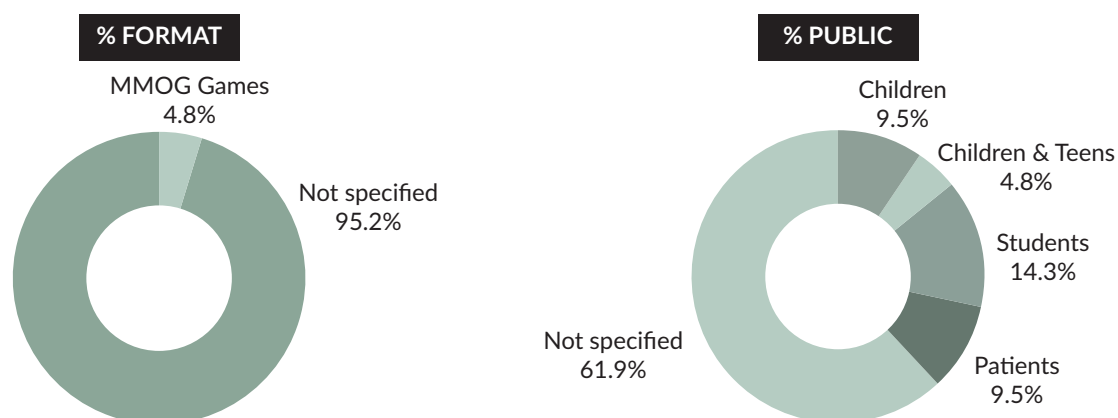
### 3.1. General Characteristics of the Selected Models

To answer RQ1, the selected models were analyzed in order to extract common characteristics from them. The scientific production of models to create serious games in recent years has been constant over time (see Table 2), with a decrease observed in 2017 and 2018, where no selectable research was found. The years 2015 and 2021 represent the peak in production, accounting for 38% of studies conducted in the last decade. Methodologically, all articles employ a qualitative research design.

Regarding the format, 95.2% of models are not oriented towards specific serious game typologies (see Figure 2). Additionally, 61.9% of models do not specify a target audience, though those that do mainly target young people such as children, adolescents, and students.

**Table 2.** Selected models after systematic review.

Article	Authors	Year	Methodology
A01	Padilla-Zea et al. (2014)	2014	Qualitative
A02	Starks (2014)		
A03	Kim and Lee (2015)	2015	
A04	Plass et al. (2015)		
A05	Shi and Shih (2015)		
A06	Zarraonandia et al. (2015)		
A07	Daylamani-Zad et al. (2016)	2016	
A08	Roungas (2016)		
A09	Weitze (2016)		
A10	McGann et al. (2019)	2019	
A11	Mokhtar et al. (2019)		
A12	Khowaja and Salim (2020)	2020	
A13	Tahir and Wang (2020)		
A14	Tsikinas and Xinogalos (2020)		
A15	Abidin et al. (2021)	2021	
A16	Beristain-Colorado et al. (2021)		
A17	Jaccard et al. (2021)		
A18	Ledezma and Simini (2021)		
A19	Ishaq et al. (2022)	2022	
A20	Jiang and Shangguan (2022)		
A21	Razali et al. (2022)		


**Figure 2.** Main characteristics of the models.

### 3.2. Key Elements for the Creation of Serious Games Models From the Literature

To answer RQ2, a qualitative analysis of the selected articles was carried out. The main elements were extracted to identify the key elements that should be present when creating a guide for the design of serious games. For their understanding, they have been classified together with their corresponding references to the articles that mention them into four layers: prerequisites, ludic experience, pedagogical experience, and evaluation.

### 3.2.1. “Prerequisites” Layer

The “prerequisites” layer is the initial one and comprises the “ludic-pedagogical requirements” and “specific educational considerations” categories.

The “ludic-pedagogical requirements” category (see Figure 3) includes the initial criteria to consider when designing an educational video game. This category involves both game-related aspects like the genre (A12, A21), objectives (A15), game outline (A17), and debriefing (A06), which should detail the game’s format to adapt other components effectively. It also covers educational aspects such as the learners’ profile (A17), their age (A08), the context or environment in which they will play (A08, A17), learning prerequisites (A09) or requirements (A19), the users’ prior knowledge (A08), and the intended learning outcomes (A12).

The category “specific educational considerations” refers to particular details that influence the design of an educational game because they affect the achievement of educational goals. Some models in the literature include specific guidelines for developing games for children with autism (A12, A14), using the multiple intelligences approach (A02), or for students with reading (A15) or language learning difficulties (A19).

### 3.2.2. “Ludic Experience” Layer

The “ludic experience” layer defines the game components related to user experience and gameplay. This layer is composed of four categories: “game structure,” “narrative,” “aesthetic,” and “interaction.”

The category “game structure” includes all elements related to actions within the serious game. It is divided into three subcategories: “mechanics,” “dynamics,” and “gameplay.” “Mechanics” refers to the rules that define the game, such as interaction patterns, skills, and instructions that control the game state. These are also known as game mechanics (A03, A04, A06, A12, A13, A17), core mechanics (A20), or game mechanisms (A05). “Dynamics” are the technical aspects like technology and software, including fidelity and simulation models (A17), accessibility and adaptability (A16), interface (A06, A08, A13, A14, A17), and game media (A20). “Gameplay” covers the game’s identity and user experience (A17), including goals and objectives (A03, A08, A20), challenges (A10, A11, A14), rewards (A06, A10, A11, A20), badges (A03), points (A03, A19), rank (A19, A21), and levels (A03, A07, A08, A19, A21), among others.

The “narrative” category (see Figure 4) includes all elements related to the game’s plot, divided into three subcategories: “history,” “scenes,” and “characters.” The “history” subcategory encompasses storytelling (A06, A12), the plot (A08), dialogues (A08), the storyline (A15), narrative cinematics (A01), and emotional narratives (A20). The “scenes” subcategory (A01, A06, A12) includes all the scenarios (A01, A06, A11, A18) where the story unfolds, which are further divided into sequences (A01) and chapters (A01).

LAYERS	CATEGORIES	ARTICLES
Prerequisites	<i>Ludic-pedagogical requirements</i>	A05, A06, A08, A09, A12, A13, A14, A15, A17, A19, A21
	<i>Specific educational considerations</i>	A02, A07, A10, A12, A14, A15, A19, A20

Figure 3. Prerequisites layer, its categories, and sources.



LAYERS	CATEGORIES	SUBCATEGORIES	ARTICLES
Ludic experience	Game structure	Mechanics	A03, A04, A05, A06, A12, A13, A17, A20
		Dynamics	A03, A06, A08, A12, A13, A14, A16, A17, A20
		Gameplay	A01, A03, A04, A05, A06, A07, A08, A09, A10, A11, A13, A14, A15, A16, A17, A18, A19, A20, A21
	Narrative	History	A01, A04, A05, A06, A08, A09, A12, A13, A15, A17, A20, A21
		Scenes	A01, A06, A11, A12, A18, A20
		Characters	A01, A06, A07, A08, A12, A15, A18, A21
	Aesthetic	Audiovisual	A03, A04, A08, A13, A15, A17, A18, A21
		Sensation	A02, A03, A05, A06, A08, A09, A13, A14, A15, A16, A19, A20
		Sensory stimulation	A02, A09, A11, A13, A14, A15, A16, A20
	Interaction	Interactivity	A05, A06, A07, A09, A10, A15, A17, A20
		Socialization	A06, A07, A08, A09, A18, A20
		Feedback	A03, A04, A06, A08, A09, A10, A11, A14, A15, A16, A20

**Figure 4.** Ludic experience layer, its categories, its subcategories, and sources.

The “characters” subcategory (A01, A07, A08, A18) covers everything from avatars (A15) to NPCs (non-playable characters; A12).

The “aesthetic” category refers to the abstract reasons that attract users to continue playing, influenced by the artistic and visual presence of the game. It is subdivided into three subcategories: “audiovisual,” “sensation,” and “sensory stimulation.” The “audiovisual” subcategory (A03, A04, A13, A21) pertains to the virtual elements (A03) of the game universe (A17), including visual aspects like color (A15), and auditory elements such as sounds (A08, A18) and music (A08). The “sensation” subcategory (A05) shapes the emotions conveyed during the game, such as control (A03, A20), curiosity (A03, A08, A09, A20), freedom (A05), flow (A02, A13, A16), confidence (A03, A13), or mastery (A02). Lastly, “sensory stimulation” focuses on the consequences these sensations generate, like immersion (A13, A14, A16), concentration (A13, A16), or engagement (A02, A13).

The “interaction” category encompasses all reciprocal actions within the game, ranging from narrative interactivity to social engagement with other players. This category is divided into three subcategories: “interactivity,” “socialization,” and “feedback.” The “interactivity” subcategory includes aspects such as decision execution (A07), choices (A09, A10), interaction with the game (A17), and player decisions (A07). The “socialization” subcategory involves elements like teams (A07), communication (A18), social relations (A09), and collective consciousness (A08). Finally, the “feedback” subcategory refers to the system’s responses to the player’s actions during the game (A03, A04, A06, A10, A11, A14, A15, A20).

### 3.2.3. “Pedagogical Experience” Layer

The “pedagogical experience” layer focuses on aspects related to learning and is divided into three categories: “pedagogical content,” “educational objectives,” and “learning process” (see Figure 5). The “pedagogical content” encompasses all elements related to the instructional material (A12) and educational resources (A13), including their design, structure (A15), and implementation. The “educational

LAYERS	CATEGORIES	ARTICLES
Pedagogical experience	<i>Pedagogical content</i>	A09, A12, A13, A15
	<i>Educational objectives</i>	A09, A13, A14, A15, A17
	<i>Learning process</i>	A04, A09, A10, A12, A13, A14, A17

**Figure 5.** Pedagogical experience layer, its categories, and sources.

objectives” (A13, A14, A15, A17) are defined as the learning goals (A09, A17) that shape the game’s design. The “learning process” (A09) outlines the strategies (A13) and mechanics (A04, A17) to be used, the learning activities (A12), the functions (A17), the pedagogical scenario (A17) in which the game will be integrated, and whether any personalization for the learner is considered (A14).

### 3.2.4. “Evaluation” Layer

The purpose of the “evaluation” layer (see Figure 6) is to determine if the objectives of the serious game, both educational and ludic, have been achieved. This layer consists of two categories: “learning” and “game.” The “learning” evaluation (A09, A17) assesses not only the learning outcomes achieved (A15) but also the expected outcomes (A12), along with game analytics (A14) that measure educational aspects. The “game” category (A04, A15, A17) focuses on evaluating the purely ludic elements and the adjustments (A16) made to the video game.

### 3.2.5. Ludic-Pedagogical Approach

To respond to RQ3, the elements present in the selected models are analyzed to determine the presence of ludic and pedagogical dimensions. According to the percentages obtained (see Figure 7), the “prerequisites” layer is present in 71.4% of the studies. This, in turn, contains two categories: “ludic-pedagogical requirements” (52.4%) and “specific educational considerations” (38.1%).

The “ludic experience” layer is included in 100% of the models. Regarding the categories that make it up, “game structure” is the most used category (95.2%). “Narrative” and “interaction” account for 71.4%, and “aesthetic” for 80.9%. These four categories are further divided into subcategories. “Gameplay” is the most common subcategory (90.4%). Far behind are “history” or “sensations” (57.1%), “feedback” (52.4%), and “dynamics” (42.8%). Meanwhile, 38.1% of the models include “mechanics,” “characters,” “audiovisual,” “aesthetic,” “sensory stimulation,” or “interactivity.” “Scenes” and “socialization” are the least represented subcategories in the literature (28.5%).

LAYERS	CATEGORIES	ARTICLES
Evaluation	<i>Learning</i>	A09, A12, A13, A14, A15, A17
	<i>Game</i>	A04, A15, A16, A17

**Figure 6.** Evaluation layer, its categories, and sources.

LAYERS	%	CATEGORIES	%	SUBCATEGORIES	%	ARTICLES
Prerequisites	71.4	Ludic-pedagogical requirements	52.4			A05, A06, A08, A09, A12, A13, A14, A15, A17, A19, A21
		Specific educational considerations	38.1			A02, A07, A10, A12, A14, A15, A19, A20
Ludic experience	100	Game structure	95.2	Mechanics	38.1	A03, A04, A05, A06, A12, A13, A17, A20
				Dynamics	42.8	A03, A06, A08, A12, A13, A14, A16, A17, A20
				Gameplay	90.4	A01, A03, A04, A05, A06, A07, A08, A09, A10, A11, A13, A14, A15, A16, A17, A18, A19, A20, A21
		Narrative	71.4	History	57.1	A01, A04, A05, A06, A08, A09, A12, A13, A15, A17, A20, A21
				Scenes	28.5	A01, A06, A11, A12, A18, A20
				Characters	38.1	A01, A06, A07, A08, A12, A15, A18, A21
		Aesthetic	80.9	Audiovisual	38.1	A03, A04, A08, A13, A15, A17, A18, A21
				Sensation	57.1	A02, A03, A05, A06, A08, A09, A13, A14, A15, A16, A19, A20
				Sensory stimulation	38.1	A02, A09, A11, A13, A14, A15, A16, A20
		Interaction	71.4	Interactivity	38.1	A05, A06, A07, A09, A10, A15, A17, A20
				Socialization	28.5	A06, A07, A08, A09, A18, A20
				Feedback	52.4	A03, A04, A06, A08, A09, A10, A11, A14, A15, A16, A20
Pedagogical experience	38.1	Pedagogical content	19			A09, A12, A13, A15
		Educational objectives	23.8			A09, A13, A14, A15, A17
		Learning process	33.3			A04, A09, A10, A12, A13, A14, A17
Evaluation	38.1	Learning	28.5			A09, A12, A13, A14, A15, A17
		Game	19			A04, A15, A16, A17

Figure 7. Key elements from revised models.

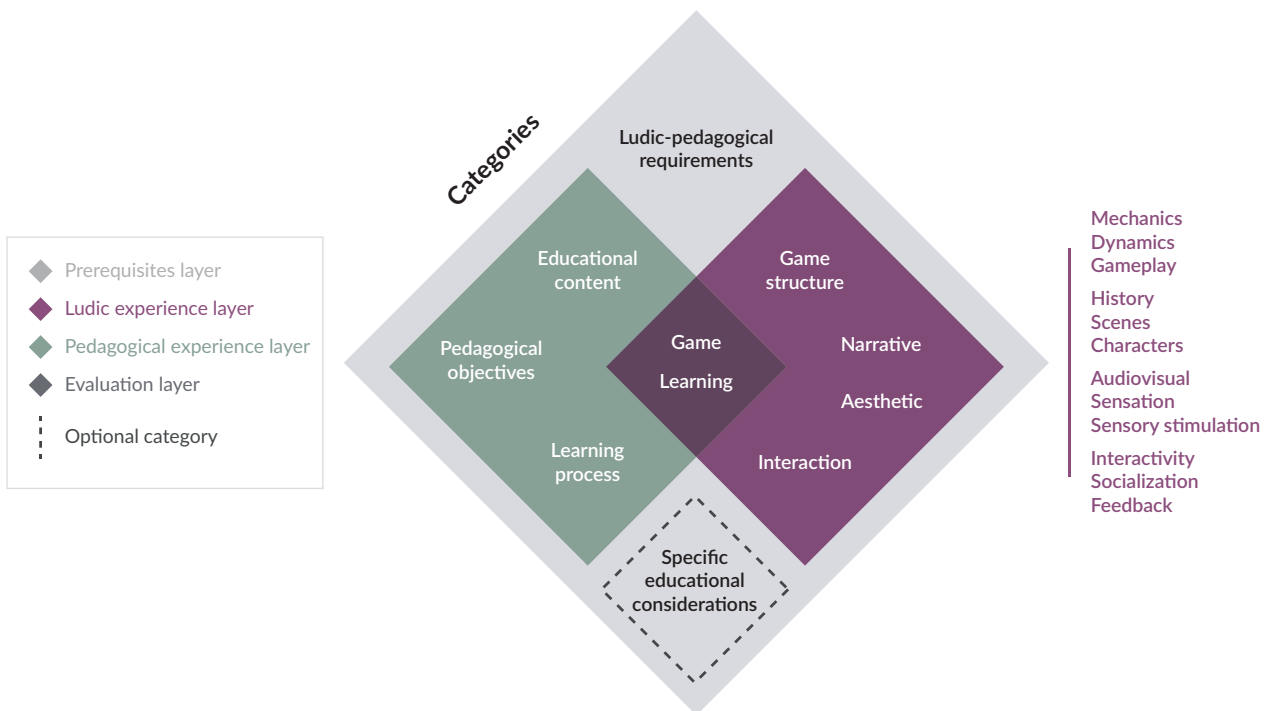
The “pedagogical experience” layer has a considerably lower presence than the previous layers (38.1%). Likewise, the three categories that comprise it have slightly lower percentages: 33.3% for “learning process,” 19% for “pedagogical content,” and 23.8% for “educational objectives.”

Something similar occurs with the “evaluation” layer (38.1%). At the category level, the evaluation of “learning” is included in 28.5% of the models, compared to 19% that incorporate an evaluation of “game.”

After analyzing the percentages of the elements present in the literature, it is observed that the presence of ludic elements, both at the layer and category level, is greater than that of educational elements, so there is no equal representation between the ludic and educational components of the models.

### 3.3. FABLE: A Model With a Ludic-Pedagogical Approach for the Design of Serious Games

This study proposes FABLE, an integrative model that emerged from the systematic review, combining elements of both ludic and educational approaches. FABLE aims to provide a framework for designing serious games but does not attempt to be a reference with a 50/50 balance between the ludic and pedagogic dimensions. However, it highlights the importance of incorporating educational elements in the design, which is a lack detected in most models in the literature. In addition, FABLE emphasizes the early determination of format, audience, and typology to lay the foundations for game development. Furthermore, this model can serve a dual role: assisting developers in designing effective educational video games and serving as an evaluation tool for teachers to assess serious game usage.



**Figure 8.** FABLE model.

FABLE is conceived to design both general serious games and video games with specific needs. Therefore, it includes the category of “specific educational considerations” as an optional element, detailed only when necessary, depending on the serious game’s nature and objectives. The model (see Figure 8) is structured into four layers: a ludic layer (ludic experience), an educational layer (pedagogical experience), and two mixed layers that integrate both educational and ludic elements (prerequisites and evaluation).

### 3.4. Comparison of FABLE With Models in the Literature

The methodological strategy of directed content analysis (Hsieh & Shannon, 2005) was carried out, using FABLE as a reference framework, to find out whether the created model improves the models for the design of serious games analyzed. To this end, an analysis of each model has been carried out, checking the presence or absence of the elements included in FABLE. The analysis was conducted at the category level, awarding one point to each category (11 points total). Each “ludic experience” category is divided into three subcategories, each scored on 1/3 to ensure that all categories have the same weight in the analysis (see Figure 9).

After analysis, only 28.6% of the models scored half of the points (5.5), which means that the remaining 71.4% have shortcomings in the proposed framework. On the one hand, there are models with only 1.33/11 (A01, A11) or 1.66/11 (A02, A18), while the majority range between a score of 2 and 4 (A03, A04, A05, A06, A07, A08, A10, A16, A19, A20, A21). On closer inspection, the lowest scoring items have their points accumulated mainly in the layer “ludic experience” (except for A02, which covers “specific educational considerations”). Layers such as “pedagogical experience” or “evaluation” are not very present in the selected models. These data reiterate the results of previous sections and show a lack of presence of educational elements in most of the models reviewed. At the other extreme are the highest-scoring models. The highest scoring model

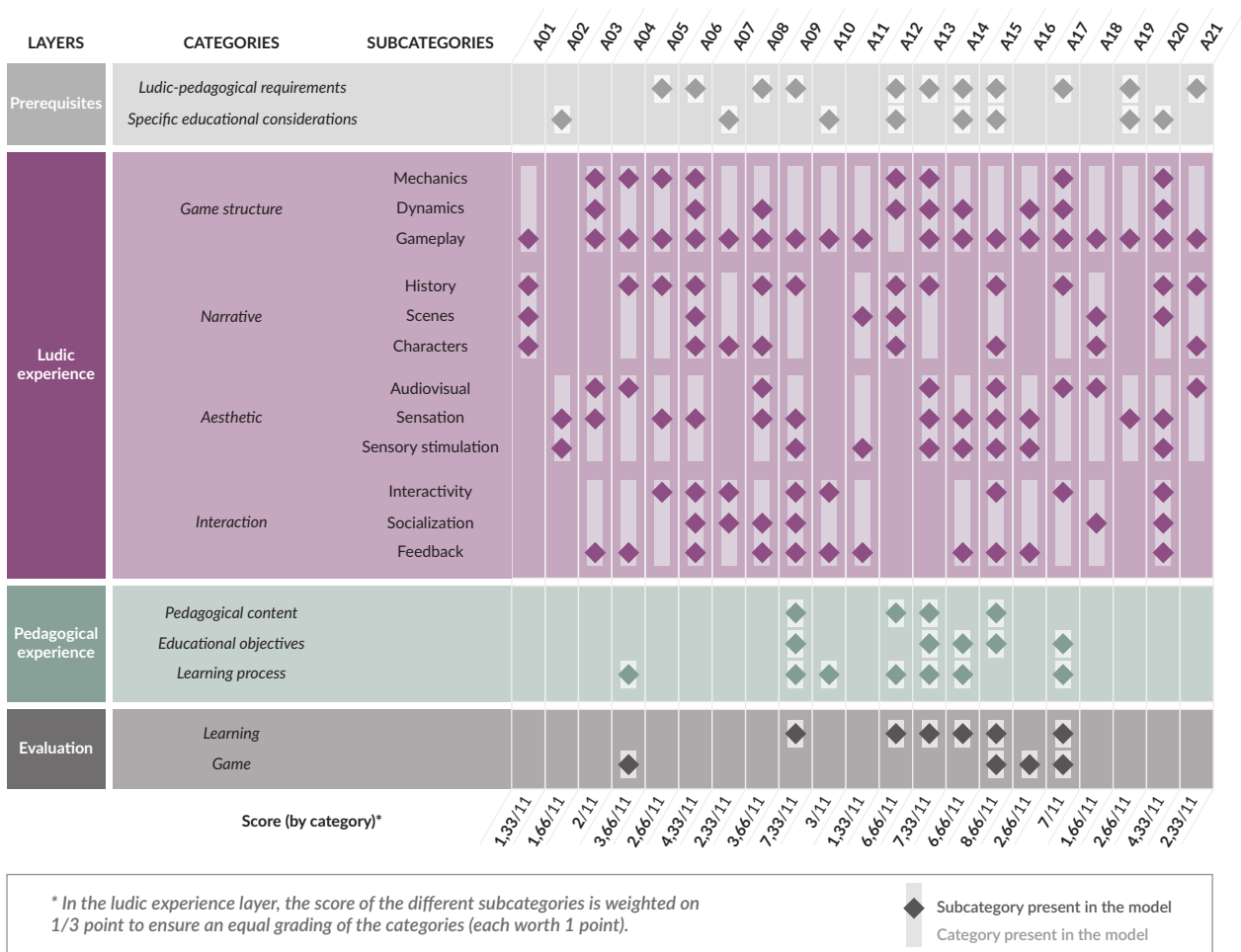


Figure 9. Articles evaluation.

scores are 8.66/11 (A15), followed by 7.33/11 (A09, A13), although they are still incomplete compared to the emerged model.

#### 4. Discussion and Conclusions

Research suggests that serious games serve as effective educational tools (Egea-Vivancos & Arias-Ferrer, 2021), motivating students and providing interactive and practical learning opportunities (Felicia, 2020), making them suitable for 21st-century learners. However, to ensure their efficacy in knowledge transfer, standardized approaches are needed to enhance serious game quality (Gentry et al., 2019). To this end, this study analyses models in search of guidelines and creates FABLE, a model for creating serious games with a focus on both playful and pedagogical aspects.

Regarding RQ1, the study investigated common characteristics in the design of serious games. Results indicate that audience and format are key identifiers of model characteristics. Interestingly, 61.9% of models do not specify an audience, while those that do mainly target young demographics such as students, children, or teenagers. This finding contrasts with other research emphasizing the benefits of serious games for older audiences and beyond academic settings, such as skill enhancement in older individuals (Abd-alrazaq et al.,

2022) and symptom reduction in depression (Saragih et al., 2022). Hence, proposing models targeting older audiences is beneficial to leverage the format's advantages and its contribution to fields beyond education. Despite format's crucial role in determining user experience (Caroux et al., 2023), it's largely overlooked in almost all studied models (95.2%), with only one detailing format considerations.

In response to RQ2, the study identifies key elements essential for creating a guide in serious game design by examining existing literature. Identification, categorization, and synthesis of these elements makes it possible to establish a framework incorporating the main elements from both ludic and pedagogical approaches. This represents a step towards creating holistic models that focus on both components, addressing some shortcomings observed in the studied models.

Regarding RQ3 and the determination of the presence of ludic and pedagogical elements in the selected models, the results are not encouraging. At the layer level, ludic components are present in all models (100%), while pedagogical elements (38.1%) and evaluation (38.1%) are scarce. At the category level, these percentages remain a decompensation. Categories with the highest presence in models in the literature align with the ludic layer ("game structure," "narrative," "aesthetic," and "interaction"), contrasting with low percentages (<25%) of elements related to the "pedagogical experience," including "pedagogical content," "educational objectives," and "learning process." These results invite us to reflect on the nature of the models themselves and show the relevance of proposing models that present a playful-pedagogical approach and do not lose sight of the main objective of any didactic tool: to promote learning (Gros, 2017). Developing a model serving as a guide for serious game creation necessitates finding an appropriate approach, considering both ludic and pedagogical elements (Egert & Phelps, 2020; Martínez et al., 2022), ensuring that the video game format promotes immersion and interactivity in learning while meeting educational objectives (Sasupilli et al., 2019).

Based on these findings, FABLE emerges as a ludic-pedagogical model consisting of four layers: one ludic, one pedagogical, and two mixed. This framework aims to take a first step in understanding serious game design, aligning with advocated approaches by authors such as Ávila-Pesántez et al. (2017). FABLE intends to overcome the shortcomings of game-based learning due to a lack of consensus, laying the foundations for digital learning (De-Lope et al., 2017). Moreover, FABLE underlines the importance of early determination of format, game typology, and target audience to establish the design and development of serious games on a coherent basis and tries to provide teachers and developers with a valuable instrument for designing educational video games. This model aims to provide a framework for designing serious games but does not attempt to be a reference with a 50/50 balance between the ludic and pedagogic dimensions. However, it highlights the importance of incorporating educational elements in the design, a lack that has been detected in most of the models reviewed despite being a demand for some authors (Ahmad, 2019; Lamrani et al., 2019; Natucci & Borges, 2021; Westera, 2019). The approach of FABLE is aligned with other studies that advocate the importance of the pedagogical component. Serious games should be designed with the objective of gamifying the educational process (Martin et al., 2021), always taking as a premise that guaranteeing learning is their primary objective. For this reason, the models and frameworks that serve as a guide for their creation should include the pedagogical dimension in order to be an effective reference when creating quality educational video games (Smith & Bowers, 2019). To achieve this, authors such as Linderöth and Sjöblom (2019) propose a solution to incorporate in the design process people with knowledge of pedagogical content, such as teachers themselves, so that the instructional goals are taken as a starting

point to guide the development process of serious games and fulfill the educational purpose for which they are created.

Furthermore, comparing FABLE with existing models reveals that 71.4% of articles do not incorporate the educational dimension into their models. The most incomplete frameworks often prioritize the “ludic experience” layer while neglecting essential elements like “pedagogical experience” and “evaluation,” resulting in educational incompleteness. Authors such as Natucci and Borges (2021) emphasize the need for a holistic approach in serious game conception, recognizing them as digital games with objectives beyond mere entertainment. While entertainment should be ensured, it is not the primary goal. In summary, as noted by Merino-Cajaraville et al. (2023), these findings highlight the importance of guiding models and achieving a ludic-pedagogical approach, crucial for ensuring learning and knowledge transfer (Gentry et al., 2019) within an immersive and interactive gaming experience.

In conclusion, over the last decade, researchers and theorists have tried to contribute to the growth of serious games as tools for digital learning, providing theoretical foundations with different approaches. However, this study reveals a lack of consensus on what constitutes an adequate guide for creating serious games, despite the availability of various models. Moreover, the results show a decompensation between the ludic and pedagogical elements of the selected models, lending themselves as incomplete references to support the design of educational video games. In response to these findings, FABLE is created as a framework addressing the detected shortcomings. FABLE strives to achieve a ludic-pedagogical approach, ensuring learning while leveraging the immersive format’s benefits. It also underlines the importance of determining aspects such as format and audience at an early stage. Therefore, FABLE emerges as a more comprehensive model than those evaluated, to take a first step in understanding serious game design.

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### Conflict of Interests

The authors declare no conflict of interests.

### Data Availability

The data presented in this study are available on request from the corresponding author.

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