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Engaging digital mini-games for learning as frontiers of traditional gamification. A pedagogical semio-aesthetics perspective.

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Abstract: Digital gamification is currently undergoing a significant transformation, moving beyond traditional elements such as points, badges, leaderboards, levels, and multiple-choice tests toward more complex and engaging narrative micro-games. Platforms such as Kahoot! and Genially increasingly integrate features that enrich conventional gamified activities with virtual environments, escape rooms, coding games, and retro-inspired gameplay. This paper investigates these emerging forms of gamification through a semio-pedagogical perspective, combining the MDA (Mechanics, Dynamics, Aesthetics) framework, the structural vs content gamification distinction by Karl M. Kapp and selected semiotic concepts developed by Gérard Genette. Particular attention is devoted to the aesthetic dimension, where narration emerges as a key element of engagement. The thesis of this study is that new forms of micro-storytelling and micro-drama transform the traditional gamified structure into a more personalized and participatory experience, positioning students as active agents in the development of the narrative, thus allowing richer aesthetic experiences. The concepts of palimpsest and paratext further illuminate how these games simultaneously evoke previous videogame experiences and function as engaging extensions of traditional gamification. The analysis suggests that this emerging mini-storytelling represents a promising direction for future pedagogical game design and empirical research.

Keywords: gamification; mini-game; semio-aestetic; digital education; videogame

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1. Introduction

Gamification has been defined in the literature as ”the use of game design elements in non-game contexts” (Deterding et al., 2011, p.10) or, more extensively, as the use of “game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems” (Kapp, 2012, p.10). In practice, gamification has been mostly characterized as the introduction of game-like elements, such as points, badges, and leaderboards, to non-game tasks. The traditional digital gamification is going through an historical shift in direction of innovative and engaging narrative mini-games based on a brand-new video-ludic aesthetics and game design.

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In this study, we will use the term "mini-game" to refer to either a mechanic that is employed in a wider game including them (Dunwell et al., 2016) and/or an element that is incorporated in an overarching game (Xiao, 2023). Despite the vagueness of the definition employed, this reflects the common use of the term in the game design literature, whereas its academic use is less clearly defined, to the point that sometimes "mini-game" or "minigame" is employed to refer to any short game with simple rules (Illanas et al., 2008). On the other end, we choose not to use the term micro-game which more clearly defines a short, but self-contained game experience (Rahmadi et al., 2021).

If we see the modern history of the gamification, starting from the new millennium (Pandey, 2017), the gamification started with a profound boundary to the structure of the quiz. This happened because the digital gamification in some way inherited the digital model of the first gamification elements of the first e-learning platform of Plato (Programmed Logic for Automated Teaching Operations) a project that started in University of Illinois by Donald Bitzer. The Plato project (Cope & Kalantzis, 2023) indeed in '60 introduced for the first time a sort of pro-gamification in the learning with some Multiple choice text linked to the distance education.

This schematic Multiple choice text as milestone and as core of the gamification was crucial during the spread of gamification starting from about 2008, when gamification began to spread. This model was linked to a model of gamification based on the "hedonic" (Oluwajana et al., 2019) form of gamification that leverages the physical pleasure stimulation.

Indeed, the gamification, in recent times, is just going beyond the classic elements of the gamification, that marked the first 20 years of its history, such as badges, points, time challenges, leaderboards, levels, progress bars and immediate feedback. This still represents the majority of gamification strategies (Pelizzari, 2023). However, in recent months we are observing the spreading of a new type of mini-games within the most used gamification platforms.

The traditional gamification platforms, as Kahoot! or Genially, are being enriched with newer and more complex functions that present an unusual way to engage students and that feature new substantial characteristics. For the rest of this study, we will examine the topic focusing on two mini-games added on these two platforms: Kahootopia and Escape Rooms, respectively.

The most emblematic example of this new typology of didactics videogames, inserted into traditional gamification platforms, is Kahootopia, a new gamified tool added in 2024 in the Kahoot! gamespace. This new app consists of a virtual reality space of a tropical isle that is initially kept empty but can subsequently be built upon by the students (Figure 1).

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Figure 1. A typical Kahootopia island. Source: https://support.kahoot.com

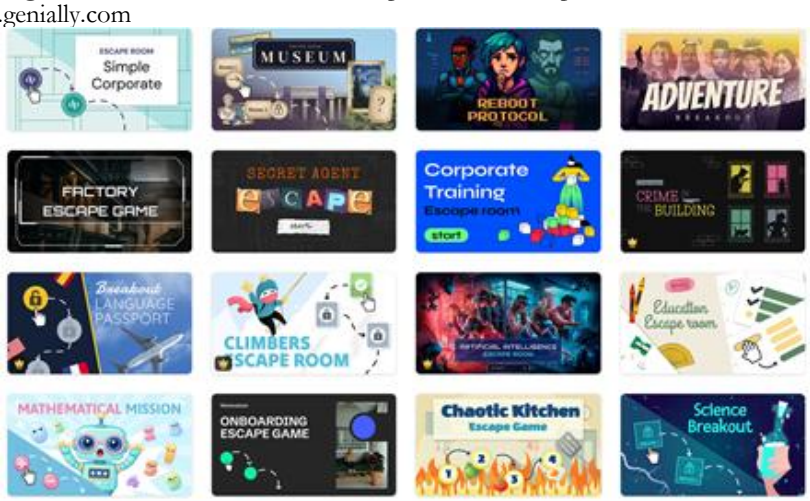


A virtual classroom can enrich it with lots of building structures, using the points they have gained by completing the classic Kahoot! multiple choice text sessions. Kahootopia, a sort of "virtual utopia" of gamification, is a form of virtual space co-building that allows a personalization of the island according to the preferences of the classroom.

Kahootopia is the most famous but not the only mini-game that has been gradually added to the base Kahoot architecture. Other examples are Kahoot! micro-games for coding or for language learning with minimalistic graphics and a simple game design logic, that evoke some virtual management videogames such as Age of empires or Caesar III.

Another example are the escape rooms from Genially. Genially is a tool for the creation and sharing of user-created educational micro-games, from classic quizzes to matching; recently, the option to create escape rooms, starting from templates that evoke the first 2 dimensions '90 videogame style, and accompany the classical multiple choice text of the platform, has been added to the available tools (Figure 2).

Figure 2. A Selection of Escape Room templates available on Genially. Source: www.genially.com



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An escape room is "an interactive game in the real or virtual world where a group solves various puzzles and challenges, experiencing a scenario with a clear objective" (Neubig, 2024, p.1). Currently, most escape games no longer involve an escape scenario (*ibid.*), but may include virtually any set of gamified challenges that are thematically or conceptually linked through an overarching narrative. Within the Escape Room template, users in Genially can link together different challenges within a common narrative frame. For instance, in a museum-themed escape rooms, players might be asked to piece together fragments of a painting (jigsaw puzzle), then in a following room to find clues on a painting so solve a riddle, and so on.

2. The semiopedagogical perspective

An analysis of these mini-games from a semio-pedagogical perspective could shed light on the most important engaging elements and on their fashion.

In particular it could be useful a perspective based on the MDA (Mechanics, Dynamics, Aesthetics) framework by Hunicke et al. (2004) crossed with a semiotic point of view to go into detail of the engaging elements of this type of micro-games.

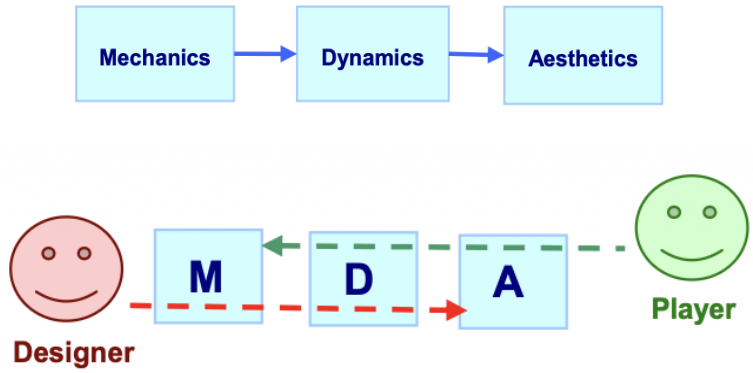
The MDA framework analyzes the game through three components: Mechanics, Dynamics and Aesthetic (Figure 3). In this context, particularly interesting for an analysis of the engagement, is the Aesthetics level, because it answers the question «What makes a game "fun"?» presenting a taxonomy of the Aesthetic elements of the game. So, analyzing these micro-games by this level, a new element emerges that was almost absent in the classical digital gamification: the "narration", or "Games as drama" one of the eight elements of Aestethic pleasure identified by the researchers (Hunicke et al., 2004).

The insertion of the micro-narration as micro-drama or micro-storytelling in a previous most structured architecture based on multiple choice text (MCTs) is a key engaging element. These mini-games represent a form of mini-narrativization of the base game design.

This storytelling is particularly engaging because it is strictly connected with the gamified experience and puts at the center of the narrative development the student-gamer. Actually, these mini-games are a form of ergodic literature: a form of narration where the evolution of the diegesis is linked to the personal choice of the video-gamers. This type of game design, far from the rigid structures of the traditional digital gamification, corresponds to the pedagogical principle of personalization of the learning and of a co-building of a shared knowledge.

So these video games are linked to another aesthetic level of the MDA: Expression, that is to say "Game as self-discovery". The choice of a particular one allows one to discover the own preferences and, in the same way it happens in literature, to explore the most intimate dimensions.

Figure 3. The MDA model and the perspectives of designer and player (from Hunicke et al., 2004, p. 2).



3. Structural and content gamification in Kahootopia! And Genially escape rooms

The MDA framework, although conceived for game design and not gamification specifically, allows to identify the potential sources of aesthetic pleasure that mini-games allow. Another way to frame these innovations uses the concepts of structural and content gamification introduced by Karl M. Kapp.

In a post originally appeared on the researcher's website, content gamification is defined as "the application of game elements and game thinking to alter content to make it more game-like. For example, adding story elements to a compliance course or starting a course with a challenge instead of a list of objectives are both methods of content gamification" (Kapp, 2013). The original Kahoot! Is a straightforward example of content gamification: a classic educational task, multiple-choice test, is transformed into a real-time quiz challenge, including options for individual or group competition, time-based pressure and feedback (sound, lights, feedback, awards). The Kahoot! Platforms provides the gamified settings, whereas educational content is provided by the teacher/educator, thus allowing personalization of content and the possibility of choosing from an expanding library of user-generated quizzes. Other applications, including Wayground (formerly Quizziz) and Blooket, provide variations to this architecture.

A limitation of the original Kahoot! is that it did not provide an opportunity to link single quizzes into a sustained narration: each game was an independent, self-contained experience. The innovation introduced through Kahootopia! is the integration of these experiences within a larger gamified structure.

In Kapp's words, structural gamification "is the application of game-elements to propel a learner through content with no alteration or changes to the content itself. The content does not become game-like, only the structure around the content. […] An example would be a learner gaining points within a course for watching a video or completing an assignment where the assignment or video had no game elements associate with them other than the fact that the learner received points for watching

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the video or completing the assignment." (Kapp, 2013). Structural gamification is the kind of gamification usually associated with the use of points, badges, achievements and levels. The islands of Kahootopia! can be defined a form of structural gamification, as they provide a set of achievements to encourage repeated play, without altering the single quiz experience. Kapp's definition further clarifies the typical elements of structural gamification that we recognize in Kahootopia!: "This type of gamification also typically has a leaderboard and methods of tracking learning progress (…) as well as a social component where learners can share accomplishments with other learners and share what they have achieved. Although, it is possible to add elements of story, characters and other game elements to structural gamification the content does not change to become game-like" (Kapp, 2013). Kahootopia! does not transform the learning content of a Kahoot! challenge, but provides an overarching narrative structure to link individual challenges in a larger framework, centered around the development and embellishment of the island. Other structural elements that we identify include the possibility to share the island with others and compare it with other classes (a leaderboard of sorts). A particularly interesting feature is the "Time Machine", which creates a sort of time-lapse of the island growth; this allows the creation of a personal narrative centered around the results achieved in time, with the likely aim of developing a sense of ownership in participants.
Thus, through the categories of content and structural gamification, we can interpret what Kahootopia! adds in terms of motivation and engagement to the base Kahoot! Experience; by adding an overarching narrative layer centered on rewarding sustained play and encouraging the socialization of the results achieved through time, further motivational value is added to the original gamified experience.
Escape rooms in Genially provide another example of effective combination of structural and content gamification, with the added benefit of giving the user the possibility to personalize the overarching narrative.
In Genially, escape rooms act functionally as a set of webpages, or slides, which can host simple minigames such as puzzles, item rearrangement through drag-and-drop mechanics, etc. This simple template allows designers to connect both narratively and conceptually different tasks: for answering a riddle on one slide may give the combination to open a safe on a subsequent slide, sustaining simple forms of non-linear exploration which provide game-like agency to players – for instance, exploring different locations to find clues for solving an investigation. In this case, structural gamification provided by the escape room narrative aims to reinforce the player's commitment in the gamified content (the minigames) by offering an opportunity to contextualize the activity.

4. The semiotic analysis

The aesthetic expression level could be linked to another engaging aspect of these mini-games: the nostalgia effect that pushes many gamers to remember the past fondly.

In addition to the narrativization element it is particularly interesting that these games, explicitly or implicitly, are able to engage the user leveraging the nostalgic storytelling effect.

These games in a certain way invite to (re)discover the atmosphere of '90 that above all adult students have lived and that reconnect with the infancy or teen-ager

lifetimes. So, the emotional factor becomes a strong engaging element of these games.

Most of these new gamification mini-games are a sort of retro-games that evokes the videogaming console of '80 and '90. The engaging aesthetic leverages the fashion elements of the '80 and '90 gaming, that in the collective imagination recall a sort of golden age not only of the videogaming industry but more in general of a more emotive age, where the digital world was less invasive than today.

Sometimes the mini-games are inspired by old famous characters of the last decades of the past century, as for instance the "camp Snoopy" Kahoot! mini-game.

Particularly interesting for a deeper analysis of the aesthetics of these games are the semiotic concepts by the Gerarde Genette, of "palimpsest", whose etymology comes from ancient Greek of "palin" y "psao", "scraped a second time" and indicates a particular type of manuscript. The term indicates a "parchment from which earlier writing has been removed to clear it for new writing" and where it can be read the new writing as well the previous. In the field of philology, the palimpsest has enabled the recovery of many texts considered lost through the reading of the writing marks.

So, this philological metaphor mostly used for literature (whose nature is based on frequent literary allusions), could be used also to go into detail of the aesthetic of these mini-games because they usually allude to other previous games or characters.

From a pedagogical point of view the new writing is just the desire to join the engaging to a learning purpose.

As regards the MDA level of Dynamics, that is to say the game dynamics, another Genettian concept appears crucial for an analysis of these mini-games: the paratext. The paratext is what is around the main text. These mini-games are a sort of "engaging paratext" of the main Multiple choice text gamified structure. They are not the current core of gamification platforms but are used to amplify the engagement with more sophisticated tools and gameplay and to expand the target of the gamified project. But, depending on the evolution of the game market, these mini-games could switch in the future from a paratextual dynamic within the digital platform to a more central role in the event that they met with particular success among the public.

With regards to the last MDA framework level that one of the Mechanics, these mini-videogame, beyond the huge difference of every app, leverage a simplified gameplay. Also in the mechanics they are a sort of palimpsest because their game mechanics follows the model of universally known games of the past as Pacman or arcade games.

5. Discussion

In this study, we examined emerging form of narrative gamification in the space of digital education, focusing on the cases of Kahootopia and Genially Escape Rooms. We used different lenses, pertaining to semiotic analysis through a Genetian perspective, to gamification studies through Kapp's structural and content gamification distinction, and to game design studies through the MDA framework. Emerging forms of narrative gamification enrich the basic gamified mini-games of Kahoot and Genially by adding new layers to player experience that draft upon different forms of engagement (Table 1).

Table 1. The different layers of player experience provided by the mini-games examined in the study.

	Type of gamification	Main Genettian categories	MDA Aesthetics
Kahoot!	Content	Palimpsest	Challenge
Kahootopia	Content Structural	Palimpsest Paratext	Challenge Narrative Fellowship Expression
Genially games	Content	Palimpsest	Challenge
Genially escape rooms	Content Structural	Palimpsest Paratext	Challenge Narrative Fantasy Discovery

Why adding narrative structure to digital gamification, then? Kahootopia makes individual quizzing challenges part of a greater story, one that draws on players' opportunity for self-expression in the form of personalizing and showcasing their own classroom island; this could enhance motivation towards the task by creating a shared memory of the players' effort and achievements. Genially escape rooms similarly provide context to individual activities; this might help players attribute meaning to the gamified content beyond their instrumental learning function, generating a more memorable and goal-oriented experience.

Despite the similarities between the two cases examined in the study, it should be noted that there is a difference in the use of narrative elements. To this aim, we can refer to Kapp's (2012) interpretation of the concepts of intrinsic and extrinsic fantasy originally defined by Thomas Malone (Malone, 1981). According to Kapp, extrinsic fantasy "allows the learner to work toward some external fantasy like winning a digital game show or to avoid some external catastrophe (and) depend only weakly on the skill used in a game" (Kapp, 2012, p. 56), while intrinsic fantasies "are intimately related to the use of the skill (...) problems are presented in terms of the elements of the fantasy world and players receive a natural kind of constructive feedback". (*ibid.*). It can be argued that Kahootopia islands are a form of extrinsic fantasy, whereas the construction of the narrative is almost independent of the players' skill in solving the individual quizzes. Although player's performance is rewarded in the form of creating and improving buildings on the island, this reward is only loosely related on the content of the challenge; Kahootopia rewards the performance on a disciplinary basis, rather than being specifically related to the content or topic: a quiz on the structure of the eucaryotic cell or on the function of the cerebral cortex, contribute equally towards upgrading the "Biology" building. Thus, progression revolves around sustained play rather than reflecting the skills and specific knowledge displayed by the players. On the other hand, the narrative in Genially escape room can be extrinsic (if the narrative elements are purely used as a frame and individual minigames are unrelated from each other) or intrinsic (if the overarching narrative is used to help the solution of the mini-games, for instance

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giving clues for solving the challenges or helping in connecting conceptually the challenges). Kapp, in continuity with Malone, argues that "in general, intrinsic fantasies are both more interesting and more instructional than extrinsic fantasies. The cognitive advantages of using fantasy are that the metaphors or analogies of the kind provided by intrinsic fantasies can often help a learner apply old knowledge in understanding new things." (*ibid.*). Thus, while both Kahootopia and Genially escape room offer narrative incentive to enhance the gamified experience, the first does so by simply adding an external layer, or structure, to the standard Kahoot! Experience, whereas the escape room template can potentially link content and structure gamification for a more cohesive and potentially richer gamified learning experience. However, the strength, and thus potential effectiveness, of the link depends entirely on the designer of the escape room, who requires specific game design skills not only to design the individual challenges but also a coherent narrative (Andreoletti et al., 2024).

To summarize, integrating structural narrative elements to gamified content is a promising frontier in digital education, as further layers are added that can enhance the aesthetic experience of the activities, potentially leading gamification away from the motivational limitations of a pointsification-oriented approach (Hellberg & Moll, 2023). That being said, not all narrative structures are the same; where the islands of Kahootopia offer a ready-made narrative frame that innovates on traditional gamification features (points and leaderboards), Genially escape rooms provide the opportunities for intrinsically driven fantasy, at the cost of increasing the requirement in terms of the designer's game design skills. It should be noted that the aim of this study was to identify and discuss narrative gamification in digital education and the analytical lenses through which they can be interpreted. Thus, we decided to focus on two relevant case studies, which however represent only a fraction of the digital gamification tools available to teachers and educators worldwide. Future research should expand this analysis; for instance, it could be interesting to compare escape rooms with extrinsic vs intrinsic narrative to ascertain the potential difference in learning, engagement and motivational effectiveness; this would in turn provide practical tools and guidelines to build effective digital educational experience able to leverage the untapped potential of gamification.

6. Conclusions

This study examined an emerging trend in digital gamification: the integration of narrative mini-games within platforms traditionally built on points, leaderboards and multiple-choice tests. Through the cases of Kahootopia and Genially escape rooms, we combined three analytical lenses: the MDA framework, Kapp's distinction between structural and content gamification, and Genette's concepts of palimpsest and paratext. The analysis suggests that narrative mini-games enrich the player's experience, being able to add new aesthetic elements to the challenge offered by the original quizzes (Table 1). In semiotic terms, they act as engaging paratexts surrounding the main quiz activity, and as palimpsests that rework familiar videogame aesthetics and mechanics. However, the implementation of narrative gamified elements can differ significantly. In Kahootopia, the story is an extrinsic layer, largely independent of the knowledge exercised in the quizzes. In Genially escape rooms, narrative can become intrinsic to the challenges, but only when the designer is able to connect story and content.

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This multi-perspective analysis of digital gamified apps could be considered a first step for further studies to develop a specific framework for the pedagogical game design or practical use of these mini-games, and also for empiric experimentation in concrete learning environment or specific settings with the objecting to verify the effective learning potential.

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