



# Enhancing User Experience in Learning Environments: a Narrative Gamification Framework for Education

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**Abstract:** This research explores the fertile intersection of narrative, gamification, and education, focusing on user experience (UX). Addressing a critical gap in the literature, we developed and validated a Narrative Gamification Framework for Education. The framework provides educators with tangible guidelines to gamify their lessons, emphasizing the content’s gameful transformation rather than the environment. The research contributes novel insights and practical tools to the fields of Human-Computer Interaction (HCI) and UX, with implications for the broader context of education. Our findings set the stage for future research, including an ongoing initiative to adapt the framework to engage teachers in a journey of recognition and learning.

**Keywords:** Gamification, Virtual learning environments, Narrative, User experience, Personalization, Framework.

## 1 Introduction

Gamification, the application of game elements and mechanics in non-game contexts [Nacke and Deterding, 2017], has gained significant attention in the field of education as a means to enhance learner engagement, motivation, and learning outcomes [Boyle *et al.*, 2016; da Rocha *et al.*, 2015; Dunwell *et al.*, 2014; Clarke *et al.*, 2012]. Virtual learning environments, in particular, have become increasingly popular platforms for delivering educational content and engaging learners in interactive experiences [Prensky, 2003]. However, designing effective gamification strategies for virtual learning environments presents several challenges that must be addressed, as there is some concern about the use of gamification processes in teaching, as demonstrated by Waltz and Deterding [Waltz and Deterding, 2015], who postulate that gamification as it has been worked on, is based mainly on the use of points (“Point-Badge-Leaderboard” approach, or simple PBL), that is, in structural frameworks. For some academic researchers, it is a derogatory simplification of the concepts of digital games since they are not limited to just that [Bogost, 2014; Herzig *et al.*, 2012; Kapp, 2012]. This view is confirmed in systematic reviews, where there is an excess of applications with this approach and a lack of use of other game elements, especially those related to narrative and immersive experience. Recent gamification studies also lack consistent classifications, where not all of them achieve the results expected from implementing gamification [Toda *et al.*, 2018; Bogost, 2014].

Besides that, gamification in education differs significantly from its application in other sectors. In an educational context, the gamification strategy must consider not only the engagement or motivation of the learners but also the learning process and content itself [Landers *et al.*, 2018]. This perspective on gamification sees it as a means of providing gameful experiences in environments traditionally outside of

games, which potentially could change the current paradigm of gamification.

This research uses a narrative and user experience gamification approach to create meaningful and immersive learning experiences [Palomino *et al.*, 2023a]. The objectives of this study are twofold: to explore the integration of narrative elements in gamified educational systems and to develop personalized gamification strategies that cater to individual learner preferences. By incorporating narrative elements, such as storytelling, avatars, and plot development, into the design of gamified learning experiences, we aim to provide learners with a more engaging and immersive environment that fosters deeper learning and knowledge retention.

This article provides a detailed description of the design process and validation of our Narrative Gamification Framework for Education, one of the four artifacts [Palomino *et al.*, 2019b,c, 2023c,d] developed for this research to explore narrative in gamification for education [Palomino *et al.*, 2023a]. We elucidate the research problem, detail the solution and methodology, discuss the results and their implications, present the contributions to the field of HCI, explain the ethical considerations of the research, and conclude with the main outcomes of the research, its limitations, and potential future works.

## 2 Research Problem

The digital age has ushered in new opportunities and challenges for educators worldwide. While technology has the potential to create engaging and personalized learning experiences, its implementation in the classroom needs to be improved [Prensky, 2003]. Among the strategies employed to foster engagement and motivation, gamification—using game design elements in non-game contexts—has emerged

as a promising approach [Nacke and Deterding, 2017]. However, the application of gamification in education is not without its complexities, stemming from the need within gamified educational environments to carefully balance engagement with substantive learning. Sometimes, focusing solely on engagement can inadvertently undermine the learning process, leading to students being entertained but not effectively educated [Toda et al., 2018; Bogost, 2014].

The primary issue investigated in this research is integrating narrative into the gamification design of educational environments in a manner that positively impacts the user experience. While game elements and mechanics have been extensively studied in the context of gamification, the role of narrative—a potentially powerful tool for engagement—has been relatively unexplored [Mora et al., 2017]. Furthermore, existing gamification designs often focus on using specific game elements without considering the overall gameful experience they create for users [Palomino et al., 2023b].

This problem becomes even more pronounced in educational settings where gamification must consider the learner’s engagement or motivation and the learning process and content itself [Rodrigues et al., 2022]. The challenge, therefore, is to design a gamification approach that is effective in terms of game mechanics and meaningful in the context of education, involving exploring the types of gameful experiences we can provide to users and how these experiences can be related to learning design.

To address the research problem, we have proposed a series of conceptual, methodological, and technical solutions to effectively integrate narrative into the gamification design of educational environments.

### 3 Narrative Gamification Framework for Education

In this section, we specifically detail the design process and theories used to create the Narrative Gamification Framework for Education, that can be used to personalize the gamification experience in digital learning environments. We validated our framework from the perspective of domain specialists, such as teachers (from higher education and high school), game designers (digital and analogical game designers) and psychologists.

#### 3.1 Background

Next, we detail the topics this study covers and works related directly to this research.

##### 3.1.1 The Hero’s Journey

The monomyth, or the “Hero’s Journey”, is a template derived from various categories of tales and lore that involve a hero who goes on an adventure and, after dealing with a decisive crisis, wins a victory, returning home changed or transformed [Campbell, 2008]. Since then, other authors have continued studying this universal epic journey, connecting it to a person’s daily life struggles, simplifying and signifying Campbell’s original 17 steps [Adams, 1981; Campbell, 2003;

Vogler, 2007]. Vogler’s 12 Steps was developed based on Campbell’s study as a script for creating stories (e.g. movies, games, comics, books) and is widely used in occidental cinema [Vogler, 2007]. Its steps are described in Figure 1. In addition, there are other narrative frameworks, such as Propp’s Morphology of the Folktale [Propp, 1968], where the author identifies seven possible roles and 31 steps analyzing magic tales (“volchėbnoi skėzki”). Also, Ricoeur’s narrative mimesis is understood as a dynamic activity such as the art of producing or representing something, defining narrative in conceptual frameworks related to humanity’s need to deal with time [Ricoeur, 2010].

For this research, we chose to work with Vogler’s Hero’s Journey 12 steps as it is one of the most used and accepted templates in story creation [Rogers, 2014; Vogler, 1985] and, according to Jung, is rooted in humanity’s unconscious. However, this framework comes from an anthropological study based mainly on Western societies, not reflecting Eastern society’s most common narrative structures. This is a limitation we are aware of and can be tackled in future works, as well as possible variations arising from this original framework. Nevertheless, as in the case of our definition of narrative for gamification in education, having been based on consolidated theories and not having approached more recent and complex theories such as the concept of transmedia, for example, our framework intends to be the foundation and starting point for further research.

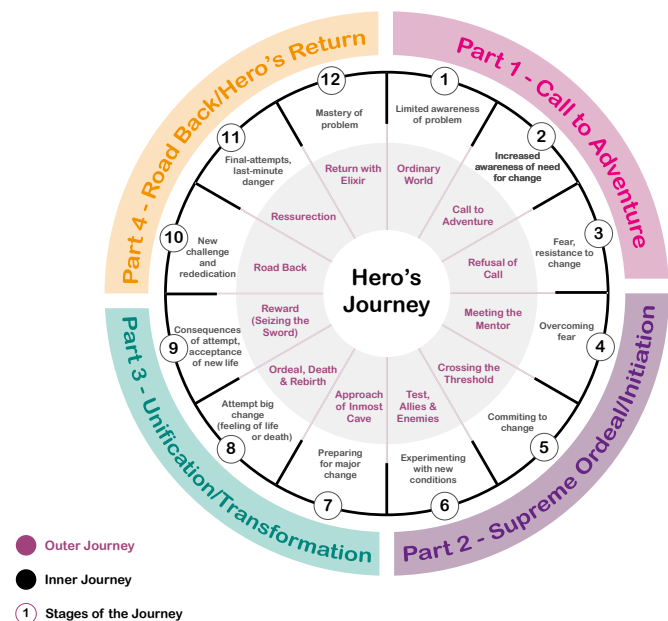


Figure 1. Hero’s Journey’s 12 Steps [Vogler, 2007]

Our framework adapted Vogler’s Hero’s Journey to the educational context and includes, in its structure, the Student’s Journey.

##### 3.1.2 Narrative and User Experience | Storytelling and Learning Experience

Our prior research defines narrative as “the process in which the users build their own experience through a given content, exercising their freedom of choice in a given space and time, bounded by the system’s logic.” [Palomino et al., 2019b] is

known as the karma system and implicit decisions. This intrinsic concept is the order of events in the game through the user experience. Implicit choices made by the user influence this experience. Examples are providing the content in different ways for the learner to choose by themselves, creating a branch, and, consequently, a different user experience. [Toda et al., 2019a]. By these definitions, the student must have several options to do content, but the final goal remains: learning that content.

Considering User Experience (UX) as the set of elements and factors related to the user’s interaction with a product, system, or service whose result generates a positive or negative perception [Norman, 2013], it is possible to use specific UX techniques, such as mapping users’ journeys to map narrative, creating milestones for particular tasks where the student can choose one path or another and predicting their behavior when interacting with the system to present the next step.

In parallel to this, Storytelling deals with ”how the context is presented and the plot developed (the story is told) in a particular environment, which can be through text, voice or even sensory” [Toda et al., 2019a], and Learning Experience (LX) deals with methods that focus on user learning, making the student protagonist of this process.

These four concepts permeate the whole framework, considering the student’s journey in the system and their journey in learning.

### 3.1.3 Gameful Design Heuristics

Gameful Design Heuristics [Tondello et al., 2019], created to be an evaluation method for gameful designs, brought the concept of heuristics from usability engineering (as the general principles or broad usability guidelines that have been used to design and evaluate systems) and developed this set of particular heuristics specifically to inspect gameful designs. Experts use heuristic evaluation to identify usability problems in an existing design as part of an iterative design. Gameful Design Heuristics is the first tool focused specifically on evaluating gameful design through the lens of intrinsic and extrinsic motivational affordances and is originally aimed at enabling evaluators to identify gaps in a gameful system’s design. They are organized into three categories and twelve dimensions, as shown in Figure 2.

Our framework uses these heuristics as part of our design iterative cycle, as guidelines of students’ user experience (and not as inspection tools), which the gamification designer should concern themselves with at the moment.

#### 3.1.4 Learning Objectives and Learning Activities Types (LATs)

As for the link with learning theories, Bloom’s original research, published in 1956, presented a framework to be used by teachers to support the instructional design of their classes [Bloom, 1956]. In 2001, this framework was revised, focusing on a more dynamic iteration [Krathwohl, 2002].

In this study, we use Bloom’s revised taxonomy [Krathwohl, 2002], composed of the statement of a learning objective, where the verb (and the action associated with it)

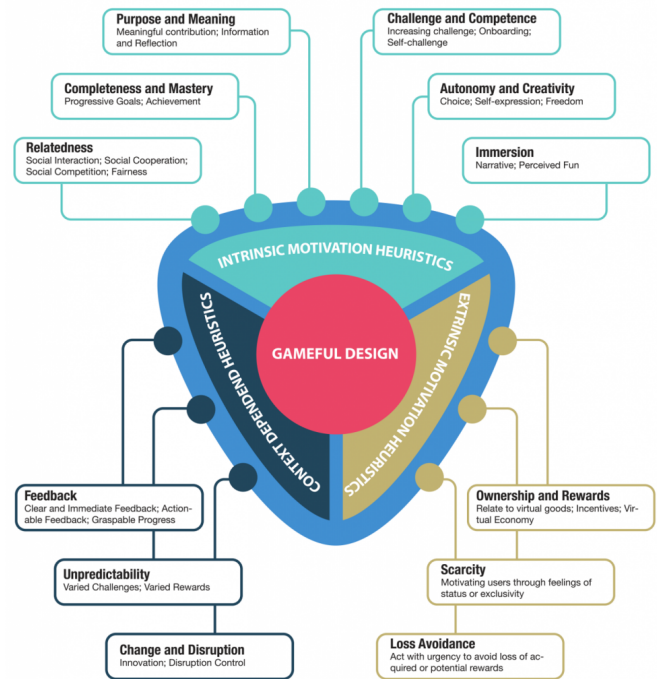


Figure 2. Gameful Design Heuristics [Tondello et al., 2019]

refers to the cognitive process, and the object (usually a noun) refers to the knowledge expected the students to acquire. As such, the authors refer to two dimensions: the cognitive process, categorized in six hierarchical stages (i.e., Remembering, Understanding, Applying, Analyzing, Evaluating, Creating), and the Knowledge Dimension, categorized in factual, conceptual, procedural, and meta-cognitive, as shown in the examples from Table 1.

Bloom’s taxonomy of learning objectives was already used in gamification, matching the learning activities gamification designs to a cognitive taxonomy [Baldeón et al., 2016] and is currently being used to map which gamification design users consider the most suitable to help them in performing a particular learning activity [Rodrigues et al., 2022].

In our framework, they guide the teacher in creating the learning content with the proper learning stages and the best gamification strategy to improve engagement both with the gameful system and the learning content.

### 3.1.5 Game Elements

Our framework is mainly based on Narrative and Storytelling as game elements. However, optionally, we can add other game elements to enrich the design.

Most gamification strategies are based on the use of game elements, and they have many different classifications. Dignan et al. [Dignan, 2011] classified 19 concepts found in games; studies by Aparicio et al. Francisco-Aparicio et al. [2013] classify these elements according to Pink’s motivational pillars Pink [2011] and Tondello et al. [Tondello et al., 2017] has been working on this classification for several years. Their most recent research shows 59 elements. However, these classifications do not consider that, in the case of educational environments, in addition to providing the gameful aspect of the elements, it is necessary to maintain the student’s focus on learning. A recent study considered both aspects to create a new taxonomy, specifically for use in educa-

**Table 1.** Revised Bloom’s Taxonomy Learning Objectives Example [Krathwohl, 2002]

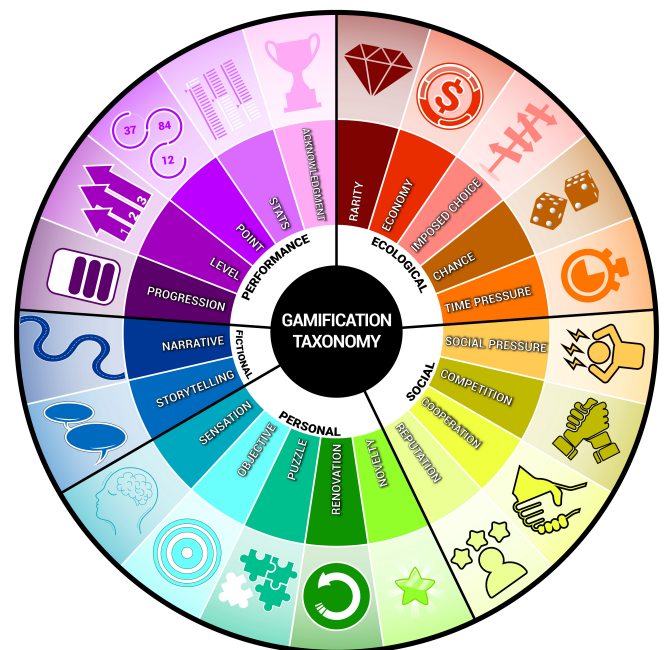
| Cognitive Process Dimension  | Knowledge Dimension   |   |   |   |
|--|---|---|---|---|
|  | Factual   | Conceptual  | Procedural  | Meta-cognitive  |
| <b>Remembering:</b><br>Relevant knowledge from long-term memory.                           | The basis that the student must have acquired with a subject.<br>List | The relationships between the basic knowledge that allows them to make sense together.<br>Recognize | How to apply knowledge, methods, skills and techniques.<br>Recall | Knowledge in its broadest form, awareness of the existence of this knowledge.<br>Identify |
| <b>Understanding</b><br>Construction of meaning through instructional messages.            | Summarize   | Classify  | Clarify   | Predict   |
| <b>Applying</b><br>Application of a procedure in a given situation.                        | Respond   | Provide   | Carry out   | Use   |
| <b>Analyzing</b><br>Distinguish information between different parts.                       | Select  | Differentiate   | Integrate   | Deconstruct   |
| <b>Evaluating</b><br>Judging based on criteria and standards.                              | Select  | Determine   | Judge   | Reflect   |
| <b>Creating</b><br>Join or organize elements in a new form, pattern or coherent structure. | Generate  | Assemble  | Design  | Create  |

tional contexts. This taxonomy was created and validated by experts in the field of gamification and games [Toda et al., 2019b]. It was used to extract data on the relationship between the use of these elements in sets—through ARM techniques [Palomino et al., 2019a], as well as in the creation of GES [Toda et al., 2020]—with positive results. It contains 21 game elements grouped into five dimensions (performance, ecological, social, personal, and fictional), as shown in Figure 3. These dimensions facilitate understanding each game element’s main area and can be better related to educational tasks in gamified design.

Our framework is built on the concepts of Narrative and Storytelling arising from our previous research, and this taxonomy<sup>1</sup> and therefore can benefit from the addition of some other elements as needed.

### 3.1.6 Instructional Design Frameworks

Instructional frameworks provide a structure of components adaptable to work with different teaching styles, content areas, and students’ needs. They are designed to provide a step-by-step for teachers to create their learning content with confidence and method. One of the most famous instructional design frameworks is ADDIE, which stands for Analyze, Design, Develop, Implement, and Evaluate [Morrison et al., 2019] as seen in Figure 4. This sequence, however, does not impose a strictly linear progression through the steps. Teachers, instructional designers, and training developers consider this a practical approach because having



**Figure 3.** Taxonomy of Gamification Elements for Educational Environments (TGEEE) [Toda et al., 2019a]

clearly defined stages facilitates effective learning content implementation.

Our framework was designed to work with any instructional design framework, encompassing their process into its own and becoming a robust framework to design gamified educational strategies.

<sup>1</sup>Our Narrative definition [Palomino et al., 2019b] was used to define the elements of Narrative and Storytelling in this taxonomy.

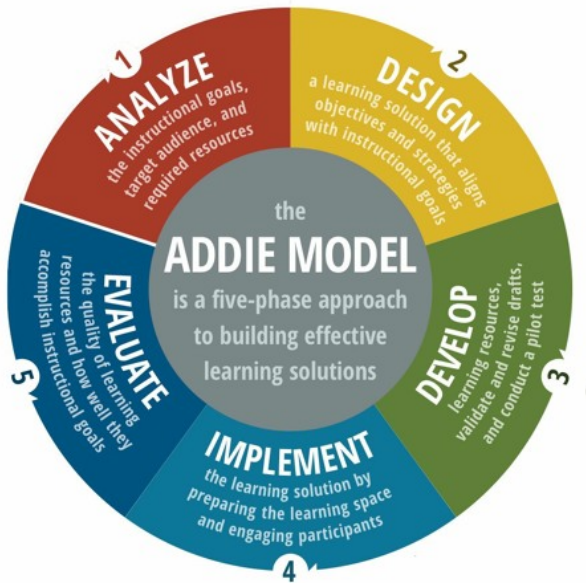


Figure 4. ADDIE model [Morrison et al., 2019]

### 3.2 Method

To build the Narrative Gamification Framework for Education, we used the Design Science Research model, which aims to build knowledge that professionals from its domain can use to create design solutions to their field problems.

The design sciences focus on choosing what is possible and valuable for creating possible futures rather than what already exists. [Hevner et al., 2004] state that the main objective of Design Science Research is to gain knowledge and understanding of a problem domain through constructing and applying a designed artifact, therefore being the most suitable research model for constructing our framework. Design Science Research is divided into six steps that we describe and explain how each of them was applied to our research, therefore designing and evaluating the framework.

1. **Problem identification and motivation:** This step seeks to define the specific research problem and justify the value of a solution. In our case, the central gap this thesis attacks is that gamification for education, unlike in other areas, has two layers of complexity: the students' engagement with the gameful system and the student's engagement with the learning process. Therefore, the most common game elements used in gamified solutions have little impact on the students' engagement, and when they are effective, they might hinder the learning process in exchange. We hypothesize that content-based elements such as Narrative and Storytelling might be more effective since they might be applied to the content and not to the system's structure. Considering these, we propose the creation of a Narrative Gamification Framework for Education, seeking to answer the following research question: **"How to create a systematic model that allows the creation of interactive narratives for gamification?"**
2. **Objectives of a solution:** In this step, we infer the objectives of a solution from the problem definition. Our research would include "developing, testing, and

validating a narrative-based content gamification framework to be used in educational systems for higher education students."

3. **Design and development:** is the step where we create the artifactual solution. Such artifacts are potential, with each defined broadly, constructs, models, methods, or instances [Hevner et al., 2004].

Using brainstorming techniques, we conducted exploratory research on the various theories described in the background section. The Hero's Journey, representing the personal growth journey, was related to the learning process the student goes through. In this sense, the everyday world (the hero's universe before and after returning from the journey, in the first and fourth quadrants of the cycle) is related to the user experience and the special world (second and third quadrants) to the learning experience, so that, through a positive user experience, the student starts and advances to the special world on their learning journey. When they complete these steps, they return to their everyday world (as someone with more knowledge). The experience on this journey is represented by the user experience supported by Narrative and the learning experience supported by Storytelling.

Therefore, our Learning Journey uses a summarized adaptation of the four quadrants as follows:

- (a) **Call to Action:** The first quadrant is related to the UX, the student's first contact with the system, and their motivation to start learning.
- (b) **Trials:** In the second act, the student are in their special world and the start of their learning experience. The Remembering, Understanding, and Applying from Bloom's Taxonomy stages better reflect the pedagogical content they should be studying.
- (c) **Transformation:** In the third act, the student is already used to the everyday learning challenges and should be able to transfer their newly acquired knowledge. Bloom's Analysing, Evaluating, and Creating steps best suit this arc's pedagogical contents.
- (d) **Result:** The last quadrant is responsible for evaluating the student's whole journey, what they learned, what they felt, and how they changed in the process, and therefore, is related to their user experience.

The framework works iteratively and incrementally, i.e., the educational gamification strategy can be implemented by blocks (or modules) in several different cycles, or it can be considered a journey for an entire subject, implementing the content progressively accordingly.

The framework design was done using the brainstorming technique and iterative processes, which started with a very rustic sketch Figure 5 and evolved, using feedback from other researchers in the area until our latest version Figure 6. In all these stages, based on exploratory research, we sought to relate better the fundamental theories used so that the processor would obtain

a complete framework that could be used in various educational contexts but that it would also be possible to observe in the framework what the journey was. that the student would be going through.



Figure 5. Narrative Gamification Framework for Education Sketch - version 1.0

entire process and relate to the user experience (whether the student’s experience with a gamified system or with the classroom itself) and the learning experience, which differs from the first in that it focuses on learning itself. The key to using Narrative and relating it to UX is to guide students so they can create their own learning experiences (as a result of their personal choices and understanding of the learning process, as well as their decisions when doing the activities) with freedom of choice but with a clear goal in mind.

The Storytelling game element supports the narrative approach by providing resources to guide the learning experience and strengthen the context, thus strengthening why something should be studied.

Also, the framework supports the use of different frameworks for instructional design (such as ADDIE and Design Thinking) and Bloom’s taxonomy, which is also considered in some cases as an instructional framework. In this case, however, what we call frameworks for instructional design (represented in the model in the upper area of the circle with ADDIE model steps: Analyze, Design, Develop, Implement and Evaluate) define how the design cycle should be worked, while Bloom’s Taxonomy, represented in the model at the bottom of the circle, in gradients of green (Remembering, Understanding, Applying, Analyzing, Evaluating and Creating), represents the student’s learning stages during the learning journey.

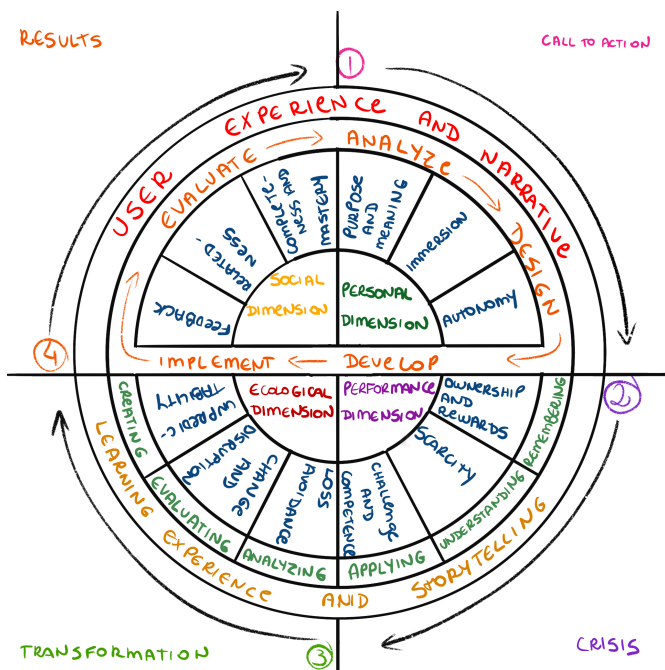


Figure 6. Narrative Gamification Framework for Education Sketch - version 4.0

4. **Demonstration:** In this step, we demonstrate the efficacy of the artifact in solving the problem. We built a case study based on an HTML and CSS module as an example and wrote complete documentation in accessible language. Then, we recruited domain experts (teachers, instructors, game designers, and psychologists) to read the documentation, use it if they wanted, and then participate in a semi-structured interview. The framework documentation sent to these experts in English and Portuguese can be read in the supplemental material.
5. **Evaluation:** In this step, we observe and measure how well the artifact supports a solution to the problem. First, we used Mora’s Framework Scale [Mora et al., 2015] to describe, from the experts’ perspective, what game design items they could grasp from reading the documentation. Next, their qualitative data were analyzed using Reflexive Thematic Analysis [Braun and Clarke, 2006]. After synthesizing the results, we generated the framework’s final version, as seen on Figure 7. The detailed validation process can be read in the next section.
6. **Communication:** In this step, we communicate the problem and its importance, the artifact, its utility and novelty, the rigor of its design, and its effectiveness to researchers and other relevant audiences.

The model in Figure 7 has a double representation: The student’s journey in the learning process (the four acts and Bloom’s taxonomy) and the guidelines that the teacher must follow to implement the strategies (heuristics, instructional design and dimensions). As a framework that considers the use of Narrative and Storytelling game elements a priority, both permeate the

### 3.3 Framework Validation Results

This section describes the process we used to validate our framework from a domain expert’s perspective.

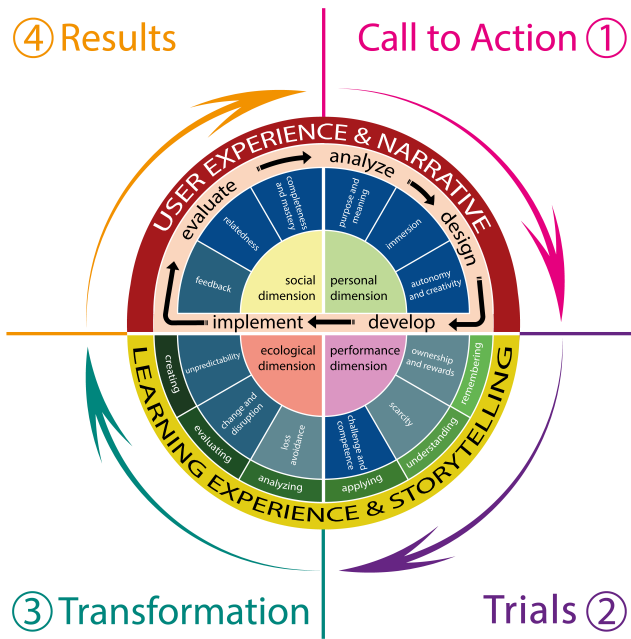


Figure 7. Narrative Gamification Framework for Education Sketch - version 4.2 - After Validation

### 3.3.1 Semi-structured Interviews

After obtaining ethics approval, we recruited participants to receive the framework documentation, read it, optionally use it, and then participate in a semi-structured interview. The participants were recruited from teachers, instructors, game designers, and psychologists to assess the framework’s general sense, ease of use, and effectiveness. The interview was divided into three parts: the first was a demographic one; in the second part, they were asked to answer from their perspective; the framework presented each of the 19 game design elements from Mora’s Framework Scale Validation [Mora et al., 2015]. In the last part of the interview, they were asked several open questions to assess their opinion on the framework’s clarity, usability, and effectiveness.

We interviewed 12 Brazilian participants: six lecturers (teachers, professors, and instructors), four game designers, and two psychologists. Their age ranged from 32 to 49 years old; six were female and six male; only one of them did not play some game (analogical of digital); seven had already used some kind of gamified system before; nine of them had already tried to apply gamification in their fieldwork; eight of them had some kind of experience with game design; only one of them did not have any experience with narrative before (as writer, researcher or player) and five of them had some kind of knowledge in UX.

### 3.3.2 Framework Scale Validation

[Mora et al., 2015] developed the framework scale to aid in a Literature Review of Gamification Design Frameworks to summarize each framework’s essential properties and better assess their characteristics. We used the same scale to objectively assess how the experts considered our framework in terms of game design.

Mora’s framework scale consists of 19 game design elements, clustered and organized into five categories, as fol-

lows:

#### 1. Economic:

- **Objectives:** are the specific performance goals.
- **Viability:** a previous study, evaluation and analysis of the potential of applying gamification or refuse it.
- **Risk:** a probability or threat of damage, injury, liability, loss, or any other negative occurrence.
- **ROI (Return On Investment):** the benefit to the investor resulting from running a gamified experience.
- **Stakeholders:** a technique used to identify and keep in mind the people who have to interact with the design process.

#### 2. Logic

- **Loop:** the game mechanics combined with reinforcement and feedback in order to engage the player in the key system actions.
- **End game / Epic win:** a pre-established end of game or glorious victory in the system, usually stretching players to the limits of their abilities.
- **On-boarding:** the way of starting the new participants.
- **Rules:** the body of regulations prescribed by the designer.

#### 3. Measurement

- **Metrics:** the standards of measurement by which efficiency, performance, progress, process or quality.
- **Analytic:** the algorithms and data used to measure key performance indicators.

#### 4. Psychology:

- **Fun:** the enjoyment or playfulness.
- **Motivation:** the behaviours which causes a person to want to repeat an action and vice-versa.
- **Social:** the interaction between players.
- **Desired behaviours:** the expected response of the players after the interaction.
- **Ethics:** a branch of philosophy that involves systematizing, defending and recommending concepts of right and wrong conducts.

#### 5. Interaction:

- **Narrative:** the story and context created by designers.
- **UI/UX:** refers to everything designed into the gamified system which a player being may interact and the player’s behaviours, attitudes, and emotions.
- **Technology:** the use or need of a software component for development.

These items should be classified into:

- **E:** explicit, the item has appeared in the framework’s definition.
- **I:** implicit, the item has not appeared explicitly in the framework definition. Inferred by the authors or referred inside an academic work of the author.

- U: unavailable, the item has not appeared anyway.

Table 2 details how each participant described the framework according to this scale.

### 3.3.3 Reflexive Thematic Analysis

Reflexive thematic analysis is an approach to analyzing qualitative data to answer broad or narrow research questions about people's experiences, views and perceptions, and representations of a given phenomena [Braun and Clarke, 2019]. Therefore, we choose this technique to analyze our qualitative data from the domain experts' perceptions of our framework. We used a mixed methods approach, having deduced four main themes at the beginning of coding: Usability, Efficiency, Hindrances, and Improvements. However, other themes were induced during the process: Clarity, Equity, Motivation, and Unplugged approach vs System approach.

Next, we present each theme and quote examples from one or more participants.

**Usability:** Regarding ease of applying the framework.

*You could explore the examples a little more and eventually create examples of different people, via systems, via the classroom, with different people, different teachers, to have a wide variety of examples, to help start in a more simplified way and take some of this first opportunity to fix the content to be able to apply,* (Participant I, Psychologist)

*Usability is already put into practice in the document itself,* (Participant E, Game Designer)

*I had a bit of difficulty understanding certain things due to the specificity of the terms.* , (Participant K, University Professor)

**Efficiency:** Regarding the framework's efficiency.

*For the vast majority of students, this is very likely to apply and have good results,* (Participant G, Game Designer and instructor)

*The content we learn while having fun is the content we always learn, I like that idea on the framework, I strongly believe in this,* (Participant F, teacher)

**Hidrance:** Regarding aspects that can hinder the process.

*Resistance from students, because they believe that the traditional education system is better,* (Participant K, University Professor)

**Improvements:** Regarding suggestions and upgrades.

*The balance between engagement and learning needs to be measured and controlled by the teacher for the framework to be used effectively. It would be nice to have a metric in that sense, so they know if it's leaning one way or the other. Maybe a checklist of explicit and implicit things he can notice and balance,* (Participant J, Game Designer)

**Clarity:** Regarding clarity of understanding.

*I found the step by step perfect [...] However, it is thorough, one needs to be very careful when reading ,* (Participant E, Game Designer)

**Equity:** Regarding equity in education.

*The framework is effective for a classroom without students with autism spectrum. It would not be effective for them, as a more specific view of that student would be needed. [...] If you can do a more in-depth analysis of these students' environments that are different, it would be great, because gamification could help students with special needs to better focus if designed accordingly,* (Participant G, Game Designer and Instructor)

*It seems to me that the framework can be used for any age, including children from 7 years old ,* (Participant F, teacher)

**Motivation:** Regarding students' motivation.

*When talking about the hero's journey, it is necessary to work deeper on the frustration and internal conflicts,* (Participant H, Game Designer)

**Theme: Unplugged vs System:** Regarding the use of the framework in an unplugged or digital environment.

*The interactive system makes the student more comfortable, with less social pressure to experiment more deeply,* (Participant F, teacher)

*When we do something offline, there is an exchange between people and this is very important,* (Participant H, Game Designer)

According to our validation, most experts consider the framework's documentation clear and objective and believe more varied examples would significantly improve its understanding; all of them would use it in their respective areas, including outside of education (the two psychologists would like to use it). There is a significant concern about equity, and half of the teachers commented on it, believing the framework needs improvement. Some suggested that the documentation, if shared widely with teachers, should be even more accessible. They consider that all the sections explaining the framework's creation and theories are not of interest to the people who will use it. In this sense, a straightforward step-by-step would be more helpful.

Our analysis of the framework scale used in the interviews showed that the framework demonstrates the game design elements in its build; for most of the answers, the item was explicit in the documentation and, secondly, implicit. Only some game design elements had a significant answer of unavailable, being relevant in the Risk and Analytic features. This demonstrates that, in general, the framework was well accepted and understood by the domain experts and, therefore, suffered two changes. The first, where we exchanged the words of Crisis from the second arc in the Students' Journey for Trials, following a suggestion from one of the game



**Table 2.** Participants’ perspective on the Framework according to Mora’s Framework Scale [Mora et al., 2015]

| FRAMEWORK VALIDATION SCALE | PARTICIPANTS |   |   |   |   |   |   |   |   |   |   |   |
|----------------------------|--------------|---|---|---|---|---|---|---|---|---|---|---|
|                            | A            | B | C | D | E | F | G | H | I | J | K | L |
| <b>ECONOMIC</b>            |              |   |   |   |   |   |   |   |   |   |   |   |
| Objectives                 | E            | E | E | E | E | I | E | E | E | E | E | E |
| Viability                  | I            | E | E | E | E | E | E | E | E | E | E | E |
| Risk                       | U            | E | I | I | I | E | U | U | I | E | U | I |
| ROI (Return On Investment) | E            | E | E | E | E | I | I | I | I | U | E | E |
| Stakeholders               | I            | E | E | E | I | E | U | I | E | E | E | E |
| <b>LOGIC</b>               |              |   |   |   |   |   |   |   |   |   |   |   |
| Loop                       | E            | E | E | E | E | E | E | E | E | I | E | E |
| End game / Epic win        | I            | E | I | E | E | E | I | E | E | E | I | E |
| On-boarding.               | I            | E | E | E | I | I | E | E | E | E | E | E |
| Rules                      | E            | E | I | E | E | E | I | E | E | E | E | E |
| <b>MEASUREMENT</b>         |              |   |   |   |   |   |   |   |   |   |   |   |
| Metrics                    | E            | E | I | I | E | E | E | E | E | E | U | I |
| Analytic                   | E            | I | E | I | E | I | I | U | E | U | U | I |
| <b>PSYCHOLOGY</b>          |              |   |   |   |   |   |   |   |   |   |   |   |
| Fun                        | E            | E | E | I | E | E | I | I | E | E | I | E |
| Motivation                 | I            | E | I | E | I | E | E | I | E | E | I | E |
| Social                     | E            | E | E | I | E | E | E | E | E | E | E | I |
| Desired behaviours         | E            | E | E | E | E | E | E | E | E | E | E | E |
| Ethics                     | I            | I | E | I | E | E | I | I | I | E | E | U |
| <b>INTERACTION</b>         |              |   |   |   |   |   |   |   |   |   |   |   |
| Narrative                  | E            | E | E | E | E | I | E | E | E | E | E | E |
| UI/UX                      | E            | E | E | E | E | I | E | E | E | E | E | E |
| Technology                 | I            | E | E | E | I | I | I | I | E | E | E | E |

designers, who argued that Crisis did not represent that stage well; and the second, where we deepened the Hero’s Journey concepts to deal with the hero’s external experience (outer journey, dramatic and ruled by actions) and internal experience (inner journey, psychological and ruled by feelings and inner perceptions) All the other suggestions were categorized as improvements for a future framework upgrade, as they demand in-depth research in areas previously not projected.

This validation limitation is that all of the experts interviewed were Brazilians, and therefore, we do not know how well the framework would be received in other cultures.

## 4 Discussion

The discussion section focuses on interpreting and analyzing the results, providing a comprehensive understanding of the implications and significance of the research findings. It also explores the study’s limitations and potential avenues for future research.

The results of the user evaluations and expert feedback collectively demonstrate the effectiveness and potential of the narrative-based gamification framework in enhancing learner engagement, motivation, and learning outcomes in virtual learning environments. Incorporating narrative elements and personalized experiences proved crucial in creating immersive and gameful learning environments that captivate learners’ attention and promote active participation.

The findings of this research have several implications for the design and implementation of gamified learning environments in educational settings:

1. Integrating narrative elements like storytelling has the potential to significantly enhance learner engagement and motivation by providing a meaningful and immersive learning experience.
2. Personalization approaches allow for tailored experiences that address learners’ needs, preferences, and motivations, potentially leading to increased satisfaction and better learning outcomes.

While this research contributes valuable insights into gamification in education, it is essential to acknowledge its limitations:

1. The study focused on virtual learning environments; further research is needed to explore the framework’s application in other educational contexts.
2. The research primarily relied on self-reported measures and subjective evaluations, which may introduce biases. Future studies could incorporate objective measures and longitudinal assessments to provide a more comprehensive understanding of the long-term effects of the narrative-based gamification approach.
3. The research primarily focused on the experiences of educators in implementing gamified learning environments because of the COVID-19 situation during the study, and further investigations could examine learners’ experiences.

The outcomes of our research extend the existing body of literature on gamification and education. They reinforce the importance of personalized, meaningful gamification experiences and the significant role narrative elements can play in

enhancing these experiences, and the Narrative Gamification Framework for Education offers educators and gamification designers practical solutions for integrating gamification into the classroom.

## 5 Contributions to HCI

This research advances the Human-Computer Interaction (HCI) field, contributing original, impactful insights, methodologies, and practical tools. Our work situates gamification within the broader landscape of HCI, expanding its potential to foster engagement and enhance user experience in educational contexts.

- **Originality:** Our research is characterized by its original approach to gamification in education, prioritizing narrative elements and personalized experiences. Developing the Narrative Gamification Framework for Education marks a significant departure from conventional, one-size-fits-all gamification strategies.
- **Impact:** The impact of our research is multi-faceted. Our work equips educators and gamification designers with the tools necessary to create more engaging, effective learning environments. Theoretically, it extends our understanding of how narrative-based gamification functions within the broader HCI landscape. Our research has already begun to influence the field, as evidenced by the numerous citations of our work.
- **Methodological Contributions:** Our research methodology, which involved a literature review, semantic mapping, mixed-methods research, and real-world testing, represents a comprehensive, rigorous approach to HCI research. This methodological framework is replicable and can be used by future researchers investigating similar topics.
- **Technical Contributions:** The Narrative Gamification Framework for Education offers practical tools for developing virtual learning environments that provide an immersive and meaningful user experience.

As such, we believe our research provides new insights and tools that can help shape the future of gamification in HCI.

## 6 Conclusion

This research journey into the unexplored realm of narrative gamification in educational environments has culminated in a comprehensive understanding of the problem, innovative solutions, and tangible contributions. It is unequivocal that well-crafted gamification strategies can significantly enrich the user experience in educational contexts.

Our most substantial contribution, detailed in this article, is the Narrative Gamification Framework for Education, a practical tool for educators to gamify their lessons without specific technologies. The framework's emphasis on gamifying the content rather than the environment sets it apart, offering clear guidelines for creating gameful learning content from scratch.

Derived from this research is an ongoing adaptation of the Narrative Gamification Framework for engaging teachers. The goal was to immerse educators in a journey of recognition and learning, fostering their engagement in the gamification process. This initiative signals a shift in focus, recognizing that the success of any educational strategy also hinges on the involvement and engagement of the teacher.

As for limitations, this research primarily focused on the experiences of educators in implementing gamified learning environments because of the COVID-19 situation during the study, and further investigations could examine learners' experiences in receiving these strategies created by their educators.

This research has shed light on the potential of narrative gamification in education. It has laid a robust theoretical foundation and developed practical tools for integrating narrative elements into educational environments to enhance user experience. Our findings and contributions are a significant step forward in this rapidly evolving field, and we look forward to seeing how they will shape future research and practice.

## Supplemental Material

Documentation for utilizing the Narrative Gamification Framework for Education is readily accessible to both English and Portuguese-speaking users. For those seeking guidance in English, the documentation can be accessed via the link [https://drive.google.com/file/d/18QYnrR3A12fPGVODEYz35H316wnJd-\\_c/view?usp=drive\\_link](https://drive.google.com/file/d/18QYnrR3A12fPGVODEYz35H316wnJd-_c/view?usp=drive_link). Alternatively, Portuguese-speaking users may refer to [https://drive.google.com/file/d/1BVm06dVFBcaL10LIAjs2MhtUwgT5G-09/view?usp=drive\\_link](https://drive.google.com/file/d/1BVm06dVFBcaL10LIAjs2MhtUwgT5G-09/view?usp=drive_link) for the documentation tailored to their linguistic preferences. This dual-language availability ensures that users can engage with the material in their preferred language, promoting a better understanding and more effective framework use.

## Declarations

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We maintain that ethical considerations and transparency are integral to the design of gamification in education. Our research has been approved by the Ethics Committee at Plataforma Brasil under the project "Impacto do uso da Gamificação no Ensino (CAAE: 42598620.0.0000.5464)." The card sorting experiment was approved by the University of Waterloo Ethics Committee (ORE#42392).

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## Authors' Contributions

SI supervised this PhD research. PP is the main contributor in conceptualizing, performing the experiments, and writing this manuscript. Both authors read and approved the final manuscript.

## Competing interests

The authors declare that they do have competing interests.

## References

- Adams, D. (1981). *Mythology: the voyage of the hero*.
- Baldeón, J., Rodríguez, I., and Puig, A. (2016). Lega: A learner-centered gamification design framework. In *Proceedings of the XVII International Conference on Human Computer Interaction*, Interacción '16, pages 45:1–45:8, New York, NY, USA. ACM. DOI: <https://doi.org/10.1145/2998626.2998673>.
- Bloom, B. S. (1956). *Taxonomy of educational objectives: The classification of educational goals*. Longman, New York.
- Bogost, I. (2014). Gamification is Bullshit. In *The Gameful World*. The MIT Press, 1st edition.
- Boyle, E. A., Hainey, T., Connolly, T. M., Gray, G., Earp, J., Ott, M., Lim, T., Ninaus, M., Ribeiro, C., and Pereira, J. (2016). An update to the systematic literature review of empirical evidence of the impacts and outcomes of computer games and serious games. *Computers & Education*, 94:178–192. DOI: <https://doi.org/10.1016/j.compedu.2015.11.003>.
- Braun, V. and Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2):77–101.
- Braun, V. and Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health*, 11(4):589–597. DOI: <https://doi.org/10.1080/2159676X.2019.1628806>.
- Campbell, J. (2003). *The hero's journey: Joseph Campbell on his life and work*, volume 7. New World Library.
- Campbell, J. (2008). *The hero with a thousand faces*, volume 17. New World Library.
- Clarke, S., Arnab, S., Dunwell, I., and Brown, K. (2012). PrEpare: A game-based approach to relationship guidance for adolescents. *Procedia Computer Science*, 15:38–44. DOI: <https://doi.org/10.1016/j.procs.2012.10.056>.
- da Rocha, R. V., Bittencourt, I. I., and Isotani, S. (2015). Análise, projeto, desenvolvimento e avaliação de jogos sérios e afins: uma revisão de desafios e oportunidades. In *Brazilian Symposium on Computers in Education (Simposio Brasileiro de Informática na Educação-SBIE)*, volume 26, page 692.
- Dignan, A. (2011). *Game Frame*. Free Press.
- Dunwell, I., de Freitas, S., Petridis, P., Hendrix, M., Arnab, S., Lamer, P., and Stewart, C. (2014). A game-based learning approach to road safety. In *Proceedings of the 32nd annual ACM conference on Human factors in computing systems - CHI '14*, pages 3389–3398, New York, New York, USA. ACM Press. DOI: <https://doi.org/10.1145/2556288.2557281>.
- Francisco-Aparicio, A., Gutiérrez-Vela, F. L., Isla-Montes, J. L., and Sanchez, J. L. G. (2013). Gamification: Analysis and Application. pages 113–126. Springer, London. DOI: [https://doi.org/10.1007/978-1-4471-5445-7\\_9](https://doi.org/10.1007/978-1-4471-5445-7_9).
- Herzig, P., Ameling, M., and Schill, A. (2012). A Generic Platform for Enterprise Gamification. *2012 Joint Working IEEE/IFIP Conference on Software Architecture and European Conference on Software Architecture*, pages 219–223. DOI: 10.1109/WICSA-ECSA.212.33.
- Hevner, A. R., March, S. T., Park, J., and Ram, S. (2004). Design science in information systems research. *MIS quarterly*, pages 75–105.
- Kapp, K. M. (2012). The Gamification of Learning and Instruction: Game-based Methods and Strategies for Training and Education.
- Krathwohl, D. R. (2002). A revision of bloom's taxonomy: An overview. *Theory into practice*, 41(4):212–218. DOI: [https://doi.org/10.1207/s15430421tip4104\\_2](https://doi.org/10.1207/s15430421tip4104_2).
- Landers, R. N., Auer, E. M., Collmus, A. B., and Armstrong, M. B. (2018). Gamification science, its history and future: Definitions and a research agenda. *Simulation & Gaming*, 49(3):315–337. DOI: <https://doi.org/10.1177/1046878118774>.
- Mora, A., Riera, D., Gonzalez, C., and Arnedo-Moreno, J. (2015). A Literature Review of Gamification Design Frameworks. In *2015 7th International Conference on Games and Virtual Worlds for Serious Applications (VS-GAMES)*, pages 1–8. IEEE. DOI: <https://doi.org/10.1109/VSGAMES.2015.7295760>.
- Mora, A., Riera, D., González, C., and Arnedo-Moreno, J. (2017). Gamification: a systematic review of design frameworks. *Journal of Computing in Higher Education*, 29(3):516–548. DOI: <https://doi.org/10.1007/s12528-017-9150-4>.
- Morrison, G. R., Ross, S. J., Morrison, J. R., and Kalman, H. K. (2019). *Designing effective instruction*. John Wiley & Sons.
- Nacke, L. E. and Deterding, S. (2017). The maturing of gamification research. *Computers in Human Behavior*, 71:450–454. DOI: <https://doi.org/10.1016/j.chb.2016.11.062>.
- Norman, D. (2013). *The design of everyday things: Revised and expanded edition*. Basic books.
- Palomino, P., Nacke, L., and Isotani, S. (2023a). Gamification of virtual learning environments: A narrative and user experience approach. In *Proceedings of the XXII Brazilian Symposium on Human Factors in Computing Systems*, pages 1–10. DOI: <https://doi.org/10.1145/3638067.3638103>.
- Palomino, P., Rodrigues, L., Toda, A., and Isotani, S. (2023b). Enhancing students' learning experience through gamification: Perspectives and challenges. In *Grand Research Challenges in Games and Entertainment Computing in Brazil-GrandGamesBR 2020–2030: First Forum, GrandGamesBR 2020, Recife, Brazil, November 7-10, 2020, and Second Forum, GrandGamesBR 2021, Gramado, Brazil, October 18–21, 2021, Revised Selected Papers*, pages 113–133. Springer.

- Palomino, P., Toda, A., Oliveira, W., Rodrigues, L., Cristea, A., and Isotani, S. (2019a). Exploring content game elements to support gamification design in educational systems: narrative and storytelling. In *Brazilian Symposium on Computers in Education (Simpósio Brasileiro de Informática na Educação-SBIE)*, volume 30, page 773.
- Palomino, P. T., Rodrigues, L., Luz, A., Toda, A. M., Nacke, L., and Isotani, S. (2023c). Predicting user types with symbolic images: An empirical validation based on two card-sorting studies. *Entertainment Computing*, page 100596. DOI: <https://doi.org/10.1016/j.entcom.2023.100596>.
- Palomino, P. T., Toda, A. M., Oliveira, W., Cristea, A. I., and Isotani, S. (2019b). Narrative for gamification in education : why should you care ? In *International Conference of Advanced Learning Techniques - Icalt 2019*. DOI: <https://doi.org/10.1109/ICALT.2019.00035>.
- Palomino, P. T., Toda, A. M., Oliveira, W., Rodrigues, L., and Isotani, S. (2019c). Gamification journey: A novel approach for classifying gamer types for gamified educational systems. In *Simpósio Brasileiro de Jogos e Entretenimento Digital 2019 (SBGames 2019)*.
- Palomino, P. T., Toda, A. M., Rodrigues, L., Oliveira, W., Nacke, L., and Isotani, S. (2023d). An ontology for modelling user profiles and activities in gamified education. *Research and Practice in Technology Enhanced Learning*, 18. DOI: <https://doi.org/10.58459/rptel.2023.18018>.
- Pink, D. H. (2011). *Drive: The surprising truth about what motivates us*. Penguin.
- Prensky, M. (2003). *Digital Game-based Learning*, volume 1. McGraw-Hill, New York. DOI: <https://doi.org/10.1145/950566.950596>.
- Propp, V. I. (1968). *Morphology of the Folktale*, volume 9. University of Texas Press.
- Ricoeur, P. (2010). *Time and narrative*, volume 1. University of Chicago Press.
- Rodrigues, L., Toda, A. M., Oliveira, W., Palomino, P. T., Vassileva, J., and Isotani, S. (2022). Automating gamification personalization to the user and beyond. *IEEE Transactions on Learning Technologies*, 15(2):199–212. DOI: <https://doi.org/10.1109/TLT.2022.3162409>.
- Rogers, S. (2014). *Level Up! The guide to great video game design*. John Wiley & Sons.
- Toda, A. M., Klock, A. C., Oliveira, W., Palomino, P. T., Rodrigues, L., Shi, L., Bittencourt, I., Gasparini, I., Isotani, S., and Cristea, A. I. (2019a). Analysing gamification elements in educational environments using an existing gamification taxonomy. *Smart Learning Environments*, 6(1):16. DOI: <https://doi.org/10.1186/s40561-019-0106-1>.
- Toda, A. M., Oliveira, W., Klock, A. C., Palomino, P. T., Pimenta, M., Gasparini, I., Shi, L., Bittencourt, I., Isotani, S., and Cristea, A. I. (2019b). A taxonomy of game elements for gamification in educational contexts: Proposal and evaluation. In *2019 IEEE 19th International Conference on Advanced Learning Technologies (ICALT)*, volume 2161, pages 84–88. IEEE. DOI: <https://doi.org/10.1109/ICALT.2019.00028>.
- Toda, A. M., Palomino, P. T., Oliveira, W., Rodrigues, L., Klock, A. C., Gasparini, I., Cristea, A. I., and Isotani, S. (2020). How to gamify learning systems? an experience report using the design sprint method and a taxonomy for gamification elements in education. *Journal of educational technology and society*, 22(3):1–14.
- Toda, A. M., Valle, P. H. D., and Isotani, S. (2018). The dark side of gamification: An overview of negative effects of gamification in education. In Cristea, A. I., Bittencourt, I. I., and Lima, F., editors, *Higher Education for All. From Challenges to Novel Technology-Enhanced Solutions*, pages 143–156, Cham. Springer International Publishing. DOI: [https://doi.org/10.1007/978-3-319-97934-2\\_9](https://doi.org/10.1007/978-3-319-97934-2_9).
- Tondello, G. F., Kappen, D. L., Ganaba, M., and Nacke, L. E. (2019). Gameful design heuristics: a gamification inspection tool. In *International Conference on Human-Computer Interaction*, pages 224–244. Springer. DOI: [https://doi.org/10.1007/978-3-030-22646-6\\_16](https://doi.org/10.1007/978-3-030-22646-6_16).
- Tondello, G. F., Mora, A., and Nacke, L. E. (2017). Elements of gameful design emerging from user preferences. In *Proceedings of the Annual Symposium on Computer-Human Interaction in Play*, pages 129–142. ACM. DOI: <https://doi.org/10.1145/3116595.3116627>.
- Vogler, C. (1985). A practical guide to joseph campbell's the hero with a thousand faces. *Hero's Journey*.
- Vogler, C. (2007). *The Writer's journey*. Michael Wiese Productions Studio City, CA.
- Waltz, S. P. and Deterding, S. (2015). *The Gameful World: Approaches, Issues, Applications*.