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Chapter

From Gamification to Serious Games: Reinventing Learning Processes

Cirit Mateus De Oro, Daladier Jabba Molinares,
Ana María Erazo Coronado and Rodrigo M. Campis Carrillo

Abstract

Virtual games represent one of the most important contemporary possibilities to enhance learning processes in educational environments. There is ample evidence of their applications in teaching cultural aspects, citizenship, science, and the development of critical thinking, among many others. However, despite the scientific support, many questions arise about the effectiveness of gamification in education. Most studies and reviews of empirical studies on gamification indicate that they generally have a positive effect on motivation, concentration, and other cognitive aspects, as well as on interaction and prosocial behavior. However, there are gaps in terms of purposes and outcomes between gamification and the application of serious games. This is a review aimed at elucidating these differences, to argue for the reinvention of educational processes.

1. Introduction

According to AlMarshedi et al. [1] the term *gamification* refers to the use of game development elements and mechanisms in non-game environments. This derives in several streams, among them, edutainment, and serious games. As for edutainment, AlMarshedi suggests that it is primarily a motivational tool that combines the principles of engagement, reward, and incentive. The use of this tool encourages changes in behavior through play, motivating users to learn new skills or increase their participation. This generates possibilities of behavioral change and capabilities, accompanied by the element of enjoyment it brings. It is in this way that gamification can help to achieve predetermined objectives.

In the twentieth century, J. Piaget, and L. Vigotsky started the trend of highlighting the importance of games in human learning and in personal cognitive development. Since then and from the development of their theoretical elaborations, it is understood that learning based on play is concerned with investigating the forms of interaction between play and learning. This produced a way of conceptualizing education that

today has a long tradition. However, what those authors could not foresee is the enormous incidence that the vertiginous development of technology has today in every aspect of human life, including education.

Framed in the Internet era, a space of convergence between education, digitality and games arises, giving way to edutainment. According to Shaffer et al. [2] this is described as a type of game with defined learning outcomes. In this context, games present clear objectives that are divided into achievable short-term goals. They give a seamless sense of player progression, providing frequent rewards that act as external motivators.

In addition to motivation, video games provide a fictional context in the form of narratives, graphics and music that foster players' interest [3]. Due to the improvement of the supporting technology, this interest is furthermore growing for the individual and extends to wider and wider population groups. Because of this potential, a great deal of work has been done on ways in which video games can be successfully used for educational purposes.

According to Mejía and Londoño [4] virtual games represent one of the most important possibilities for learning processes in children and adolescents. They warn that these games can be applied in fields such as the teaching of culture, citizenship, and social sciences, among others. Despite these findings, questions arise about the effectiveness of gamification in education. Most studies and reviews of empirical studies on gamification indicate that they generally have positive effect on motivation and behavior [5–8].

In gamification, it is generally observed that there is a greater possibility of engagement and ability to connect with intrinsic motivation. This simultaneously favors the production of cognitive, emotional and social benefits [9–11].

On the other hand, Connolly [12] presents a systematic review of the literature on game-based learning, focusing on the attainment of empirical evidence. In his results, he emphasizes the need for more rigorous evidence of the effectiveness of games and their real impact. This implies a significant questioning of the results and conclusions of previous research on the subject based on the questioning of instruments and techniques of data collection and analysis.

On this situation, it is illustrative the appreciation of Jagušt et al. [13] in which they state that:

> *Despite the growing popularity of gamification in educational contexts, there is a paucity of empirical evidence investigating under what conditions and how gamification works or fails. A review of existing research shows that the impact of gamification is often assessed through self-reported measures relating to an individual's perceptions and attitudes through survey instruments (p. 446).*

Beyond the above, some educational researchers observe this type of entertainment with great interest. De-Marcos et al. [14] asserts that video games are interactive activities that continuously provide challenges and objectives to players. This implies an intentional learning process to acquire progressive mastery of the game mechanics. In the same sense Busch et al. [15] present the results of their experiment. In this experiment, the researchers used games from a web platform for an e-learning experience—gamified—and evaluated it. Their findings suggest that the platform serves as a collaborative database where students could create and answer questions, using it as an alternative way to study and review geography and mathematics topics, among other content.

Thus, it is difficult to judge definitively the positive, negative, or neutral nature of the inclusion of games in educational environments. However, it would seem that research findings are pragmatically divided into two large groups: the first, broad, which usually concludes that games are effective and the second, composed of those who attribute to flaws in the game design and not to the platform itself when the results of the edutainment application are not as expected [5–8].

Despite these discussions, the educational field is not exempt from the use of video games and in Latin America in particular, the approach to this issue refers to figures of recognized trajectory in the field of communication. In this sense, Orozco et al. [16] argue that the playful part of learning leads to inadvertent learning. They argue that children obtain them from video games, for example, when they are able to remember sequences in the controls, passwords and tricks that allow them to improve their skills or eliminate obstacles in the video game. In other words, even though these games are not intended to educate, they end up doing so.

This way of educating by playing also produces *relearning,* which is understood by Orozco as "creative and useful extensions of unnoticed learning that are produced consciously and deliberately with the aim of expanding the educational process of video gamers" (p. 11). However, superimposing edutainment on education requires a complex study of the intervening variables and their characteristics. That is why this proposal, although important, requires an experimental work that also allows a wide control of variables to obtain reliable results.

In this sense of control of variables, Scolari's [17] conceptualization of some characteristics of edutainment or gamification deserves special attention. In his opinion, these characteristics are fundamental and refer to digitalization, hypertextuality, reticularity, interactivity, and multimediality, to which he then adds virtuality, non-sequentiality and modularity. To these can be added the principle of multiplicity described by Calvino [18]. This approach is consistent with the fact that these processes have "a *fractal-like*, network-like mode of organization, that is, where all connections are revealed as constituent parts of the network, in an indefinite way" (p. 25). Consequently, the various formats make possible the hypertextual chain made up of images, sounds, messages and other digital forms.

This perspective implies the transformation of human thought. This leaves behind univocal explanations, closed models and the great truths consigned in books. From this perspective, knowledge is built from the fragment to the complexity and vice versa, but without a linear order. Thus, knowledge is constituted as a network that is woven in each of the *turns* or appearance of each fragment. In turn, each fragment or piece gradually configures a relatively complete image. This conception breaks with the idea of a traditional program or curriculum, basing the possibility of human learning on the bond with others. This finally invites us to think of communication as a mediator for learning.

2. Edutainment

According to the theoretical review, edutainment implies the design of new educational environments, duly articulated to some objectives and the tools offered by communication to promote the integration of knowledge, dialog, interaction and cognitive development of students. Therefore, it is necessary to adjust the conceptualization inherent to the traditional educational environment, including the notion of *authority*.

In this order of ideas, the characteristics of the new media and of the current forms of interaction between agents tend to eliminate verticality in the relations between these agents (educational community). In the same way, it cannot continue in the blind acceptance of the book and the teacher as the only legitimizing sources of truth and knowledge [19]. Therefore, instead of incorporating technology into traditional pedagogical processes in a vague and disjointed manner, we should promote a pedagogy that broadens the univocal vision of its functioning. This is achieved when a dialogical perspective is assumed to generate new forms of encounter with society and culture within the framework of the contemporary context, that is, between screens.

It is clear that the full and articulated incorporation of screens, games and, in general, the bet of edutainment in educational institutions, is a major challenge for contemporary educators. However, success in this task surely allows for new ways of accessing and generating information and knowledge. Edutainment makes educational events more flexible, transforms, changes perspectives, and extends the scope of educational events. In short, it promotes the search for new alternatives in a series of variables and dimensions of the educational act.

This leads to the delocalization of knowledge for the use of different communication tools and for the interaction with different types of codes and symbolic systems. As the most important achievement, edutainment also leads to the choice of the formative itinerary, of strategies and techniques for training and to the convergence that favors access to multiple sources of information. Finally, with this form of screen incorporation, different forms of content, but also of human relations, are complexified and articulated.

Precisely, the incidence of this tool in social interaction forces us to proceed with caution. Buckley and Doyle [20] suggest that the research carried out so far on the effectiveness of edutainment in an educational context should be assumed with prudent caution rather than with absolute optimism. To this end, more and more comprehensive research is required to examine the variables involved in the educational process and the context in which it takes place; learning styles or personality traits, for example, are part of these variables. Their consideration is important because sometimes success can be mistakenly attributed to an edutainment strategy that can be better explained in terms of these variables.

In summary, more research is needed, but especially longitudinal research. With this, it is possible to demonstrate with empirical evidence the relationship between the use of the tool and the behavior generated during the game in students to make valid inferences [16, 20]. It is equally important to clarify that edutainment does not get to build an experience through mechanisms based on theoretical frameworks. It uses aspects of play mechanisms to mediate an activity. It may include motivation or competition (which are game mechanisms), but it does not go so far as to include mechanisms based on social theories in an intentional or specific way.

3. Edutainment, emotion, and learning

According to González and Blanco [21], emotions can have a positive or negative influence on learning and, above all, on the motivation to learn. Whether or not a student feels motivated to learn something is one of the keys to autonomous learning. In a similar vein, Domínguez et al. [22] insist that it is necessary to focus on the fundamental elements that make games attractive in order to create an edutainment

system that increases student motivation. In the same sense, although for them the reward system is not the only element, it is highly significant.

At this point, the issue that calls is the emotional aspect and the impact that this aspect would have on the tendency to do or repeat something. On this issue.

Csikszentmihalyi [23] highlights that the fact of experiencing the notion of success depends on the ability to concentrate on something. This concentration must be sufficiently intense to lead the individual to abstract from himself and the situation he is living. In this state and in the same sense, this sensation is accompanied by another of clarity in relation to what one would like to do next, due to the immediate feedback offered by the experience itself. All of this is framed in the full conviction of how possible it is to accomplish the task, even if it might be difficult or arduous. When players set out to accomplish the goal that the tasks entail, the natural tendency is to stay with the activity with a high attitude and positive emotional response.

Games also tend to incorporate reward systems that promote and enhance positive attitudes and emotions, giving immediate recognition to the player's success. It is usual to use reward systems for points, trophies or items that can be acquired for the development of more complex tasks within the same game. Similarly, in the opposite case, that is, when a task is not successfully completed, the player is expected to experience some anxiety.

A certain degree of anxiety is acceptable, but it should be avoided as much as possible to turn it into frustration, as this could lead to abandonment of the game. To avoid this, it is preferable to design the sequence of tasks to suit the skills of the player at any level. It is also advisable that the penalty for each failure be significant enough to be recorded, but also low enough to ensure repeated attempts to complete the tasks. If this transition between failures and successes occurs in a balanced way it is very likely that the player will acquire a level of performance that is, in itself, highly motivating and promotes a balance in emotional tension.

Van Roy and Zaman [24] measured the effects on emotions and motivation of games. They analyzed a 15-week university master's course in which students interacted voluntarily with a gamified platform. Their results highlight a potential for ambivalent motivation toward the game elements incorporated into the platform. In some cases, they enhanced feelings of autonomy, competence and relatedness. In other cases, frustration was a priority.

As a derivation of the study, the authors suggest that this ambivalent motivation depends directly on some situational factors that play an important role in this process. Finally, it can be concluded that there are several factors involved in the positive or negative emotional impact of the use of gamification. Some are intrinsic, that is, they depend on the subjects who participate in the game (personality, emotional stability, etc.).

Others depend on the structure of the game, the relationships that are established with peers, the mediation of the teacher and even the culture and the way in which social ties have been woven in each human group participating in the process.

4. Edutainment and human interaction

Screens have transformed human relationships, but in relation to human interaction, what good has it done? For Petrucco and Agostini [25] the measuring stick is essentially that of Vygotsky. According to her, humans learn from our surrounding world through instruments and artifacts that increase the zone of proximal

development. Screens are, of course, part of these instruments and can—perhaps should—be linked to the very design of educational environments as something more than a simple medium. This implies the possibility of constructing spaces for learning or knowledge construction that are based in an important way on social interaction.

This appreciation is theoretically sustained in the formulation of the genetic law of cultural development proposed by Vygotsky [26] where he assures that:

> *Every function in the cultural development of the child appears on the scene twice, on two planes: first on the social plane and then on the psychological plane, at first among men as an interpsychic category and then within the child as an intrapsychic category (p.94).*

Taking this assertion to the field of the development of educational events, this law leads to the acceptance, as a principle, that all higher functions of human intelligence originate from relationships between human beings. The medium for this interaction is based on language. This means that the dialog, the collaborative workspace, and the interpellation to the other propitiates the introjection and consequently the learning.

Monereo [27] argues that the intrapsychological mental scenario should also be treated as a space of dialog, that is, as an interpsychological space. This space arises in games, be it in the manner of an opponent, a playmate, team, etc. Caillois [28] proposed that, no matter how antigregarious a game or the devices used, a competitor or opponent is required. Thus, from the social aspect, the game institutes a link between subjects. Competition, the exploration of tactics and the tension that this generates are present in social actions as part of a culture that seeks to establish relations of interaction with the other.

A derivation of this social condition consequently refers to the issue of collective performance. According to Jenkins et al. [29] this makes it necessary to explore the culture of convergence. In this conceptual framework, the concepts of collective participation and collective intelligence are articulated. Convergence is defined by Jenkins et al. [29] as the space where the old and the new converge. In this space, different content and different media platforms mix, where technological transformations with their concerning cultural and social consequences follow one another. They include subjects who search for information and make connections between different content spread across networks and media platforms. Jenkins et al. [29] also propose that in participation producers and consumers converge, transforming the passive role of the media spectator. Thus, participation-mediated convergence occurs in the brains of individual consumers and through their social interactions with others.

On the other hand, it is convenient to incorporate at this point the definition of collective intelligence by Lévy [30] who identifies it "not as the fusion of individual intelligences, in a kind of indistinct magma, collective intelligence is a process of growth, differentiation and mutual reactivation of singularities. It constitutes for the collective a new mode of identification" (p. 35). Later, the same Levy assures that it is "the mutual valuation and impulse of the particularities of each one" ([31], p. 103).

Currently, management proposals based on collective intelligence (CI), have as key factors interaction, interactive learning, distributed collaboration, and the valorization of knowledge in all its dimensions [32]. All of the above leads to ensure that convergence in participation occurs in individuals through their social interactions with others. The consumer of information resignifies it from his own cognition and subjectivity and returns a construction that enters to conjugate with that of others. The result is an

interaction of knowledge that structures a new form of social relationship, mediated by technological support. It allows the navigation between knowledge, because it constitutes the formalization of the "ideal of scientists, artists, entrepreneurs or network activists who want to improve the collaboration between people, who explore and make live different types of collective and distributive intelligence" ([31], p.8).

An example of this type of collective construction is crowdsourcing, a term that according to Uhlmann et al. [33] was coined by Howe [34]. Crowdsourcing refers to a random open call, to find among amateurs the proposal or solution to a certain problem, focusing on collective intelligence. Based on these concepts and on the vertiginous development of digital media, edutainment has found multiple ways of creation, reconstruction, transformation, as well as a multiplicity of meanings and interpretation edges. Today, collective or collaborative learning has become a fertile field for the approach of contextual problems and the search for their corresponding solutions.

Likewise, edutainment has begun to become a tool for the achievement not only of learning objectives but also of social transformation.

5. Edutainment and motivation theories

The human predisposition to play games is associated with their motivations for action. In gamification, both motivational options are evident in different forms. Yildirim [35] conducted a study with 97 participants (49 in the experimental group and 48 the control group) and found that gamification-based teaching practices have a positive impact on students' performance, attitudes, and motivation.

One explanation for why games offer a captivating and immersive experience is the flow theory [36]. Flow is assumed to imply "a state of mind characterized by focused and heightened concentration and enjoyment of intrinsically interesting activities." According to Mejía and Londoño [4] games enhance immersion in technological environments, prioritizing audiovisual languages and interactivity between members of a network of contacts, through the flow of information between people focused on the activities of the game. For Esnaola and Levis [37] the characteristics of flow experiences, typical of informal learning in video games, are as follows:

- High levels of concentration, enjoyment, and commitment.

- Immersion or loss of self-consciousness.

- Focused attention.

- Positive feedback.

- Intrinsic motivation.

- Clear ideas about the objective of the activity.

In the framework defined by Chou [38], the set of stimuli and motivations that can be included in a gamification strategy are divided into different types and have different applications depending on the type of desired outcome. Chou's model, called Octalysis, classifies the types of motivations that can be used in edutainment categories (**Figure 1**) [39].
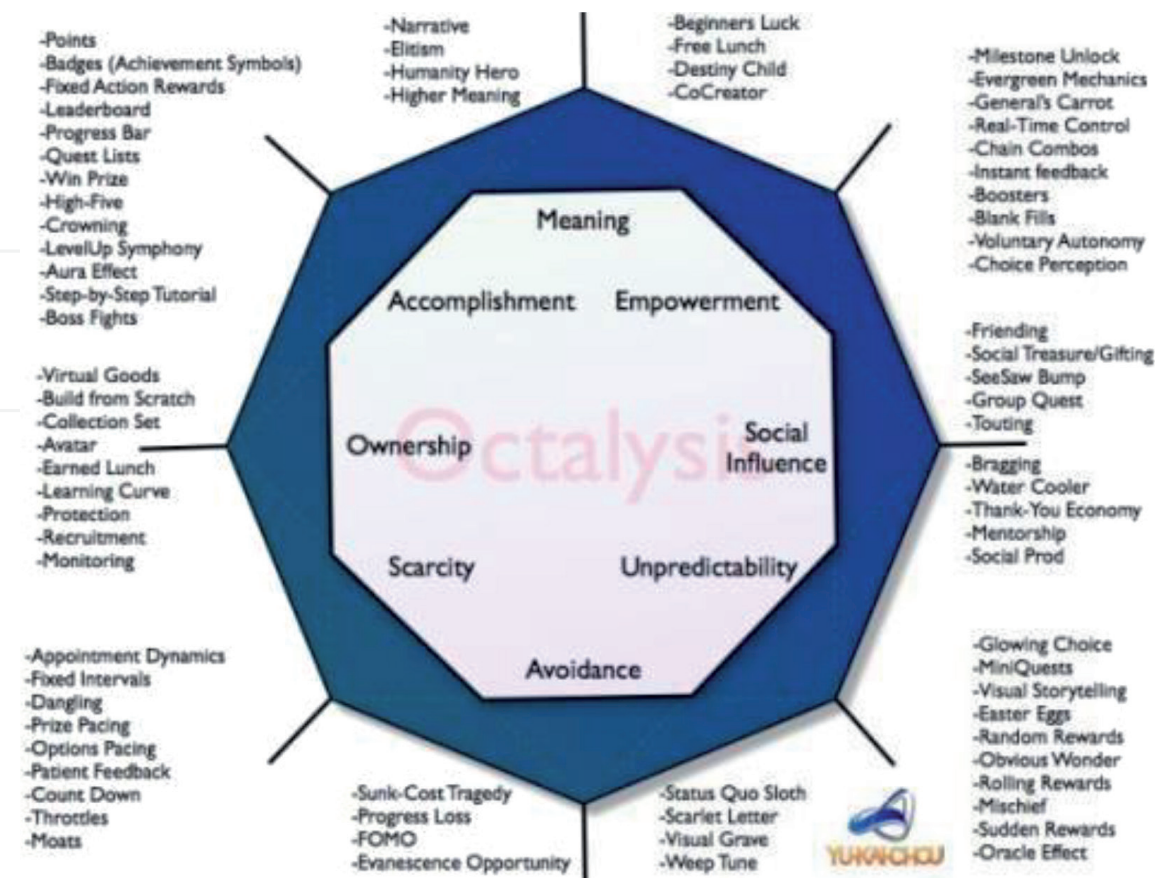
Figure 1.
Octalysis of motivation types. Source: Coronado and Vásquez [39].

Coronado and Vásquez [39] propose that one of the most interesting elements of the model is that motivations can be grouped and divided into positive (white hat gamification) and negative (black hat gamification). An additional reading of the motivations provided by Octalysis is that some of them are intrinsic and others extrinsic: The right side of the octagon (empowerment, social influence, unpredictability and some elements of avoidance and meaning) contains intrinsic motivations related to creativity, expression and social relationships, while the left side (achievement, ownership, scarcity, and some elements of avoidance and meaning) includes motivations associated with calculation, logic and properties, that is, depending on external stimuli.

6. The contribution of persuasion theories and serious games

Generally speaking, information technologies and Internet-enabled technological devices transfer values, nuances, and ideologies to people of diverse cultures, social classes, and ages around the world. This leads to a transformation of characters, folktales, and urban legends that pass-through media filters.

The influence that unfolds over consciousness through the transfer of ideologies in the media can be of such magnitude that many institutions can instill ideas that influence thought and can come to affect human actions. These institutions can refer to large corporations, political apparatuses, states, and the larger ideologies of society. As media logic and discourse influence more experiences, our words become fully mediated [40].

The issue functions in such a way that even if consumers or audiences do not in principle share an ideology or openly object to it, exposure to it can generate future incidences. This is especially so if we are clear that the self is vacillating and manageable and is not a fixed structure. Altheide [40] warns in this regard that the social order is increasingly a mediated order, and any serious attempt to understand contemporary life cannot avoid this fact and its implications. Martín-Barbero [19] predicted this many years ago when he expressed that a mass medium is not a vessel that carries ideas from one place to another, but is itself a subjective, interpretative, and ideological form.

For its part, storytelling is not only a central element of human culture, but it replaces or replaces direct experience as a source of socialization. It has the capacity to engage or provoke a high emotional involvement in the audience and to provoke strong emotional reactions. Finally, it allows incidental learning of attitudes, beliefs, and behaviors [41].

These assumptions are based on the Socio-Cognitive Theory [42, 43]. This theory supports learning processes of new behaviors through the observation of symbolic models. However, it is proven that behaviors are not learned indiscriminately. Motivation and affect, among other factors, are involved in this process. On the other hand, it has been confirmed that the model is not enough to achieve objectives such as the promotion of prosocial behaviors [44].

Igartua [41] describes Slater & Rouner's model, explaining that persuasive messages and edutainment content are not processed in the same way, since the goals and motivations are very different. Thus, compared to a traditional persuasive message (such as an advertisement in an information campaign), a basic motivation or processing goal is to develop correct attitudes for a particular topic. In this context, the level of involvement with the issue addressed by the ad plays a central role in understanding how the persuasive process will occur.

If the message is related to a topic relevant to the person, there will be a systematic, intense and careful processing of their arguments (central route). However, when the message focuses on a topic of low relevance, the individual will not develop such a careful or systematic processing (peripheral route; [41]). Along the same lines, the consumption of narratives exerts significant effects beyond pure entertainment, amusement and affective impact. The above is based on the human capacity to learn by observation, but without own experience.

This implies that a large part of the knowledge that a person acquires throughout his life is not obtained through direct experience, but through the stories he hears, observes, and internalizes. This approach leads to think about the substitution of lived experience and is being widely used in video games. They base their functioning on the mechanism of narrative transport, in the sense that transporting oneself to these experiences involves the subjects both cognitively and emotionally.

Therefore, Wendorf's [45] opinion about the great help that the linking of persuasion theories can mean is relevant. Examples include Petty and Cacioppo's [46].

Elaboration Probability Model or Ajzen and Fishbein's [47]. Theory of Reasoned Action. Likewise, psycho-social models that explain the impact of attitudes on behavioral intention are also good theoretical references. This linkage is so promising that the application of edutainment could be extended to a distant field such as health communication [41].

Entertainment-education-based strategies include messages that are attractive to their audiences, have a strong emotional component and a clear narrative structure, and tend to engage audiences, just like any other commercial entertainment content [44, 48]. From them derives the potential for their use in health communication strategies as well as in education in general.

Slater and Rouner [44], Moyer [48], Igartua [41] and Wendorf [45] converge that motivation and the emotional component are relevant in narrative persuasion. In the opinion of Kreuter et al. [49] narrative persuasion should involve creating coherent stories that should have an identifiable structure in terms of beginning, middle, and end. It should also provide information about a scene, a character, and a particular conflict or situation, raising questions or conflicts and providing the elements that lead subjects to find or construct the solution (p. 778).

However, Moyer-Gusé [48] proposes that for this to happen there must be a kind of balance between fantasy and plausibility. Although narrative persuasion creates a *scene about the scene* (and thereby suspends the enactment of reality), he argues that the scenario presented must be credible and to some extent plausible within existing schemas. This leads to the narrative becoming attractive and thus obtaining the qualitative value that favors the adoption of changes in attitudes and beliefs. This makes it necessary to insist that narrative persuasion bases its effectiveness on the capacity of transportation and identification. This is because, for example, identification reduces counterargument, resistance, fear, and inertia.

According to Green and Brock [50], transportation into a narrative world is a mental process that involves a convergence of attention, imagery, and feelings. This notion of being absorbed in the story is what distinguishes narrative processing from overtly persuasive messages [48]. Slater and Rouner's [44] conducted work with the extended elaborative likelihood model (EELM) and found that:

> *...absorption in the narrative can more deeply motivate a different kind of processing and can lead viewers to adopt attitudes and behaviors promoted in the narrative, while reducing the resistance that can occur when viewers are exposed to overtly persuasive messages (p. 187).*

Igartua and Muñiz [51] conceptualizes the identification with the characters as a mechanism through which the narrative is experienced from within, because an empathic relationship with the protagonists of the narrative is produced. According to Wendorf [45] identification in Extended Elaboration occurs primarily with a key character. It is not imitation and has four distinct dimensions: shared feelings (empathy), shared cognitions (cognition), shared goals (motivation), and absorption (transportation). Through identification with a key character, individuals can enact responses and choices to situations from a position of suspended ideology. Identification with characters is associated with greater cognitive elaboration and developing a reflective process of higher quality or complexity during the viewing of a dramatic feature film among other content [51].

Subjects, identifying with the character, respond from the role to their role, suspending their own thoughts. Transportation is the complete absorption by the narrative of an audience member and allows individuals to temporarily lose themselves. Green and Brock [50] also assume it as a convergent process, but of all mental systems and capacities focus on the events that occur in the narratives.

Wendorf [45] proposes that those involved in narrative persuasion are better able to understand the other's position through distancing themselves. In addition to temporarily losing access to reality, the possibilities for introspection in the choice of roles and the lived experience of those assigned or chosen are increased. According to Wendorf [45], equally important is the homophily or belief that one possesses information, emotions, or cognitions with the character. This experience places subjects in a position of greater susceptibility to attitude changes presented in persuasive narrative content [44].

Other essential concepts are parasocial interaction, originally coined by Horton and Wohl in [52] with the aim of referring to the chimera of reciprocal interaction that audience members felt toward media figures, especially, television at that time. Through such interactions viewers have the feeling that they know the characters or develop the same vicarious type of friendship relationships. This leads them to care about the characters when they go through difficult/compromising situations or to rejoice and express positive emotions at their successes [53].

There are studies that evaluate the role played by parasocial interaction and narrative participation in attitude change. There are also evaluations on the probability of viewer elaboration, attitude change and the probability of behavioral change, among other topics [54–56].

Another intervening factor is the concept of perceived self-efficacy, defined as confidence in one's own ability to achieve the intended outcomes in a given situation [57, 58]. Self-efficacy is considered one of the most important predictors of behavior change in society. In fact, empirical studies explain it as a moderating factor. Van't Riet et al. [59] have also suggested the positive role of self-efficacy in persuasion but including a protective factor (Motivation Theory (PMT) and the Extended Parallel Process Model (EPPM). For Rogers [60], individuals with higher self-efficacy are more likely to accept persuasive narratives than those with lower self-efficacy, who may react defensively, either by ignoring the message or rationalizing negatively.

Worchel and Brehm [61] and Brehm and Brehm [62] propose from this defensive presupposition the psychological reactance theory (PRT). It argues that, when perceived freedom is removed or the individual feels threatened by external factors, he or she will be motivated to restore that freedom. The authors explained that this restoration of freedom refers to restoring individuals' sense of autonomy and self-determination. Subsequent studies have indicated that individuals of higher self-efficacy tend to be more deeply engaged in processing because they are more confident in the recommended behavior and are more motivated to evaluate the advantages and disadvantages of carrying out the recommended behavior.

The structural elements of persuasive storytelling described in the previous paragraphs configure a framework reference for social transformation processes. Therefore, it becomes another framework, this time of converging vectors. Those come together in the commitment to the construction of innovative educational perspectives. In turn, this construction could be display from games platforms, either from gamification used as a learning tool without narrative theoretical foundations or from serious games with the mediation of communication as a fundamental element.

7. Conclusions and discussion

The incorporation of digital games in educational institutions facilitates new ways of accessing, generating, and transmitting information and knowledge. This allows to make flexible, transform, extend and, ultimately, to seek new perspectives of the educational act. Specifically, the effective linking of digital games makes the temporal and spatial contexts more flexible and, along with the interaction and reception of information, among other aspects.

This incorporation also delocalizes knowledge and generates interaction with different types of codes and symbolic systems. At the same time, it leads to the choice of the formative itinerary and of strategies and techniques for training and technological

convergence. Likewise, it favors access to information and its different sources and, of course, flexibility in terms of the roles of the teacher and his or her figure.

The above conclusion is consistent with Eftimova et al. [63]:

> *"The arrival of the new learning methodologies is in response to the reality: new generations should learn in a different way. The so-called "Millennials" are looking for another kind of stimulus. Discussions for modernizing the curriculum include various solutions to retain students' attention and, in order to ensure that teachers learn how to act with a critical attitude, they will be confident and with the developed creative skills that they will need for success in the professional world in the future" (p. 21).*

The review of the different ways of approaching games makes it possible to distinguish between games for learning and serious games. The main differences between them are circumscribed in the management of motivation and fun in the games. Learning games are based on motivation and fun to facilitate educational processes. Serious games, on the other hand, require a particular theoretical foundation on which their structure is built and do not depend on fun, since motivation is handled from theories of persuasion.

Regarding its effectiveness, authors such as Bolyle and Connolly [64], Connolly et al. [12] stated that, despite the increased popularity of game-based learning, there is a lack of empirical evidence to support its validity. However, current scientific research has shown otherwise. The theoretical review found that there are many papers with game platforms that demonstrate the effectiveness of games. Caserman et al. [65] investigated the effectiveness of games based on the following criteria:

Focus on the characterizing goal, clear goals, indispensability of the characterizing goal, correctness of the domain expert content, appropriate feedback on progress, appropriate rewards, proof of effectiveness & sustainable effects, awards, and ratings.

Caserman's results showed that:

> *The effectiveness of serious games should be proven in scientific studies or by winning game awards. Second, high-quality serious games should be fun and enjoyable. They must ensure player engagement and should keep the players in flow (ability vs skills). Finally, the double mission of serious games, that is, the balance between the serious and the game part, must be ensured. Therefore, high-quality serious games should embed the characterizing goal into the gameplay, so that engaging in the serious part is mandatory for playing the game. Furthermore, the interaction technology should be suitable for the target group and game purpose. (2020, p. 10).*

According to the above, the discussion does not focus on the effectiveness of games to facilitate learning (gamification) and social change (serious games); what is relevant in this regard is their design, set-up, and structure to achieve their intended objectives, as described by several authors [5–8, 66, 67].

There are many challenges for researchers in the field, including the application of effective evaluation instruments and the rigorous analysis of the results of the application of games. In this sense, it is of great relevance that game design should be based on scientific research, so that valid and reliable results can be obtained. However, it is important to note that to the extent that serious games and gamification allow participants to learn by doing, they are in line with technological advances and in this sense contribute innovative aspects to education.

Author details

Cirit Mateus De Oro[1,2]*, Daladier Jabba Molinares[2], Ana María Erazo Coronado[3]
and Rodrigo M. Campis Carrillo[1]

1 Universidad Metropolitana, Minciencias and Uninorte Scholar, Barranquilla,
Colombia

2 Universidad del Norte, Barranquilla, Colombia

3 Universidad Metropolitana, Barranquilla, Colombia

*Address all correspondence to: ciritmateus@unimetro.edu.co

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