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Research Paper

Why Don't You Let the Light In? Developing Radiant Patterns for a Critical Game Aiming Player Empowerment

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Abstract. The exponential growth of the digital games industry has intensified the use of Deceptive Patterns (DPs) – design strategies that, while profitable, undermine players' psychological well-being by frustrating their needs for autonomy, competence, and relatedness, as defined by Self-Determination Theory (SDT). In response, ethical alternatives, such as Radiant Patterns (RPs), have been proposed; however, they have remained mainly theoretical. This study addresses this gap with a twofold contribution. First, it details the refinement and operationalization of the RPs concept, transforming it from an abstract idea into a structured framework for well-being-oriented design. Second, it presents the development and evaluation of The Good Dev (TGD), the first critical game to implement this refined framework. TGD was evaluated in two phases (Alpha and Beta tests) using a mixed-methods approach, including validated instruments and semi-structured interviews. Findings reveal that while players recognize DPs, they are unaware of the psychological impact these patterns have on player well-being. The game demonstrated high playability and engagement, proving effective in fostering critical reflection on design ethics. Ultimately, this study highlights the potential of combining the RP framework with critical gameplay to empower players and contribute to healthier digital gaming environments.

Keywords: Radiant Patterns, Deceptive Patterns, Dark Patterns, Critical Game, Self-Determination Theory

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1 Introduction

Digital games reflect the social context and values of their time [Fizek *et al*., 2023]. As the game industry continues its rapid expansion – the global games market generated $184 billion in revenue and engaged over 3 billion players worldwide in 2023 [Wijman, 2023] – games have become deeply embedded in contemporary culture and everyday life [Hsiung *et al*., 2023]. Within this landscape, a critical challenge emerges for the field of Human-Computer Interaction (HCI): balancing industry interests with players' well-being [Miranda *et al*., 2022; Peters *et al*., 2018; Johannes *et al*., 2021].

To address this challenge, we draw on Self-Determination Theory (SDT), which has emerged as a promising theoretical framework for guiding ethical design practices. SDT posits that well-being stems from the fulfillment of three basic psychological needs (autonomy, competence, and relatedness), and when these needs are satisfied, they foster optimal motivation; when they are frustrated, they lead to ill-being [Deci and Ryan, 2012; Uysal and Yildirim, 2016]. The frustration of users' basic psychological needs has been extensively studied within the HCI community [Ballou and Deterding, 2023; Tyack and Mekler, 2020; Wolf *et al*., 2022]. This frustration is often associated with deceptive design patterns that negatively impact users [Allen and Anderson, 2018]. In the literature, these patterns are commonly referred to as *Deceptive* or *Dark Patterns* (DPs), which are tricks embedded in websites, games, and applications to manipulate users into taking unintended actions, such as making purchases or subscribing to services [Brignull, 2023].

Design patterns of this nature undermine a user's capacity for informed choice, operating independently of a designer's underlying motives Darin [2024]. By targeting specific cognitive vulnerabilities, these frameworks manipulate users into disclosing personal information, prolonging session times, or acquiring unnecessary products Brignull [2023]; Mathur *et al*. [2021]. Adopting DPs results in highly engaging games, supported by design practices that exploit strategies harmful to users' autonomy [Zagal *et al*., 2013; Rogers, 2017]. Consequently, the engagement versus addiction dilemma arises [Yang and Gong, 2021], as excessive engagement can lead to dependence and negatively affect well-being across multiple levels and contexts [Rigby and Ryan, 2011; Hefner and Vorderer, 2017]. Recognizing the harms of excessive gaming, the World Health Organization (WHO) now includes Gaming Disorder (GD) in the ICD-11 [World Health Organization, 2020]. The disorder is defined by a loss of control where gaming takes precedence over other life activities despite negative consequences, and is linked to aggressive behaviors, withdrawal symptoms, reduced well-being, and weakened relationships [Gavriel-Fried *et al*., 2023; Stevens *et al*., 2021].

Although researchers warn that design strategies employed in games – particularly DPs – are potential risk factors for GD [Jěčius and Frestadius, 2022; Stockman *et al*., 2024; Sousa and Oliveira, 2023], DPs as mechanics and features are well-known in the game industry by both developers and players. However, the consequences of their use are often poorly understood or even disregarded [Darin, 2024]. Developers may adopt these patterns without fully understanding

their negative implications, frequently replicating strategies already present in other games – such as daily rewards or loot boxes – in pursuit of profit and engagement [Spicer *et al*., 2022]. Likewise, players may remain active in games that employ these patterns due to the manipulative techniques embedded in them, resulting in frustration and compromising their autonomy [Stockman *et al*., 2024]. The uncritical repetition of this model perpetuates a cycle of potentially harmful practices. Breaking this cycle requires identifying harmful patterns and offering constructive design alternatives.

Developing practical and positive design solutions for games, such as Bright Patterns [Sandhaus, 2023] and Fair Patterns [Potel-Saville and Da Rocha, 2024], which aim for transparent and balanced interfaces that preserve user autonomy, requires further efforts. However, they have not yet fully covered the gap of actionable ethical practices in games. In this context, the study by Miranda *et al*. [2022] introduced the **Radiant Patterns (RPs)** as an alternative for developers, posing the RPs as patterns intentionally used to preserve well-being and meet players' basic psychological needs. The work of Santos Filho and Darin [2026] moved Radiant Patterns from theory toward practical application by refining the concept and beginning its operationalization. This study adopts their operationalized framework to develop new patterns and test their utility in real world settings.

This article expands on the work first presented at the *XXIII Brazilian Symposium on Human Factors in Computing Systems (IHC 2024)* by Santos Filho *et al*. [2024]. The main objective of this expanded version is twofold. First, to detail advances and refinements that transform the RPs concept from an abstract idea into a structured tool, with a clear problem, context, and solution framework to support the development of games that consider player well-being.

Second, to present the first initiative applying RPs through their incorporation in the development and evaluation of *The Good Dev* (TGD) (Sousa Junior *et al*. [2025]), a critical game designed to apply this RP framework. Grounded in SDT, TGD is a meta-critical, decision-making game that empowers players by revealing the consequences of design choices. Players assume the role of a developer, choosing between alternatives based on RPs and DPs, where each decision leads to one of seven possible outcomes and fosters reflection on player well-being.

Through this work, we aim to inspire the HCI & Games community to incorporate RPs, proposing theoretical lenses and describing healthy patterns to create experiences that promote psychological growth and well-being. Ultimately, we present our findings as a design challenge to the community, inviting them to build upon these concepts and create more ethical games.

The remainder of this paper is structured as follows: Section 2 presents the theoretical background, Section 3 discusses related work, and Section 4 details the methodology used for TGD's development and evaluation. Section 5 presents the expanded RPs concept and framework. Section 6 reports the results from our user studies, while Section 7 discusses the findings and their implications. Finally, Sections 8 and 9 discuss the limitations and ethical issues of this research, followed by the Conclusion in Section 10.

2 Background

This section defines the key concepts and theoretical frameworks that contextualize and underpin our research.

2.1 Deceptive Patterns

Deceptive Patterns (DPs) (also known as "Dark Patterns") are tricks employed in websites and applications to induce users into unintended actions, such as making purchases or subscribing to services [Brignull, 2023]. These persuasive patterns influence users to take actions that result in negative consequences for them [Barbosa *et al*., 2021].

Initially cataloged for graphical user interfaces, DPs were first classified into 12 types by Brignull [2010]. Later, Gray *et al*. [2018] expanded this taxonomy by identifying five common types in virtual environments: *Nagging*, which involves interrupting the user's intended interaction to persuade them to take a different action (e.g., social networks insisting that users enable notifications); *Obstruction*, which makes an activity more difficult or costly in order to discourage the user from completing it (e.g., a newsletter that makes it difficult for users to cancel their subscriptions); *Sneaking*, which hides relevant information from the user (e.g., a website that includes an unwanted magazine subscription during the checkout process); *Interface interference*, which manipulates the user interface to favor certain choices over others (e.g., presenting important information with low-contrast text, making it difficult to read); and finally, *Forced action*, which compels the user to perform an unnecessary action to access a feature (e.g., forcing the user to enter personal information in order to proceed to the next page).

Zagal *et al*. [2013] directed the study of DPs toward the digital games industry. They categorized these patterns into four types: Temporal, referring to time-related mechanics that conflict with the player's expectations; Monetary, which involve strategies designed to deceive players into spending more money than they initially intended; Social Capital, which manipulate the social aspects inherent to the player's life by creating a sense of social obligation; and Psychological Tricks, which incorporate concepts from psychology and behavioral economics.

The frequency and type of DPs in games vary depending on context, implementation, target audience, and other factors [Zagal *et al*., 2013]. Developers may employ monetary patterns (e.g., Pay to Skip or Pay to Win) to increase profit, or temporal patterns (e.g., Grinding or Wait to Pay) to extend playtime. The frequent use of such patterns manipulates players, leading to compulsive behaviors, frustrating their basic psychological needs, and promoting ill-being [Deci and Ryan, 2012].

Although there are no specific tools to combat DPs, various research techniques are being explored to identify and mitigate them [Helamo, 2023]. SDT, which aims to promote well-being through the satisfaction of basic psychological needs [Deci and Ryan, 2012], has been applied in conjunction with HCI to develop design patterns that foster positive experiences for players [Darin *et al*., 2023; Miranda *et al*., 2022; Ballou and Deterding, 2023; Tyack and Mekler, 2020; Wolf *et al*., 2022].

Therefore, it becomes necessary to develop strategies that evoke transformative and critical reflection, both from

developers and players, to encourage a behavioral shift that prioritizes practices focused on well-being in game development and consumption.

2.2 Self-Determination Theory (SDT)

SDT is an organismic theory that examines how social and contextual factors influence individuals' well-being through the satisfaction of their basic psychological needs [Ryan and Deci, 2017, 2000]. SDT critically analyzes the elements that promote vitality, motivation, initiative, social integration, and well-being, while also identifying those that lead to exhaustion, disintegration, antisocial behavior, alienation, and unhappiness [Ryan and Deci, 2000]. It therefore investigates how biological, social, and cultural conditions can support or hinder psychological development, engagement, and well-being [Ryan and Deci, 2017].

The Basic Psychological Needs Theory (BPNT) – one of SDT's mini-theories – identifies three fundamental psychological needs [Ryan and Deci, 2017]: autonomy, competence, and relatedness. **Autonomy** refers to the need to act in accordance with one's own goals, principles, and values. **Competence** refers to the need to feel capable and effective in facing challenges. **Relatedness** refers to the need to feel connected to others and a sense of belonging to a group. The satisfaction of these needs fosters motivation, well-being, and personal growth, while their frustration can lead to stress and ill-being [Ryan and Deci, 2000; Ryan *et al*., 2013].

Basic psychological needs are a relevant concept in HCI [Ballou and Deterding, 2023; Van Roy and Zaman, 2019]. Researchers and practitioners have increasingly focused on studying happiness, human growth, and well-being in the context of technology use [Peters *et al*., 2018]. Technologies can influence psychological well-being, either intentionally or unintentionally. Engagement and enjoyment, while important for player experience, do not necessarily guarantee a positive psychological state [Ryan and Deci, 2017].

Thus, SDT stands as a fundamental theoretical foundation for well-being–oriented game design. By understanding how the satisfaction (or frustration) of basic psychological needs affects player motivation and experience, SDT provides a solid framework for guiding more ethical and conscious design decisions. Incorporating its principles into game development enables designers to create experiences that not only engage and captivate players but also promote their intrinsic motivation, personal satisfaction, and lasting well-being.

2.3 Critical Games Development

The design of critical games aims to foster awareness of games as sociocultural artifacts [Romero, 2016]. Flanagan [2018] explores critical design as a way to engage players in critical dialogue through game mechanics. Critical games use play as a provocative tool to reorient players [Malazita and O'Donnell, 2023], serving as a method of social intervention [Malazita and O'Donnell, 2023].

Critical game design practices seek to convey messages and promote critical thinking by questioning the operational logics of institutional spaces [Flanagan and Nissenbaum, 2007; Malazita and O'Donnell, 2023]. Over the past decades, critical games have addressed social issues such as war, social inequality, and political power [Flanagan and Nissenbaum, 2007], expanding to explore complex themes with social, political, aesthetic, or educational goals [Flanagan, 2010]. Examples such as McDonalds Game[1] focusing on the ambiguous practices of big corporations, September 12th[2] which aims to create debate around the war against terrorism, and LAYOFF[3] focusing on empathy with the financial crisis as a background context, demonstrate the diversity of themes and approaches found in critical games. These examples address specific social issues that are relevant to contemporary audiences and also explore concepts of autonomy and learning [Flanagan and Nissenbaum, 2007].

The Activity Theory-Based Model for Serious Games (ATMSG) supports the development of critical games by mapping game, learning, and instructional design elements onto game mechanics [Carvalho *et al*., 2015]. Based on the Activity Theory, the ATMSG defines activity as an intentional interaction between subject and object, aimed at achieving mutual transformation [Kaptelinin and Nardi, 2009].

The ATMSG structures activity into three hierarchical levels: action, tool, and objective. At the highest level, the activity is driven by an action, performed through the use of tools, in order to achieve a specific goal [Kaptelinin and Nardi, 2009]. In serious games, the ATMSG connects game components with their educational objectives [Carvalho *et al*., 2015]. It breaks down each level into three types of activity: Game Activity, Learning Activity, and Instructional Activity. The Instructional Activity is further divided into Intrinsic Instruction and Extrinsic Instruction [Carvalho *et al*., 2015]. For each activity, there is a corresponding sequence of action, tool, and objective, referred to as "Serious Game Components" [Carvalho *et al*., 2015].

The ATMSG has been successfully applied in the design of serious games for both conceptual and evaluative purposes [Gauthier *et al*., 2022; Callaghan *et al*., 2018]. For example, Gauthier *et al*. [2022] used the framework in the redesign of the game Stop & Think (S&T) with the goal of shifting the instructional aspect from extrinsic instruction to intrinsic instruction (i.e., transforming S&T from an externally driven learning environment to one that fosters autonomous learning).

2.4 Radiant Patterns Context

Deceptive practices in game design have emerged as a rising concern within player research, with several DPs already identified, cataloged, and their consequences studied [Darin and Carneiro, 2026]. Moreover, beyond merely examining the consequences of these patterns, research on how to mitigate their effects has also become a point of interest within the HCI community [Gray *et al*., 2024; Schäfer *et al*., 2024; Darin and Carneiro, 2026].

Different mitigation approaches to address the harms caused by DPs in games have been proposed within HCI research, including regulatory measures [Herman, 2024], ethical design guidelines [Frommel and Mandryk, 2022], and

[1] `https://www.molleindustria.org/mcdonalds/` (Accessed on 12 Dec 2025)

[2] `https://kotaku.com/games/september-12th-a-toy-world` (Accessed on 12 Dec 2025)

[3] `https://tiltfactor.org/game/layoff/` (Accessed on 13 Dec 2025)

educational initiatives [Aagaard *et al*., 2022] aimed at empowering players. Among these approaches, the Radiant Game Design Patterns – or simply Radiant Patterns (RPs) – stand out as an alternative to DPs by proposing strategies that both mitigate their negative consequences and satisfy players' basic psychological needs.

RPs are a group of game design patterns based on SDT that aim to promote player well-being [Miranda *et al*., 2022], as stated in the definition:

> Radiant Patterns are patterns intentionally used by developers in the creation of digital games to preserve player well-being, preventing negative experiences and seeking to satisfy the player's basic psychological needs. These patterns act as the antithesis to unethical DP patterns by seeking to contribute positively to player health.

Unlike the unethical nature of DPs, RPs are grounded in ethical principles and aim to make a positive contribution to players' well-being. However, although conceived as a design practice intended for implementation, the RPs framework still remains largely conceptual or theoretical. Therefore, a critical step is to operationalize this concept, transforming it from a theoretical ideal into a practical framework that can be effectively applied in game design contexts, a challenge this paper addresses in Section 5.

3 Related Work

This section explores related work on the use of games to promote awareness of relevant societal and ethical issues, with a particular focus on studies grounded in SDT and those investigating the negative consequences of DPs.

3.1 Games Aimed at Fostering Awareness

Spyridonis and Daylamani-Zad [2019] developed GATE, a serious game designed to raise awareness among designers about web accessibility guidelines. The study concluded that the game is a promising tool for increasing awareness and adoption of these guidelines, emphasizing the importance of evaluating usability to ensure the game is both educational and user-friendly. In the field of cybersecurity, Hart *et al*. [2020] created Riskio, a game intended to raise awareness about cyberattacks. The study found that the game provides an active learning environment in which players assume the roles of attackers and defenders within a fictional organization.

Ghodsvali *et al*. [2022] developed S.N.O.G., a serious game focused on environmental issues to support decision-making in urban food–water–energy systems. The study concluded that the game enhances learning policy outcomes by helping participants identify and understand the drivers of integrated resource management, highlighting how decision-making mechanics can be effective for content assimilation.

Similar to these studies, the present work employs a serious game to increase user awareness. However, our focus lies on fostering reflective awareness, encouraging players to critically reflect on the ethical implications of DPs in game development. The decision-making mechanics, similar to those used in Riskio [Hart *et al*., 2020] and S.N.O.G. [Ghodsvali *et al*., 2022], are employed to place players in the role of a developer, enabling them to experience the consequences of their choices and thus stimulating deeper reflection on the topic.

3.2 Games Grounded in SDT

Ryan *et al*. [2006] investigated the effects of SDT on player well-being, concluding that the satisfaction of basic psychological needs is associated with higher levels of enjoyment and engagement, as well as improvements in overall well-being. Rogers [2017], in examining how feedback, rules, and social elements in games relate to the dimensions of SDT, corroborated these findings. They concluded that games featuring flexible rules and social components enhance players' feelings of competence and relatedness, contributing to a greater sense of enjoyment.

Going beyond need satisfaction, Mills *et al*. [2018] investigated the role of need frustration in game frequency. The author found that both the satisfaction and frustration of psychological needs contribute positively to how frequently individuals engage with games.

In line with these studies, the present work acknowledges the importance of SDT in shaping the player experience. However, our focus is on raising awareness about the negative consequences of DPs, specifically how the use of such patterns can frustrate users' basic psychological needs. While previous studies have primarily focused on the effects of need satisfaction and frustration on player experience, this study explores the role of DPs as potential sources of that frustration, aiming to promote critical reflection on their ethical use in game development.

3.3 Studies Investigating the Consequences of DPs in Digital Games

Stockman *et al*. [2024] investigated the use of aesthetic manipulation patterns in the game FarmVille 3, highlighting how "cute design" is used to diminish players' sense of autonomy. Jěčius and Frestadius [2022] analyzed the experiences of both novice and veteran players with reward systems in Genshin Impact, a game known for its use of DPs. The study concluded that the overuse of such patterns distracts players from the lack of meaningful goals, leading them to continue playing solely due to the manipulative effects of those systems.

Expanding this line of research, Sousa and Oliveira [2023] examined the presence of DPs in mobile digital games targeted at children aged 0 to 5, analyzing the most popular free games on the App Store. The study revealed the widespread presence of deceptive strategies, including temporal, monetary, and psychological manipulations, that negatively affect young users.

As in the studies discussed above, the present work acknowledges the widespread presence of DPs across games of various genres and target audiences. However, while most of the existing research focuses on identifying and analyzing the negative consequences of these patterns, our work seeks to address the gap in studies that explore mitigating strategies. We developed a serious game grounded in SDT that aims to raise user awareness about DPs, encouraging critical reflection on their ethical implications and promoting positive change in game design and player experience.

Taken together, previous studies demonstrate the potential of serious games to promote awareness, the relevance

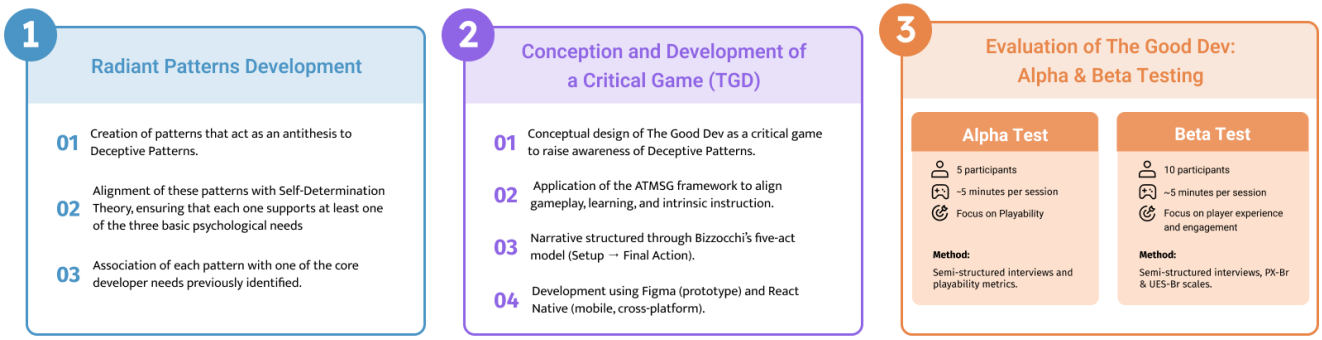


Figure 1. Overview of the study's development and evaluation phases, including the design and testing of The Good Dev. Click here for a better visualization of this figure.

of SDT in understanding player experiences, and the growing concern around the negative impact of DPs in digital games. However, there remains a lack of research focused on actionable, reflective strategies to mitigate these patterns, particularly through game-based interventions that support critical awareness and psychological well-being. Addressing this gap, the present study proposes and evaluates a critical game designed to promote ethical reflection on the use of DPs in game development, guided by the theoretical principles of SDT. The following section details the methodological approach adopted in the design, development, and evaluation of this game.

4 Methodology

The goal of this study was to stimulate reflection on design patterns by exploring the potential of a critical game and SDT as tools to achieve this aim. To accomplish this, TGD's development and evaluation were structured into four main phases: **(1) RPs Development, (2) Conception and Development of a Critical Game (TGD)**, **(3) Evaluation of The Good Dev**, conducted in two complementary stages: the *Alpha Test*, focusing on the evaluation of playability facets, and the *Beta Test*, focusing on the evaluation of player experience and engagement (Figure 1). The following subsections detail each stage of this process.

4.1 Phase 1: RPs Development

To create the positive patterns that would be used in the critical game, we used Miranda *et al*. [2022]'s definition of a Radiant Pattern. Those positive patterns, in turn, were empirically developed by a group of 3 researchers (two undergraduate students and one graduate student) through a three-step process: (1) Creation of patterns that act as an antithesis to DPs, (2) Alignment of these patterns with SDT, ensuring that each one supports at least one of the three basic psychological needs, and (3) Association of each pattern with one of the core developer needs previously identified.

The initial positive patterns were designed as direct antitheses to DPs. For example, we created a positive prototype called "Certain Purchase" as a counterpart to the Accidental Purchase pattern. However, simply contrasting a negative pattern does not guarantee that the resulting pattern is inherently positive. Based on SDT, it was necessary to align each positive pattern prototype with at least one basic psychological need to ensure that it would meet user needs and promote well-being. Finally, the positive pattern was adjusted to match a developer need, enabling it to serve as a meaningful and ethical alternative to a Dark Pattern.

From the 14 RPs created, six were selected to compose the critical game. These patterns were organized into a spreadsheet containing the following information: description, use, related patterns, examples, basic psychological needs met, and cautions to take when using each pattern. This spreadsheet was evaluated by a senior game researcher who was responsible for reviewing, correcting, and expanding the information presented.

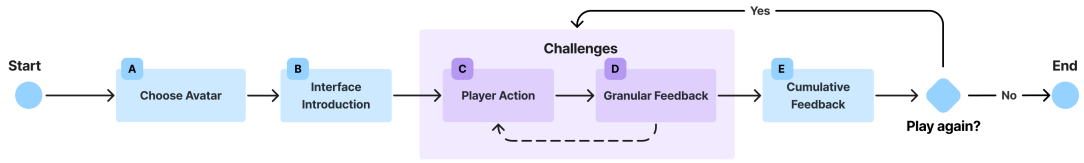
4.2 Phase 2: Conception and Development of a Critical Game (TGD)

In this phase, we developed a critical game called The Good Dev (TGD). The game's conceptualization phase employed the ATMSG framework [Carvalho *et al*., 2015] to integrate gameplay elements, learning activities, and intrinsic instruction, enabling the game itself to convey content to the player. We adapted ATMSG – originally developed for serious games – to raise players' awareness of DPs, embedding learning activities throughout the game experience.

ATMSG guided the design process through four key stages:

1. **Activity Description:** We identified the subjects and motivations for each activity (gameplay, learning, and intrinsic instruction), ensuring consistency between the players' actions and the intended outcomes.
2. **Game Sequence Representation:** We created a visual diagram of TGD flow (Figure 2), representing major interaction points and action loops.
3. **Identification of Actions, Tools, and Objectives:** We decomposed each interaction point into player actions, interface tools (e.g., buttons, menus), and intended learning objectives, using Bloom's Taxonomy [Almerico and Baker, 2004] as a reference.
4. **Implementation Description:** We developed a detailed description of TGD's implementation, specifying the functionality of each element within the player experience.

The combined application of these four stages, as proposed by Carvalho *et al*. [2015], resulted in a comprehensive and structured description of TGD, encompassing everything from its general objectives and features to its implementation



		A Choose Avatar	B Interface Introduction	C Player Action	D Granular Feedback	E Cumulative Feedback
GAMEPLAY ACTIVITY	Actions	Customize	Obtain help	Select Read Informations	Watch/ Listen to/ Read Information	See performance evaluation
	Tools	Avatars Information	Tutorial	Cards Information	Karma Points Composite Metrics Performance Record	Karma Points Composite Metrics Performance Record
	Goals	Configure game	Learn to use interface	Reach narrative end Get acquainted with story	Maximize performance	Get acquainted with story
LEARNING ACTIVITY	Actions	X	Visualize	Observe Interpret Decide Judge	Read Interpret	Examine Find more information about
	Tools	X	Definitions Rules Texts	Events Problems	Graphic Text Story	Conclusion Report
	Goals	X	Remembering Understading	Remembering Understanding Internalizing Values	Understading Internalizing Values Perception	Reflective observation Understading
INTRINSIC INSTRUCTION	Actions	X	Present Material	Repetion Show similar problems Tell Story	Qualitatively assess perfomance Quantitatively assess perfomance Tell Story	Qualitatively assess perfomance Quantitatively assess perfomance Tell Story
	Tools	X	Help Text	Challenge Limited set of problems Story	Performance Measures Story	Performance measures Story
	Goals	X	Inform learner of objective Provide Learning Guidance	Attentions Provide Learning Guidance	Provide Feedback	Gain Attention Assess Performance Reflective observation

Figure 2. Visual diagram of the ATMSG model describing the mechanics and flow of the critical game. The diagram details the sequence of game mechanics into actions, tools, and objectives for each activity – gameplay, learning, and intrinsic instruction – using the serious game component taxonomy proposed by Carvalho *et al*. [2015]. Click here for a better visualization of this figure.

details, such as the interface, rules, feedback, and progression.

Following the structural design of TGD, we developed the narrative arc using the framework proposed by [Bizzocchi, 2007], which is divided into five stages: Setup, Problem, Development, Climax, and Final Action. The goal was to create an engaging narrative that would guide players through an immersive experience, conveying the message about DPs and their impact on well-being. The critical game was developed for mobile devices, using Figma for interface prototyping and React Native for cross-platform development (Android and iOS). This approach ensures broader accessibility, allowing users to engage with the game without requiring specific hardware.

4.3 Phase 3: Evaluation of The Good Dev: Alpha and Beta Tests

We conducted two test sessions with complementary objectives to investigate participants' understanding of the game's message and to assess its reflective potential, as well as key aspects of engagement, playability, and player experience.

4.3.1 Alpha Test

The Alpha Test was conducted remotely with the goal of evaluating the player experience and gameplay attributes of TGD. To this end, five playtests were carried out using a combination of digital tools: *Google Meet* for videoconferencing, *OBS Studio* for recording participant interactions, and *AnyDesk* for screen sharing and real-time interaction with the game emulated on *Android Studio*. Each session lasted approximately 30 minutes, with around five minutes dedicated to the gameplay phase. This stage allowed for feedback collection to identify and correct issues before testing with a larger sample in the Beta Test.

Participants. Five undergraduate students in the field of technology, all female and aged between 18 and 24, participated in this stage of the study. The selection followed a convenience sampling method, involving students from the Federal University of Ceará who were linked to related research projects or had prior contact with the researchers, all of whom were already familiar with SDT. Table 3 presents more information about the participants.

Methods. The Alpha Test was conducted by one evaluator and two research assistants (one responsible for note-taking and the other for emulating the critical game), and it was divided into five steps, namely:

1. Presentation and signing of the Informed Consent Form (ICF)[4];
2. Completion of a player profile questionnaire designed by the researchers to gather relevant background information;
3. A free play session;
4. Application of the playability metrics proposed by Sánchez and Vela [2014], a validated instrument used to assess the game experience through various gameplay facets;
5. A semi-structured interview to gain deeper insight into the gameplay experience.

[4]Further details on the ethical procedures can be found in Section 9.

As a mandatory prerequisite, all subsequent steps were performed only after the participant provided formal consent by signing the ICF. The player profile questionnaire consisted of 11 questions divided into three sections: sociodemographic data, experience with digital games, and familiarity with SDT and critical games.

The playability evaluation took place during the play session, in which each participant completed one full run of TGD, composed of six consecutive levels. After the session, participants responded to the playability metrics questionnaire proposed by Sánchez and Vela [2014], which consists of 30 statements divided into six sections, each assessing a different playability attribute: intrinsic, mechanical, interactive, artistic, personal, and social. For each statement, participants indicated their level of satisfaction using a 5-point Likert scale ranging from 1 (Very Dissatisfied) to 5 (Very Satisfied). The instrument uses the average score of each facet as the metric for overall playability.

Next, we conducted a semi-structured interview composed of 10 questions (four general and six in-depth questions). The interview explored topics such as the user's experience with the critical game, the quality of the information presented, previous exposure to critical games, and the curiosity sparked about design patterns in digital games.

Quantitative data were analyzed using basic descriptive statistics and presented in tables and charts. The interviews were transcribed, segmented into meaningful units, and analyzed to identify critical incidents. Based on gameplay session recordings and insights gathered during the interviews, confusing or incomplete interaction points were identified and subsequently revised for the Beta Test.

4.3.2 Beta Test

The Beta Test was conducted with the goal of evaluating the quality of interaction between the player and the game, based on the gameplay adjustments identified during the Alpha Test. A total of 10 remote evaluations were carried out, using the same tools and setup as in the previous stage, but with a new group of participants who had not taken part in the Alpha Test.

Participants. Ten participants took part in this stage, including six men, three women, and one person identifying as non-binary, aged between 18 and 40 years. The sample followed a convenience sampling method, composed of individuals recruited through the researchers' own contacts and networks. More information about the participants is presented in Table 3.

Method. As in the previous stage, the process included the presentation of the Informed Consent Form (ICF), an ad-hoc profile questionnaire, a free play session, a post-game questionnaire, and a semi-structured interview. However, unlike the Alpha Test, the questionnaires used in this stage were the User Engagement Scale – Brazilian Portuguese version (UES-Br) [Miranda *et al.*, 2021], which measures user engagement, and the Player Experience Inventory – Brazilian Portuguese version (PX-Br) [Aranha and Nunes, 2022], which evaluates player experience. Both are validated instruments translated into Brazilian Portuguese. A total of 10 remote evaluations were conducted, using the same tools and setup as in the previous stage, but with a new set of participants who had not taken part in the Alpha Test.

As in the Alpha Test, participants were first presented with the Informed Consent Form (ICF), following the same procedures as the previous stage. After signing the form, each participant completed a profile questionnaire containing 11 questions divided into three sections: sociodemographic aspects, experience with digital games, and familiarity with the concepts of SDT and critical games. This questionnaire was used to characterize the participant profile for the Beta Test.

After completing the profile questionnaire, participants played a full session of TGD consisting of six consecutive levels with the gameplay phase lasting around five minutes. At the end of the session, they completed the PX-Br [Aranha and Nunes, 2022] and UES-Br [Miranda *et al.*, 2021] questionnaires, presented in randomized order. The PX-Br is a validated Brazilian Portuguese instrument that evaluates immersion/presence, enjoyment, and playability through three statements. Participants indicated their level of agreement using a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The UES-Br measures engagement with interactive systems through 30 items, also using a 5-point Likert scale. This instrument calculates individual factor scores and uses their average as a measure of overall engagement.

Finally, participants took part in a semi-structured interview consisting of 10 questions (4 general and 6 in-depth), aimed at investigating whether TGD's mechanics and components effectively communicated their objectives and message, and how this influenced their experience. As in the Alpha Test, the interview covered topics such as the user's experience with the critical game, the quality of the information presented, prior experiences with critical games, and the curiosity sparked around the concept of design patterns in digital games.

The evaluations were conducted remotely, each lasting approximately 30 minutes, using *Google Meet* for videoconferencing, *OBS Studio* for recording interactions, and *AnyDesk* for screen sharing and real-time interaction with the critical game emulated in *Android Studio*. Both quantitative and qualitative data were analyzed together to assess whether the study's main goal was achieved (i.e., stimulating reflection among players and developers about design patterns through a critical game) and evaluate the player experience and engagement.

5 RPs Concept Expansion and TGD's Concept

In this section, we present the development of the critical game TGD that seeks to explore RPs in contrast to DPs in order to explore the critical reflection generated by the consequences of using these patterns. First, we present the logic used to develop these RPs and the need to extend Miranda *et al.*'s concept of RPs. Next, we detail the development process of TGD, focusing on the construction of the decision mechanics.

5.1 Expanding RPs Concept

While developing the options for each challenge in TGD, we referred to the definition of RPs to design options that would

not undermine the basic psychological needs of the end user. We discussed this definition and its application in various situations, focusing on the developers' needs while prioritizing players' well-being. Our goal was to demonstrate that developers can create engaging game design choices without harming players. As a result, we propose a set of six patterns and refine the definition of RPs. This process aimed to enhance conceptual clarity and practical applicability while preserving the original ethical principles outlined.

The original version, which we will refer to as **Definition A**, characterized RPs as "patterns intentionally used by a developer in the creation of digital games to preserve the player's well-being, avoiding negative experiences and aiming to satisfy the player's basic psychological needs." [Miranda *et al*., 2022]. This definition explicitly tied intentional design practices in game development to the essential issues of player well-being and fulfillment of intrinsic psychological needs, as SDT described. By doing so, Definition A could establish the central ethical argument that design choices bear responsibility for their possible psychological state impacts on players beyond functional or engagement-driven considerations. It was simple and direct, and its language was committed to a player-centered, ethically-driven design aiming to safeguard psychological well-being.

However, Definition A was particularly difficult to implement. It was characterized by the absence of clear operational parameters, as happens when using words such as "well-being" and the imperative "to maintain," which we found to be interpreted differently. The goal of "avoiding negative experiences" was very challenging, as the player experience depends on contextual and personal factors, in addition to design choices. It could also be interpreted as contradicting the value of challenge, difficulty, and even guided frustration to create engaging gameplay. We identified that it was necessary to discriminate between useful friction and genuinely detrimental experiences. In addition, the phrase "trying to fulfill" psychological needs conveyed a noble intention but was not specific about the expected outcome. We understand these difficulties to be inherent to the task of converting high-level ethical objectives into concrete design specifications. Hence, we iteratively refined the RP definition to provide more clarity and practical advice while remaining true to the underlying ethical ideals.

The new definition version, which we will call **Definition B**, formalizes this systematic refinement, building directly upon the ground rules established by Definition A. Definition B states that:

> "Radiant Patterns are interaction patterns intentionally selected and implemented during the digital game design process to allow the pursuit of development goals while ensuring foundational player well-being is not significantly undermined. Specifically, RPs avoid decreasing the player's autonomy, relatedness, and competence. An RP represents a conscious design choice focused on minimizing predictable risks of psychological harm and avoiding design patterns known to consistently frustrate these basic psychological needs, thereby establishing ethical boundaries for player experience."

This redefined definition keeps the fundamental principles of intentionality and prioritization of well-being but brings more specificity. First, calling them "interaction patterns" indicates a more tangible artifact, with a basic structure, comprised of a description of the problem, the context in which it occurs, and the proposed solution [Kruschitz and Hitz, 2009]. The explicit recognition of the "pursuit of development goals" situates the RP concept in the pragmatic context of game development. However, protecting player well-being is an essential boundary to observe (i.e., ensuring fundamental player well-being is not noticeably compromised) rather than a discrete goal. This wording establishes a more realistic and observable definition for creating RPs.

Further changes address the uncertainties regarding SDT needs and negative experiences. Instead of "aiming to satisfy," Definition B articulates that RPs specifically "avoid diminishing the player's autonomy, relatedness, and competence." This shifts the emphasis to a more preventative function that includes preserving current levels of need satisfaction from being undermined by design choices. Hence, the improbable goal of avoiding all negative experiences is replaced with the more specific goals of "minimizing predictable risks of psychological harm" and "avoiding design patterns known to frustrate these basic psychological needs consistently." This focuses on anticipated adverse effects directly associated with psychological harm and SDT frustration, giving designers concrete criteria based on known risks and established anti-patterns.

Therefore, Definition B preserves the ethical foundation of Definition A while providing the practical specificity needed for implementation in game design. The concept is maturing from a simple ethical assertion to a more elaborate, actionable design principle. The RPs' original definition was more philosophical, but its refined version is more attainable.

5.2 A Set of Radiant Patterns

Based on the refined definition of RPs (Definition B), we developed a set of actionable patterns designed to address common developer needs without resorting to deceptive practices. Each of the following six patterns was structured to serve as a practical guide for designers, detailing the problem, context, and a proposed solution that supports players' basic psychological needs for autonomy, competence, and relatedness.

To illustrate each pattern presented, we selected digital games that contained elements capable of strengthening the basic psychological needs of players, that is, that demonstrated the potential to be considered radiant. The choice of these games was guided by the researchers' previous experience, who used their repertoire of knowledge about games to identify situations, mechanics, and systems that could concretely exemplify how Radiant Patterns can be applied in games to satisfy a condition that positively dialogues with the proposed framework.

Each pattern follows the same structure, as follows:

- **Pattern**: The name of the pattern
- **Problem**: A description of the game design issue that this pattern aims to address
- **Context**: Recommended scenarios and game styles where this pattern can be applied

- **Proposed Solution**: How this Radiant Pattern can effectively address the identified problem
- **Avoiding Decrease in Autonomy, Relatedness, and Competence**: A description of how the pattern supports the user's basic psychological needs
- **Watch For**: How to minimize predictable risks and avoid frustrating patterns
- **Example of Implementations**: A discussion on implementation strategies and considerations to prevent potential pitfalls
- **Good Examples**: A list of applications or games that effectively incorporate this pattern

5.2.1 Pattern: World Creation

Problem: Players may have too little agency, creative paths, or channels of meaningful expression within the boundaries of a game's pre-determined parameters. Inert game worlds can restrict long-term play and social interaction based on common experience.
Context: Digital games where players interact with game systems and potentially each other. Applicable across various genres (e.g., sandbox, platformers, creative suites).
Proposed Solution: Allow players to create, customize, and collaborate on or share scenarios using readily accessible tools and resources, deliberately avoiding dependencies on direct payment or excessive repetitive grinding for core creative functions.

Avoiding Decrease in Autonomy, Relatedness, and Competence:

- **Autonomy:** World Creation promotes autonomy by giving players plenty of control and freedom (the autonomy to customize their own environments) over their creations and their interaction with the game world. It prevents reducing autonomy by definition.
- **Competence:** The pattern enables players to learn, master tools, be creative, and overcome design challenges, harnessing their creativity (sense of accomplishment). Successfully creating and sharing content builds a sense of competence. It prevents a loss of competence by offering the possibility of skill development.
- **Relatedness:** Being able to share creations, collaborate, or play others' work (e.g., share these creations and invite other players to join, encouraging social interaction) satisfies relatedness needs. Facilitating social connection through collaborative creative activities prevents a decrease in relatedness.

Watch For: A properly designed World Creation pattern would go out of its way not to make fundamental creative tools conditional on excessive grinding or direct payment. These are predicted risks for psychological harm (frustration, exploitation) and are set patterns that necessarily thwart autonomy (loss of liberty to create) and competence (progress feels hindered or artificial). The bottom line for maintaining the World Creation framework as an RP is that fundamental creative tools, basic elements, and the main ability to save and share creations should not be expressly limited by financial constraints or only provided through substituting payment for excessive grind. Monetization has to target optional enhancements, platform access, or adjacent community offerings, all so that the basic act of creation is kept separate and proficiency-dependent without creating financial pressure as a barrier to core activity.

Example of Implementations:

- **Negative Implementations (Failing to Meet RP Criteria):**
  - *To gate key components*, required mechanisms, or the storage and sharing of works behind boring, repetitive gameplay cycles (grind) or outright financial expenditure. Imposing costs on essential tools would directly hinder autonomy, as players are unable to freely realize their creative vision and competence, given that the capacity to construct is unjustly restricted by external factors unrelated to creative ability.
  - *Poor implementations or Obfuscated Tools.* The presentation of creation tools that are poorly designed, buggy, lack basic features (like precise positioning or undo functions), or are poorly documented undermine the player's feeling of competency, making them feel hampered in their ability to realize their ideas because of limitations imposed by the tools instead of limitations imposed by their skill level. In addition, this reduces autonomy by making specific forms of creative expression effectively impossible.
  - *Restrictive Sharing and Discovery Mechanisms.* When sharing works is difficult, discovery of the works of others is inadequately supported (e.g., no search/curation), or there are arbitrary restrictions on what or how much can be shared, the relatedness dimension of the pattern is strongly negated. This can be annoying since many creators' motivations are sharing and communicating with the community. Restricting this diminishes the value of creation.
  - *Insufficient Scaffolding of Sophisticated Tools.* Very sophisticated creation environments can overwhelm users if not backed up by solid tutorials, progressive feature unlocking, or overt guidance (scaffolding). Unveiling tremendous complexity without help can consistently lead to frustration and abandonment, precluding competence.
- **Positive Implementations (In line with RP Criteria):**
  - *Accessible Core Creative Suite.* To make a robust set of core creation elements and tools immediately available to the player. Though some extra pieces may be gated behind an upfront barrier, the core capacity for creation and expression is untethered from unreasonable grinding or monetary expenses. This strongly encourages autonomy and establishes a foundation for competency development.
  - *Intuitive Design and Clear Feedback.* Offering user-friendly, responsive tools with clear feedback and adequate tutorials (integrated into the gameplay itself) gives players a sense of empowerment.

This directly supports competence by making the tools learnable and usable and minimizing frustration with the interface.

– *Facilitating Sharing and Community.* Emphasize being able to post and discover/play community content easily. Making sharing and discovery easy and satisfying enhances the entire creative ecosystem and avoids the frustrating trend of isolating creators. This might include sharing full games and experiences.
– *Optional Unlocks By Engaging Play.* While fundamental tools ought to be readily available, providing optional cosmetic qualities, upgraded parts, or thematic elements as rewards for participation in many of the game's aspects (which do not solely revolve around grinding) might suit the RP model. This would provide room for progress objectives without restricting required creativity, perhaps augmenting players' senses of competence as they acquire fresh creative possibilities.

Good Examples: The LittleBigPlanet [Media Molecule, 2008] game franchise has a "Create Mode" that allows players to create levels using tools provided by the developers. These levels can be accessed by other players if they are published to the community. Similarly, the Super Mario Maker [Nintendo EPD, 2015] franchise allows players to create levels using items and resources from other games in the Mario franchise (Figure 3). Dreams [Media Molecule, 2020] goes even further, allowing players to create entire games and experiences, both visually and musically.

Figure 3. Super Mario Maker UI showing how the assets can be properly presented to enable a positive experience during world creation.

5.2.2 Pattern: Item Evolution

Problem: Players need to perceive concrete indications of their growth and advancing competencies throughout the game. If there are no clear indications of improvement, growth can feel flat or unfulfilling, and this can compromise the feeling of achievement.

Context: Games featuring character progression, item systems, and often escalating challenges or narrative development. Common in RPGs, action-adventure games, Metroidvanias, and similar genres.

Proposed Solution: Game assets evolve (acquire improved statistics, abilities, or appearances) over time, which reflects player progression. This progression and its underlying costs must be disclosed to the player and primarily based on meaningful player achievements, display of skill, or through core gameplay mechanics discovery. Most importantly, the design should avoid leaving behind paths that require too much repetitive grinding, necessitate de facto real-money investment for real progress, hinge on obscure or excessively luck-dependent conditions, or unjustly dilute previous player achievements. The evolution system must foster player comprehension and agency over their progress, ensuring that the amount of effort feels proportionately and fairly compensated for.

Avoiding Decrease in Autonomy, Relatedness, and Competence:

- **Autonomy:** An RP-based item evolution system, where progress is experienced as earned through successful playing or exploration (e.g., items in Metroid opening up new paths), does not detract from autonomy. However, if the obtaining of essential evolved items entails gratuitous, non-voluntary grinding or purchase with real money, it significantly reduces perceived autonomy by removing meaningful choice and enforcing given, possibly tedious behavior. An RP implementation should avoid this reduction.
- **Competence:** This is the primary need covered. Connecting item development to conquering difficulties, acquiring experience, or showcasing talent directly bolsters feelings of ability (e.g., feeling more capable, being rewarded for their progress, or a sense of accomplishment). It furnishes clear confirmation of mastery and improvement. Along these lines, when done correctly, the pattern strongly tends to avoid reducing competence.
- **Relatedness:** This pattern is relatively neutral on relatedness. Buying powerful items can make it simpler to join group activities with specific equipment requirements, but it does not usually actively reduce relatedness.

Watch For: Adjustable difficulty levels are useful mechanisms that enable players to choose their level of difficulty and match it with their skills. However, sometimes these levels do not meet these goals. When the game is not well-balanced, it can create frustration. It could also ignore the needs of players at different difficulty levels or limit player choices. This could be against some of the values that a good game should respect, such as respecting players' freedom and abilities. The primary method to select and modify game difficulty ought to be accessible for the player. It should present genuine alternatives for various abilities and how individuals desire to play without having to complete the game prior or imposing other unjustified restrictions. Profiting from adjusting difficulty should not become entangled; selling rights to play specific difficulties or requiring a fee to render the game less difficult undermines the system's objective. Any means of acquiring money that inhibits the player from setting the difficulty level of the game to their needs contradicts this.

Example of Implementations:

- **Negative Implementations (Failing to Meet RP Criteria):**

  - *Excessive Grind.* Implementations that push players into extremely repetitive, low-engagement tasks for extended periods merely to garner resources for item evolution (as in games like Genshin Impact for certain upgrades). It tends predictably to undermine autonomy (players are pushed into boring loops with no genuine choice in progressing) and competence (progress feels tied to brute-force time investment, not skill or ingenuity).
  - *Pay-to-Win Mechanics.* Systems in which advancing to next-level items critical to core game progress is significantly faster or possible solely through real-money purchase. This directly infringes on competence (withholding value from acquired skill/work) and autonomy (compelling spending, limiting the options of non-spending players).
  - *Obscure or Excessively Complicated Systems.* When the method, requirements, or payoff of item progression are poorly explained, hidden behind UI layers, or involve complex calculations that the player can't intuitively grasp, it impedes competence. Players can't adequately plan and experience mastery of the system. It also risks autonomy when players make irreversible choices based on incomplete information.
  - *Too Much RNG Reliance.* While randomness can be exciting, evolution systems that rely too heavily on rare, random drops for fundamental pieces of gear undermine competence (success is arbitrary, not earned) and autonomy (players lack consistent agency over their time to make progress).
  - *Poor pacing and devaluation* result from systems that rapidly incorporate substantially better items, making recently acquired evolutions obsolete within an almost immediate time frame. The pattern frustrates because it devalues player effort and undermines the feeling of competence associated with earlier achievements.

- **Positive Implementations (In line with RP Criteria):**
  - *Tying Evolution to Narrative/Exploration Milestones.* obtaining significant items is often linked to significant narrative progression or overcoming major challenges. Obtaining upgrades that grant new exploration paths is explicitly tied to activities related to players' skills, such as discovering secrets or defeating bosses. These practices are RP-aligned because the advancement is experienced as having been won through competent play with the game's underlying systems (combat, exploration, puzzle-solving, etc). They confirm competence (overcoming obstacles wins mastery) and autonomy (player decisions immediately disclose access to advancement). Frustration is prevented reliably because the pathway, though challenging, is usually straightforward and linked to core gameplay.
  - *Linking Evolution to Skill Demonstration/Challenge Completion.* Significant victories, such as defeating world bosses, obtain new relevant items or improvements. This directly rewards skills demonstrated. The terms are clearly set, and the reward scales to the challenge conquered, minimizing predictable frustration based on obscurity or unfairness.
  - *Transparent and Understandable Systems.* Even advanced systems can be reconciled with RP principles when transparently described, allowing players to understand the demands and benefits. Information that is accessible to all grants player autonomy (making good choices) and facilitates competence (understanding how to achieve goals).
  - *Balance Between Effort and Reward.* Properly paced systems ensure that the effort required for an evolution is balanced to the benefits derived and that the newly acquired/evolved item remains useful for a long time. Such a strategy respects player dedication and reduces the frustration that comes with rapid devaluation, thus creating a feeling of competence.

Good Examples: The Legend of Zelda: Breath of the Wild [Nintendo EPD, 2017] features various swords throughout the game. The most iconic, the Master Sword, can only be obtained later in the game when the player has gained enough strength and experience. In Super Metroid [Nintendo R&D1 and Intelligent Systems, 1994], progress is marked by the acquisition of new skills and items that allow the player to explore previously inaccessible areas and achieve new goals (Figure 4). In Kingdom Hearts [Square, 2002], on the other hand, as the player defeats bosses in different "worlds," he or she is awarded themed weapons with higher statuses than before, reflecting his or her progress and reward for overcoming challenges.

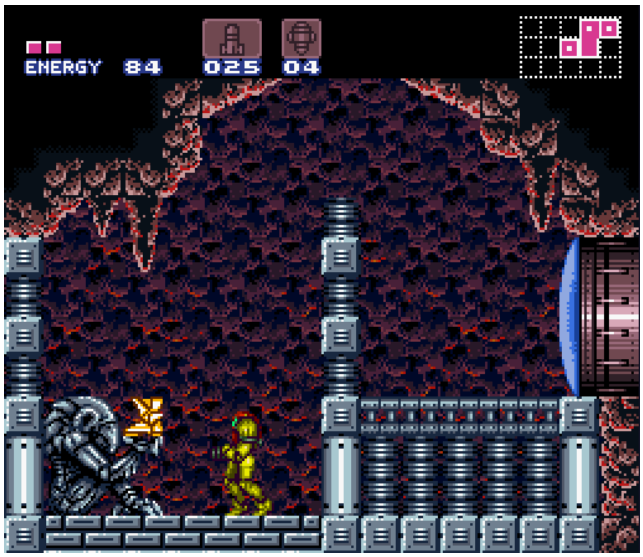


Figure 4. Samus obtaining the high jump boots. An evolution of the original boots that allows her to jump higher and access new areas.

5.2.3 Pattern: Different Difficulty

Problem: Having only one difficulty level of a set game typically does not address the differing skill levels, interests, and goals of players and leads to frustration (too hard), boredom (too easy), or inability to engage in the preferred aspect of the

game (e.g., story vs. challenge).
Context: Appropriate for most games with challenge-oriented gameplay, but particularly single-player games of most genres.
Proposed Solution: Game systems permit players to select from a range of difficulty settings, ideally both pre-game and in-game toggleable. These options should cater to different player profiles (e.g., story-focused, challenge-seeking) and provide meaningful choices without unfairly restricting or locking difficulty modes behind conditions like prior completion, so the core experience is still open and adjustable.

Avoiding Decrease in Autonomy, Relatedness, and Competence:

- **Autonomy:** Strongly supports autonomy by letting players take control over the issues they encounter. In other words, it favors player autonomy by allowing them to control the difficulty.
- **Competence:** Supports competence directly by allowing players to engage in challenges that are at their level of skill without feeling helpless (too hard) or a feeling of not having achieved anything (too easy). Difficulty adjustment provides a positive feeling of competence when faced with challenges.
- **Relatedness:** Mainly neutral, but assisting players in overcoming obstacles at their level may make it simpler for them to integrate into group activities later in certain circumstances. It does not decrease relatedness.

Watch For: Game systems can inadvertently create frustration through poor balancing, obscure accessibility needs within difficulty tiers, or restrict player choice. The primary mechanism for selecting and adjusting game difficulty must remain freely accessible to the player, offering meaningful choices that cater to different skill levels and play intentions without being gated by prior game completions or other artificial barriers. Monetization must be strictly separated from difficulty adjustment; selling access to specific difficulty levels or charging for the ability to lower the challenge fundamentally contradicts the pattern's purpose. Any monetization tactic that gates the player's ability to tailor the game's challenge level to their needs breaks this pattern.

Example of Implementations:

- **Negative Implementations (Failing to Meet RP Criteria):**
  - *Restricting Access to Difficulty Levels.* Implementations that lock certain difficulty modes, particularly higher ones, behind prerequisites like completing the game one or more times inherently restrict player autonomy. Skilled players seeking an immediate, appropriate challenge are forced through experiences that may feel unengaging, a known frustrating pattern. Similarly, only allowing difficulty selection at the game's start without the option to adjust later punishes players who misjudge the initial requirement, hindering their ability to tailor the experience.
  - *Poor Balancing and Implementation.* Difficulty modes that simply inflate enemy statistics (health, damage) without altering behaviors or encounter design often lead to tedious attrition rather than engaging, skillful challenges. This can undermine the player's sense of competence, as success feels dependent on endurance rather than mastery. Conversely, "easy" modes that trivialize core mechanics or remove meaningful interaction can also prevent players from developing competence or experiencing intended gameplay loops.
  - *Gating Difficulty via Monetization.* Introducing real-money payments to unlock easier difficulty settings, access specific challenge modes, or purchase temporary boosts that effectively lower the difficulty constitutes a severe violation. This directly undermines the principle of player autonomy over their experience and creates predictable frustration and feelings of unfairness, crossing ethical boundaries.
  - *Insufficient Granularity or Clarity.* Offering too few difficulty levels, failing to clearly communicate the differences between them, or bundling accessibility features (which should be separate) exclusively within certain difficulty tiers limits informed player choice (autonomy) and can prevent players from finding a setting that truly matches their needs and capabilities (competence).
- **Positive Implementations (In line with RP Criteria):**
  - *Accessible and Adjustable Settings.* Providing multiple, clearly distinct difficulty levels that are selectable from the start and, crucially, adjustable during gameplay (e.g., via a pause menu) strongly supports player autonomy. It allows players to dynamically match the challenge to their current skill, preference, or available time, minimizing frustration and maximizing engagement.
  - *Meaningful Differentiation.* Well-designed difficulty modes adjust more than just numbers; they might alter enemy AI, introduce new mechanics or attack patterns on higher settings, or change resource availability. This ensures that overcoming higher difficulties feels like a genuine test of skill and mastery, fostering a strong sense of competence. Lower difficulties should still engage the player with core mechanics appropriately scaled.
  - *Clear Communication.* Providing clear, concise descriptions of what each difficulty level entails empowers players to make informed choices (autonomy) before starting or when considering an adjustment. This helps set appropriate expectations and reduces the likelihood of selecting a mismatched setting.
  - *Separation of Difficulty and Accessibility.* Offering granular accessibility options (e.g., QTE timing adjustments, aim assist levels, subtitle customization) independently from the main difficulty setting allows players to fine-tune their experience precisely. This respects individual needs (autonomy) without forcing players into an overall difficulty bracket that might not suit their desired level of challenge

(competence).

Good Examples: God of War: Ragnarok [Santa Monica Studio, 2022] features five difficulty levels, ranging from the "Give Me Story" level – for players who want to focus on the story with a minimum of combat challenge – to the "Give Me God of War" level, which requires a high degree of skill and strategy. These levels are adjustable throughout the game, allowing players to tailor the experience to their skill level (Figure 5). Similarly, Marvel's Guardians of the Galaxy [Eidos-Montréal, 2021] offers an automatic victory option for Quick Time Events (QTE), ideal for players who aren't looking for a big challenge. In The Last of Us - Part 1 [Naughty Dog, 2022], the difficulty level can also be changed during gameplay by accessing the pause menu, which can prevent frustration for players who aren't looking for advanced challenges.

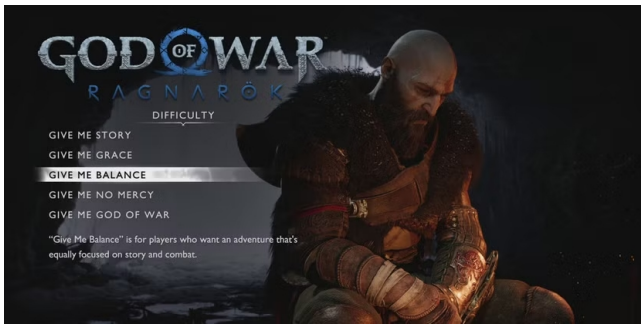


Figure 5. Difficulty Selection in God of War: Ragnarok showing how the player can select their preferred game style right on the main screen.

5.2.4 Pattern: Free Exit

Problem: Players risk losing significant progress, leading to frustration and discouragement, if they need to stop playing unexpectedly (due to real-world interruptions) or simply wish to take a break without reaching a designated, potentially infrequent, save point.

Context: Primarily single-player games or non-competitive multiplayer modes where immediate session continuity isn't paramount. Less applicable or requiring different handling in competitive multiplayer.

Proposed Solution: Implement systems that allow players to cease play and preserve their progress with minimal friction and loss. This typically involves providing options for manual saving at most times, supplemented by frequent automatic saves and/or well-placed checkpoints, ensuring players don't feel tethered to the game for fear of losing substantial effort.

Avoiding Decrease in Autonomy, Relatedness, and Competence:

- **Autonomy:** Strongly supports autonomy by giving players the freedom to stop playing when needed without facing punitive consequences.
- **Competence:** Protects feelings of competence by ensuring that progress achieved through skill and effort is not arbitrarily erased by external factors requiring the player to stop.
- **Relatedness:** Mostly neutral in single-player. It can positively enable switching to co-op modes. Does not decrease relatedness.

Watch For: Systems can inadvertently introduce predictable risks through infrequent save opportunities, poorly placed checkpoints leading to substantial replay, or technical unreliability, thereby violating the ethical boundary an RP establishes by respecting the player's time and circumstances outside the game. The primary method for preserving player progress must ensure that opportunities to save (manual, automatic, or checkpoint) are frequent, reliable, and minimize the loss of playtime and effort upon exit or failure, particularly in non-competitive contexts. Monetization must be rigorously excluded from the core function of saving progress; selling the ability to save, "save tokens", or significantly limiting free save slots to incentivize purchasing more fundamentally undermines player autonomy and introduces unnecessary frustration, breaking this pattern.

Example of Implementations:

- **Negative Implementations (Failing to Meet RP Criteria):**
  - *Infrequent or Inconvenient Save Opportunities.* Systems relying solely on widely spaced manual save points (requiring players to reach specific locations) or checkpoints with large gaps between them create a predictable risk of significant progress loss upon unexpected exit or failure. This severely restricts player autonomy (forcing potentially long play sessions) and undermines feelings of competence when earned progress is easily erased, leading to high frustration.
  - *Lack of Manual Save Options.* Omitting a manual save option entirely in substantial single-player experiences removes a key tool for player control (autonomy) and risk management. Players cannot secure their progress precisely when they feel it's necessary or before attempting risky maneuvers.
  - *Punitive Systems in Inappropriate Contexts.* Applying harsh penalties (like those designed for competitive multiplayer leavers) when a player exits a single-player or non-competitive session inappropriately punishes players for managing their real-world time and infringes on their autonomy.
  - *Unreliable or Opaque Save Mechanics.* Save systems prone to corruption, bugs, or auto-saves that overwrite crucial manual saves without warning or confirmation undermine player trust and can lead to catastrophic, highly frustrating progress loss, directly impacting perceived competence and control.
  - *Gating Saves via Monetization.* Requiring payment for the ability to save manually, selling limited "save tokens", or severely restricting free save slots to encourage purchasing more represents an exploitative practice. It directly attacks player autonomy and introduces artificial, frustrating barriers to a fundamental system function.
- **Positive Implementations (In line with RP Criteria):**
  - *Frequent and Flexible Save Opportunities.* Implementing a combination of reliable auto-saves (triggered by completing objectives, entering areas, or

at regular intervals), clearly marked checkpoints, and readily accessible manual save options (available in most non-critical moments) strongly supports player autonomy. It allows players to exit with minimal friction and loss, respecting their time.
- *Minimizing Progress Loss.* Well-placed checkpoints and frequent auto-saves ensure that upon failure or exit, the amount of gameplay needing repetition is minimized. This protects the player's sense of competence by preserving the outcomes of their successful efforts and reducing frustration.
- *System Reliability and Transparency.* Ensuring the save system is robust, performs quickly, and clearly indicates when saving occurs (and if successful) builds player trust and allows them to confidently manage their sessions (autonomy). Providing multiple save slots is also a common positive practice.
- *Context-Appropriate Design.* Recognizing that stringent save limitations might be a deliberate (though potentially frustrating) design choice for tension in some genres (like survival horror), but ensuring that for most experiences, convenience and respect for player time (autonomy) take precedence, especially outside of competitive contexts. The system should align with the intended player experience without introducing unnecessary external pressures.

Good Examples: Games in the Pokémon franchise, like Pokémon Heartgold [Game Freak, 2009] allow the player to save at any time, except during battles, by selecting the save option in the menu. Similarly, the game Disco Elysium [ZA/UM, 2019] allows saving at any time when the player is not in a dialogue (Figure 6). Free exit is a pattern that has become increasingly common in games. In the early games of the Resident Evil series, you had to find a typewriter to save and exit the game. However, in more recent installments of the franchise (starting with Resident Evil 4 [Capcom Production Studio 4, 2005]), checkpoints and automatic save points have been added that allow the player to return to that point if they die or exit the game during gameplay.

5.2.5 Pattern: Color Hint

Problem: Players may struggle to perceive critical game information, identify objectives, differentiate between entities (enemies/allies), or navigate complex environments due to visual clutter, specific aesthetic choices, or inherent visual impairments like color blindness. This can lead to frustration, impede progress, and create accessibility barriers.

Context: Applicable in visually complex or fast-paced games, and critically important as an accessibility feature across most genres.

Proposed Solution: Provide players with options to modify in-game colors, contrast, brightness, or add distinct visual highlights/markers to important game elements (objectives, interactables, enemies, allies, hazards). These features should be freely accessible and adjustable, allowing players to tailor the visual presentation for improved clarity, comfort, or accessibility needs.

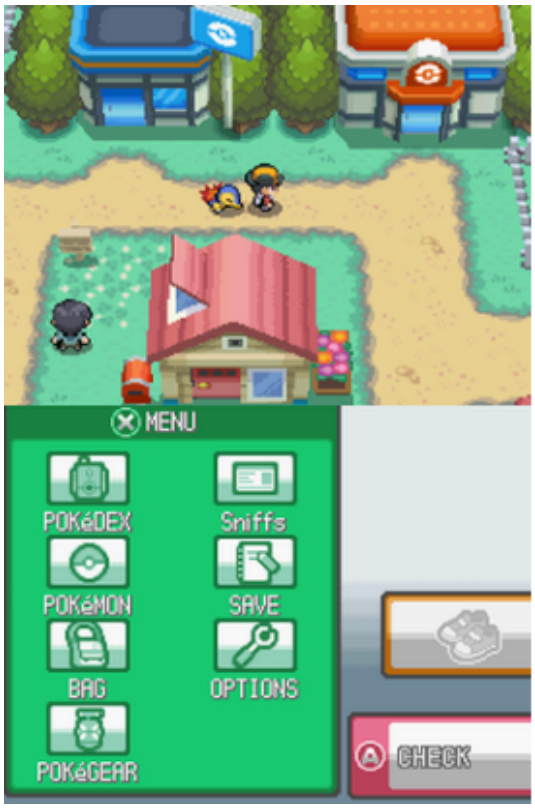


Figure 6. Pokémon HeartGold exemplifies the Free Exit pattern by allowing players to save at almost any moment simply by accessing the in-game menu.

Avoiding Decrease in Autonomy, Relatedness, and Competence:

- **Autonomy:** Strongly supports autonomy by giving players control over their visual experience. It encourages player autonomy by allowing them to choose the colors.
- **Competence:** Directly supports competence by ensuring players can accurately perceive the information needed to make informed decisions and execute actions. Easy identification contributes to mission completion and reduces frustration, reinforcing the player's sense of mastery/efficacy. For players with visual impairments, these options are essential for experiencing competence.
- **Relatedness:** Generally neutral, though clearer differentiation of allies/enemies in team games can indirectly support relatedness through better coordination.

Watch For: Designs can fail by offering inadequate options, inadvertently trivializing gameplay if not adjustable, or worse, by gating essential accessibility features. The primary accessibility functions offered by Color Hint – such as colorblind modes, contrast adjustments, or clear highlighting of essential game elements – must be freely available, adjustable by the player, and genuinely effective in addressing visual perception needs without compromising core gameplay for those who do not require them. Monetization must be strictly forbidden for any feature essential for accessibility or core gameplay clarity; charging for colorblind modes, necessary visual aids, or fundamental UI/element visibility adjustments creates predictable harm by excluding players and directly breaks this pattern. Optional, purely aesthetic UI color themes might be permissible only if core accessibility and clarity options remain robust and free.

Example of Implementations:

- **Negative Implementations (Failing to Meet RP Criteria):**
  - *Gating Accessibility Features.* Implementing essential visual aids like colorblind modes, contrast adjustments, or necessary highlighting systems in a way that requires real-money payment or significant grind fundamentally violates ethical boundaries. This practice creates predictable harm by excluding players with specific visual needs, directly undermining their ability to engage (competence) and exercise choice (autonomy).
  - *Insufficient or Ineffective Options.* Providing color adjustment options that are too limited, poorly designed, or fail to adequately address common forms of color vision deficiency or other visual impairments fails to meet the pattern's goal. This leaves accessibility needs unmet, hindering player competence and potentially causing significant frustration.
  - *Mandatory or Intrusive Hints.* Systems where visual hints (like objective markers or interactable highlights) are constantly active and cannot be disabled or adjusted by the player can undermine the intended experience. Overly revealing hints can trivialize exploration, puzzle-solving, or discovery, thereby reducing opportunities for players to exercise competence and autonomy in navigating the game world and solving problems independently.
  - *Poor Visual Design and Clutter.* Implementing hints or color adjustments that add excessive visual noise, clash jarringly with the game's aesthetic, or use confusing color codes can hinder perception rather than aid it. This undermines competence by making the game harder to read visually, leading to predictable frustration.
- **Positive Implementations (In line with RP Criteria):**
  - *Comprehensive and Free Accessibility Options.* It is crucial to provide a robust suite of visual accessibility options – including presets for common forms of color blindness, sliders for brightness/contrast, options to increase text size, or reduce motion effects – free of charge. This empowers players with diverse visual needs (autonomy) and enables them to perceive game information accurately (competence).
  - *Player-Controlled and Adjustable Hints.* Implementing visual aid systems (like detective modes, highlighting interactables, or enemy outlines) that players can toggle on/off or adjust in intensity. Offering features like these respects player autonomy, allowing players to use these tools for clarity or accessibility without interfering with the desired level of challenge or immersion when not needed.
  - *Clear and Effective Differentiation.* Using distinct, customizable colors, outlines, or symbols to clearly differentiate between critical game elements (e.g., enemies vs. allies, interactable objects vs. scenery, objective markers) significantly aids visual processing and reaction times, directly supporting player competence, especially in complex or fast-paced scenes.
  - *Optional Customization for Preference.* Allowing players to customize non-essential visual elements, like HUD color palettes or reticle colors, purely for personal preference enhances their sense of control and ownership over their experience (autonomy) without impacting core gameplay accessibility or clarity.

Good Examples: Batman Arkham Asylum [Rocksteady Studios, 2009] features Detective Vision, a system that enhances the visualization of objectives, enemies, and nearby objects by changing the color of game elements. Similarly, the Assassin's Creed [Ubisoft Montreal, 2007] series provides players with eagle vision, which highlights important elements of the landscape to make navigation and combat easier (Figure 7). In online multiplayer games such as Fortnite [Epic Games, 2017], Valorant [Riot Games, 2020], and Overwatch 2 [Blizzard Entertainment, 2023], players can adjust the highlight colors for enemies and allies, customize visual markers, and change brightness and contrast. These features make the elements of the scenario more distinct, which facilitates visual reading.

Figure 7. When activating Detective Vision in Batman: Arkham Asylum, the player can distinguish enemies from hostages through color hint.

5.2.6 Pattern: Free Pet Care

Problem: Players might desire companionship or assistance from an in-game entity (pet/mascot), but systems requiring constant, tedious, or costly maintenance can turn this into a burden, source of frustration, or vector for exploitative monetization, undermining the potential benefits.

Context: Games across various genres featuring persistent companion characters that offer utility, cosmetic appeal, or emotional connection.

Proposed Solution: Introduce companion pets that provide benefits (e.g., help with tasks, storage, navigation, companionship) and allow for customization or evolution. Critically, ensure that the core maintenance, functionality, and progression of the pet are achievable through engaging in-game activities and collection, explicitly avoiding systems that mandate excessive daily grind, rely on real-money purchases for essential care or upgrades, or use punitive mechanics exploiting guilt if care lapses.

Avoiding Decrease in Autonomy, Relatedness, and Competence:

- **Autonomy:** Supports autonomy by granting players the freedom to customize and care for a pet, allowing them to choose how the companion assists them. It prevents a decrease in autonomy by ensuring that care mechanics are neither forced nor excessively burdensome.
- **Competence:** Can support competence if the pet provides useful assistance without trivializing challenges – for instance, by helping the player successfully complete missions. It prevents a decrease in competence by ensuring that pet management is neither frustratingly complex nor overly demanding.
- **Relatedness:** Directly supports relatedness through the player-pet bond, as this companionship satisfies the need for connection and belonging.

Watch For: Predictable risks arise when pet maintenance becomes overly burdensome, promotes emotional attachment for coercive purposes, or gates essential functions behind prohibitive mechanics. The primary methods for maintaining the pet's well-being, functionality, customization, and evolution within the game must be linked to engaging, reasonable in-game activities and achievable without excessive, repetitive grind or real-money expenditure. Monetization must be strictly limited to optional, non-functional cosmetic enhancements (e.g., pet outfits, visual effects) that do not impact the pet's core abilities, health, or progression. Any monetization scheme that requires payment for essential food, care items, functional upgrades, evolution materials, or to avoid negative consequences (like the pet becoming inactive or "dying") directly leverages emotional attachment or necessity in ways that break this pattern.

Example of Implementations:

- **Negative Implementations (Failing to Meet RP Criteria):**
  - *Gating Essential Care/Evolution via Payment or Grind.* Systems requiring players to purchase essential items (food, medicine, evolution catalysts) with real money, or acquire them only through excessive, repetitive grinding, exploit the player's potential attachment to the companion. This severely undermines autonomy (forcing specific, often tedious or costly actions) and creates predictable frustration and resentment.
  - *Punitive Neglect Mechanics.* Implementing systems where the pet suffers significant negative consequences (becomes unusable, "dies," loses major progress) if the player fails to perform frequent, often mandatory, upkeep tasks leverages negative emotions like guilt and anxiety. This is ethically problematic and directly undermines autonomy by imposing burdensome obligations.
  - *Mandatory Daily Chores for Upkeep.* Requiring players to log in daily solely to perform mundane pet maintenance tasks disconnected from core engaging gameplay transforms the companion from a benefit into a chore. This tedious loop undermines autonomy and can lead to burnout.
  - *Overpowered Companions.* Designing pets whose abilities trivialize core game challenges removes meaningful engagement for the player, undermining their own sense of competence and potentially making gameplay less interesting.
  - *Limited Customization Without Payment.* Offering very few free options for pet appearance or customization while locking desirable alternatives behind paywalls hinders player expression (autonomy) and can weaken the potential bond (relatedness).

- **Positive Implementations (In line with RP Criteria):**
  - *Needs Met Through Engaging Gameplay.* Designing systems where pet needs (like food, minor upgrades, or cosmetic items) are fulfilled through activities integrated within the game's core, enjoyable loops (e.g., finding items during exploration, rewards for completing quests) respects player autonomy and makes pet care feel like a natural extension of play.
  - *Useful but Balanced Assistance.* Creating pets that offer genuine utility (e.g., item collection, storage, navigation aid, minor combat support) without overshadowing the player's own role supports competence (by helping manage tasks) and enhances the bond (relatedness) without trivializing the player's achievements.
  - *Focus on Optional Cosmetic Customization.* Allowing players to customize their pet's appearance through items earned via engaging gameplay or purchased optional cosmetics (that have no functional impact) enhances autonomy and strengthens the player-pet bond (relatedness) without introducing unfair advantages or coercive mechanics.
  - *Absence of Punitive Systems.* Avoiding mechanics that punish players severely for periods of inactivity or failure to perform upkeep respects player autonomy and prevents the system from becoming a source of anxiety or guilt. The focus remains on the positive aspects of companionship and utility.
  - *Meaningful Progression (Optional).* If pets evolve or gain new abilities, linking this progression to significant player achievements or engaging in-game activities (rather than grind or payment) can further enhance feelings of competence and relatedness as the player and companion grow together.

Good Examples: In The Legend of Zelda: Ocarina of Time [Nintendo EAD, 1998], the player is accompanied by the fairy Navi, who acts as a navigator, helping with exploration and completing objectives. In Don't Starve [Klei Entertainment, 2013], Chester is a walking chest that follows the character and serves as extra storage space. In Enigma of Fear [Dumativa, 2024], Mia is accompanied by her dog, who helps her perform missions.

Figure 8. In Enigma do Medo, Mia is accompanied by her pet Lupi, who assists her in the game to help her complete objectives.

5.3 Implementing RPs in a Critical Game

To apply the expanded definition and examples of RPs as counterparts to the DPs, we developed a critical game in the decision-making genre. The choice of this game style was based on the following premise: the player takes on the role of a game developer who faces ethical and design dilemmas aligned with common demands in the game industry, such as monetizing, expanding the active user base, and re-engaging players. The decisions made by the player (in the role of developer) lead to consequences for their users, which can be either positive or negative. These consequences affect player attributes such as engagement, autonomy, competence, and relatedness – the latter three representing well-being according to SDT. Additionally, the outcomes reflect the developer's intentions (which may be "benevolent" or "malicious") and alter the game's financial return.

The primary target audience for the critical game was players with experience in digital games, while digital game developers served as the secondary audience. Our aim was to raise awareness among these groups about how the excessive use of DPs in digital games can negatively impact users' well-being. Based on this, the defined learning objective was to foster critical thinking among players, enabling them to identify distractions, hidden costs, blame-shifting, forced continuity, or any manipulative tactic that could harm users within a given platform.

We used the ATMSG framework proposed by Carvalho *et al.* [2015] to playfully illustrate how design decisions – whether positive or not – can satisfy or frustrate end users, as well as impact players' health and well-being. The decisions made by users, who take on the role of developers, generate feedback that reflects the state of their players, allowing them to see in practice how game design patterns can affect psychological needs. The goal was to stimulate critical reflection through the gameplay itself (intrinsic instruction), without requiring external guidance, such as from a teacher or facilitator – which would characterize extrinsic instruction.

The visual diagram details the sequence of game mechanics in terms of actions, tools, and objectives for each activity (Figure 2). These activities are described using Bloom's taxonomy for serious game components [Almerico and Baker, 2004]. The implementation of the structure outlined in Figure 2 is further described in Table 1.

The narrative arc was designed to provide contextual information for learning and to create cohesion within the game, helping players engage with the storyline. Following the framework proposed by Bizzocchi [2007], the narrative arc was structured into five phases. In the setup, the characters and world are introduced. TGD takes place in a game development company, where the developer (player) must create a game alone after the dismissal of other employees. The developer works from their bedroom and has knowledge of various game mechanics, applying them as needed.

In the complication, a challenge is introduced: the developer must choose game mechanics that meet their needs, facing a moral dilemma between positive patterns (RPs) and negative patterns (DPs). Negative patterns ensure financial return but diminish at least one of the basic psychological needs of the target audience, while positive patterns maintain player well-being and satisfaction, though they may not yield the highest financial return. The development is the longest phase, in which each of the developer's needs is tied to an event that requires selecting the most appropriate mechanic, directly affecting users' psychological needs and engagement.

The climax marks the moment of suspense, when the player receives feedback on their performance, which impacts the well-being of the end users. The final action ties up the narrative with a summary report that reflects the player's journey, based on metrics related to the final player's competence, autonomy, and relatedness, as well as the "malice" and "wealth" indicators of the developer. These parameters determine one of three possible endings: good, moderate, or bad.[5].

Initially, six challenges (game levels) were defined. Each challenge is based on a specific need commonly faced by game developers, which are often addressed through the use of DPs. These needs were empirically identified by a group of experts composed of two undergraduate students and one graduate student in the field of technology, all previously involved in the project.

The needs were derived from the guiding question: "If these DPs are being used in digital games, what underlying needs are developers trying to meet?". Based on this reflection, the research group categorized the DPs presented by Zagal *et al.* [2013] according to broader need categories observed in the game industry (e.g., a developer who implements the "grinding" pattern aims to keep players engaged in repeated tasks, thereby sustaining engagement, while a developer who uses "advertisements" seeks to generate revenue through third-party video ads, increasing app income).

The categorization process began individually, with each team member identifying the underlying need associated with each pattern based on their own experience with digital games. A final consolidation round was conducted to unify the results, leading to the identification of six core needs: resource reuse, player re-engagement, profit increase, sustained engagement, player offboarding, and active user base expansion.[6]

For each level, four design patterns were defined, totaling 24 patterns in the game – six positive and eighteen negative. Each level presents four options: three DPs and one radiant pattern. We adopted the decision-making style because the chosen learning strategy was reflective in nature.

The same expert group responsible for identifying the

[5]The table of indicators used to determine the final outcomes of the critical game is available here: `https://bit.ly/3JJg2e6`

[6]DPs categorized according to developer needs. Full dataset is available at the accompanying spreadsheet: Access here.

Table 1. Description of the Implementation

Game Sequence	Gameplay Activity	Learning Activity	Intrinsic Instruction
Choose avatar	The player chooses their avatar and assigns a name to the character.	X	X
Interface Introduction	TGD begins with a tutorial that presents the interface components and the main objective of the game.	The player understands that they are a game developer and that their decisions can affect players' well-being.	Text and images explain the interface, game context, goals, and player actions.
Player action	The player begins a challenge by selecting, over six rounds, the design pattern that best fits the specific goal presented in each round.	The player must observe, interpret, evaluate, and decide which alternative is most appropriate for the problem.	The levels consist of similar problems – six in total – each representing a different need of the developer.
Granular Feedback	The player receives immediate feedback on the impact of their choices, through text and progress bars showing levels of competence, autonomy, and relatedness, as well as kindness and wealth bars.	The player analyzes the illustrations, consequence descriptions, and generated metrics to internalize values and understand the influence of their decisions on users' lives.	The immediate feedback helps the player understand the consequences of their choices and reflect on the impact of DPs on player well-being.
Cumulative Feedback	At the end of the six rounds, the player receives cumulative feedback summarizing their performance and the consequences of their decisions throughout TGD.	The player relates to the narrative, analyzes their performance, and understands the consequences of their actions within the game development context.	The final feedback aims to consolidate the player's learning, encouraging reflection on the use of DPs and their ethical and design implications.

developer needs also selected and formulated the patterns – both positive and negative. The negative patterns were selected based on the DPs framework in digital games presented by Zagal *et al*. [2013].[7]. The positive patterns, in turn, were chosen from the set of six patterns produced as we refined the definition of RPs. Each pattern — dark or radiant — was matched to one developer need, as shown in Table 2.

Table 2. List of selected patterns used based on developers' needs

Developer's Need	DPs Used	RPs Used
Resource reuse	Grinding, Competition and Variable Rewards	Free Pet Care
Profit increase	Loot Boxes, Advertisements and Pay Wall	Item Evolution
Player re-engagement	Daily Rewards, Guilds and Badges	Different Difficulty
Sustained engagement	Fear of Missing Out, Pay to Win and Can't Pause or Save	World Creation
Player disengagement	Playing by Appointment, Wait to Play and Pay to Skip	Free Exit
Active user base expansion	Competition, Social Pyramid Scheme and Friend Spam	Color Hint

In addition to the end-user metrics, we designed developer (player) indices based on two dualities: kindness/malice and wealth/poverty.[8] These metrics increased or decreased depending on the player's pattern selections. However, they were not directly tied to the end-user metrics, but rather to the categories of patterns. For example, monetization-related patterns affected the wealth/poverty index, while psychological manipulation patterns influenced the kindness/malice index.

All indices – both those of the end user and of the developer – started at 50%. Their final values after the sixth level determined TGD's outcome (Figure 9 – Cumulative Feedback). If all of the end-user metrics were above 70%, the player received the outcome titled "The Good Dev". If the metrics ranged between 30% and 70%, the result was "The Meh Dev". Finally, if any of the end-user indices dropped below 30%, the outcome was "The Bad Dev". With these definitions in place, we proceeded with designing TGD's interface (Figure 9), which was constructed based on the implementation structure described earlier (Table 1).

6 Results

This section presents the results from both the Alpha and Beta tests. In the Alpha Test, we cross-analyzed the quantitative data from the gameplay facets with the qualitative data from participant interviews. In the Beta Test, we cross-referenced qualitative interview data with the quantitative results from the Player Experience (PX-Br) and Engagement (UES-Br) questionnaires. Throughout this section, participants are referred to as PA (Alpha Participants) and PB (Beta Participants). Table 3 presents the demographic data of participants from both test stages.

6.1 Alpha Test: Evaluation Based on Playability Facets (N=5)

Playability was assessed using the playability metrics proposed by Sánchez and Vela [2014], employing a 5-point Likert scale. Participants rated each item from 1 (very unsatisfactory) to 5 (very satisfactory). Figure 10 presents the scores for each facet, with values ranging from a minimum of 2.9 to a maximum of 4.0. The interactive playability facet received the highest average score (M = 4.0, SD = 1.4; M = mean, SD = standard deviation), indicating that participants considered the controls, interface, and interaction easy to use and enjoyable. This perception is reflected in interview statements such as: "[PA01] *I think the game has a very friendly interface overall*" and "[PA05] *I liked that it had a title, an icon, and everything*".

Following that, the artistic playability facet obtained an average score of M = 3.7 (SD = 1.3), suggesting that the narrative was considered engaging and the visual elements of TGD appealing. However, the prototype used in the Alpha Test did not yet include music or sound effects, which may have negatively impacted this dimension's score.

The results for mechanical playability (M = 3.5, SD = 0.9), intrinsic (M = 3.3, SD = 1.1), and personal (M = 3.1,

[7]Healthy and Dark Games library, which includes a comprehensive list of DPs: `https://www.darkpattern.games/` (Accessed on 12 Dec 2025).

[8]We acknowledge that this representation of the developer – and of the player – is reductive. However, we opted for this simplification to meet the abstraction and association needs inherent to the game's context.

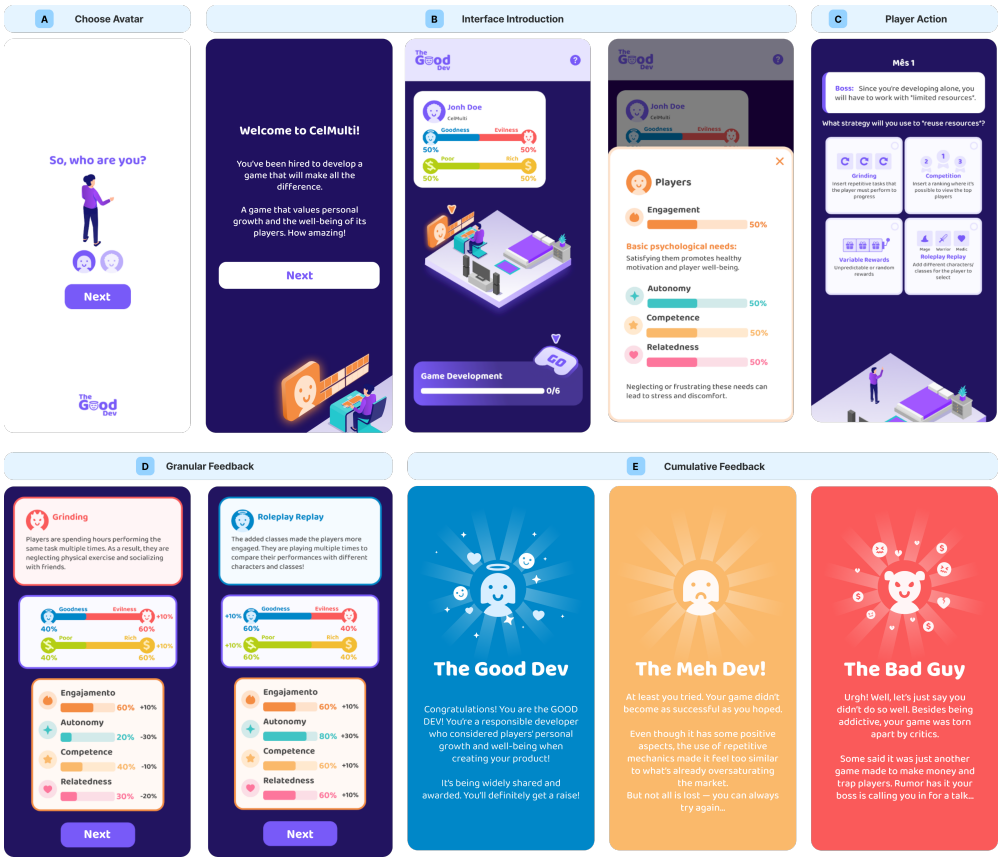


Figure 9. Screenshots of the critical game, developed based on the implementation description of the ATMSG model. These include: (A) the avatar selection screen; (B) screens presenting the game's context, status, and metrics; (C) the decision screen, where the player chooses a design pattern appropriate to the presented context; (D) consequence screens, showing the positive or negative impacts of the choice and encouraging reflection; and (E) the final screens, based on the player's choices. Click here for a better visualization of this figure.

SD = 0.8) indicated a reasonable evaluation of the experience aspects. The averages could have been higher if most players (80%) had not reported difficulties understanding the story behind TGD and what needed to be done. As cited: "[PA02] *At the beginning, I was a bit confused about what I was supposed to do*". It was mentioned that the initial descriptions did not provide a clear objective, as stated: "[PA05] *At first, I found the description of what the game expected from me a bit vague"*. Additionally, they had difficulty understanding how to start the session using the buttons, which added further confusion to the previously mentioned issues.

Another important point is that, when selecting the mechanics for each challenge, it was not possible to view which choices had been made previously, an issue identified by 60% of the players. This problem generated comments such as: "[PA03]: *At the end, it was hard to remember all the ones I had chosen before*", which directly affected users' recall ability. The lowest average score was for social playability (M = 2.9, SD = 1.1). This may be due to several factors, including the nature of TGD genre and the fact that it is a single-player game without social features or interaction with other players.

During the interviews, the comments primarily focused on the feedback related to choices, where all players (100%) expressed surprise at the consequences of their decisions, especially regarding the developer attributes (malice and wealth). Examples of comments made during the test and in the interviews on this topic included: "[PA04]: *Oh my God, I'm evil!*" and "[PA05]: *(I made) a lot of evil choices in a row, even*

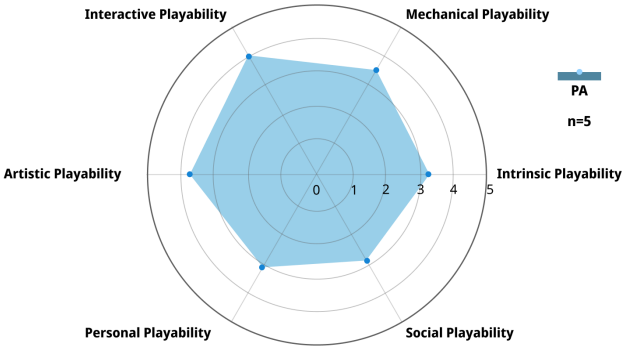


Figure 10. Measures of Gameplay Facets (PA = Alpha Participants)

though I didn't mean to". 60% of the players experienced unmet expectations upon realizing that their choices, initially perceived as positive due to increased engagement, were actually contributing to a path of enrichment, increased malice, and frustration of players' basic psychological needs. One example of this is the comment: "[PA05]: *I was really sad, [...] almost all the actions I was choosing at the beginning were making me richer. But also more evil*".

Regarding pattern selection, the overall average selection of RPs was 50%. All participants chose the RPs in Challenges 4 and 5, corresponding to World Creation and Free Exit, respectively. In contrast, no participant selected the Item Evolution pattern in Challenge 2. It is worth noting that Participant 2, who was the only one to receive the final result of TGD, also uniquely selected the RPs Different Difficulty and Color

Table 3. Participant Profile. Where PA = Alpha Participant, PB = Beta Participant, F = Female, M = Male, and NB = Non-Binary.

P#	Age Group	Gender	Gaming Frequency	Education Level	SDT Knowledge	Critical Games Knowledge
PA01	18–24	F	Weekly	Undergraduate	Familiar with the theory	Never heard of it
PA02	18–24	F	Monthly	Undergraduate	Familiar and applies the theory	Unfamiliar with the term
PA03	18–24	F	Monthly	Undergraduate	Familiar with the theory	Unfamiliar with the term
PA04	18–24	F	Weekly	Undergraduate	Familiar with the theory	Unfamiliar with the term
PA05	18–24	F	Daily	Undergraduate	Familiar with the theory	Unfamiliar with the term
PB01	18–24	F	Weekly	Undergraduate	Never heard of it	Unfamiliar with the term
PB02	25–30	NB	Daily	Master's student	Familiar and applies the theory	Unfamiliar with the term
PB03	31–40	M	Weekly	Undergraduate	Never heard of it	Never heard of it
PB04	18–24	M	Weekly	Undergraduate	Never heard of it	Never heard of it
PB05	18–24	M	Daily	Undergraduate	Never heard of it	Never heard of it
PB06	18–24	M	Daily	Undergraduate	Never heard of it	Never heard of it
PB07	18–24	F	Weekly	Undergraduate	Never heard of it	Unfamiliar with the term
PB08	18–24	M	Daily	Undergraduate	Never heard of it	Never heard of it
PB09	18–24	F	Weekly	Undergraduate	Never heard of it	Never heard of it
PB10	18–24	M	Weekly	Undergraduate	Never heard of it	Never heard of it

Hint in Challenges 3 and 6, respectively (Table 4).

Table 4. Patterns choice by participants in each challenge (C) for Alpha test. RP = Radiant Pattern and DP = Dark Pattern.

ID	C1	C2	C3	C4	C5	C6	RP Rate
PA01	RP	DP	DP	RP	RP	DP	50%
PA02	RP	DP	RP	RP	RP	RP	83,33%
PA03	DP	DP	DP	RP	RP	DP	33,33%
PA04	RP	DP	DP	RP	RP	DP	50%
PA05	DP	DP	DP	RP	RP	DP	33,33%
				Average		50%	

At the end, the participants achieved the following final outcomes: *The Good Dev* (20%), *The Bad Guy* (20%), and *The Meh Dev* (60%). The players (80%) who did not receive the *The Good Dev* ending expressed a desire to replay and explore alternative choices in order to become good developers, as illustrated by: "[PA05] *I wanted to be a good dev! I wanted to be a good dev*" and "[PA03] *I wanted to go back (into the game) and be able to do it again. And be more careful now, really pay [...] more attention and see how it would turn out*".

6.2 Beta Test: Evaluating Player Experience and Engagement (N=10)

Through the use of PX-Br, it was evident that the player experience (PX) was positively evaluated in two of the three dimensions: Playability (rated positively by 80% of participants) and Enjoyment (positive for 70% of participants). The Immersion/Presence dimension, however, showed lower scores, as presented in Figure 11.

The results presented in Figure 11 show that TGD achieved a positive playability rating from 80% of participants (50% very high – 30% high). Ease of use was highlighted during the interviews, for example: "[PB06] *there's really no way to get lost about what to do, it's very intuitive*". This demonstrates that the adjustments made after the Alpha Test were effective in improving playability. The immediate feedback provided to participants was also positively noted, as

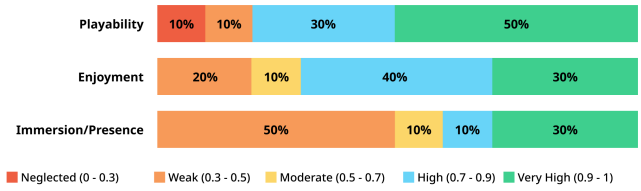


Figure 11. PX-Br - Player Experience Dimensions (PB = Beta Participants)

expressed in: "[PB07] *I thought it was really cool that when I chose the option [...] it already gives the feedback right away. That was really important for me to know*".

The enjoyment dimension was positively evaluated by 70% of participants (40% high – 30% very high). In this regard, participants appreciated the way TGD presented its content: "[PB01] *putting yourself in the shoes of a creator and becoming responsible for it, but in a fun way... it brings reflection, but still gives you a little laugh*". The game components were also praised by participants, as reinforced by: "[PB10] *I like this karma system, like good vs. evil, because it kind of gives you a choice to either be chaotic or really try to play properly, you know*".

Immersion/Presence was the only dimension that was not positively evaluated, being rated as weak by 50% of participants. One factor that influenced this result was the way information was presented at the beginning of the interaction, which made it difficult for users to understand the narrative. As stated: "[PB09] *At the beginning, I felt a bit overwhelmed with information*". Participants also reported that the short gameplay time directly affected their experience. For example: "[PB05] *When it got to the end, I was even a little unsure if that was really the end or if I was just moving on to the next stage based on the result I got*".

Engagement was evaluated using the UES-Br, which applies a 5-point Likert scale. Players rated each item from 1 (strongly disagree) to 5 (strongly agree). Figure 12 presents the scores for the four dimensions of the scale.

Engagement metrics showed positive results for the Aes-

thetic Appeal dimension (M = 4.4, SD = 0.08) and Perceived Usability (M = 3.9, SD = 0.6). The results were moderate for the Reward Factor (M=3.7, SD=0.6) and Focused Attention (M = 3.6, SD = 0.58). Overall engagement yielded a positive score (M = 3.9, SD = 0.38). These results indicate that TGD has a pleasant aesthetic, provides good usability and appeal, and that participants were generally focused while playing.

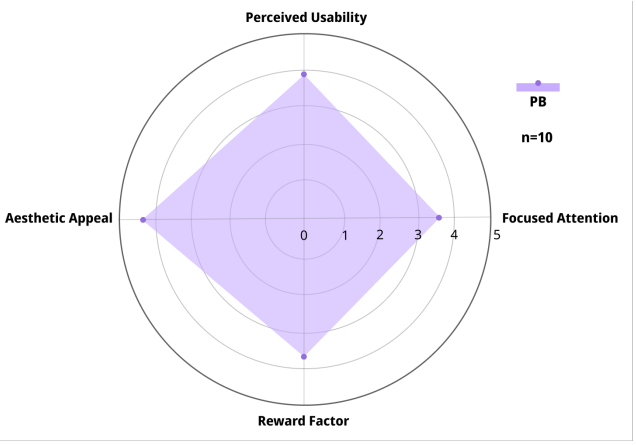


Figure 12. UES-Br - Categorization of Engagement Dimensions. (PB = Beta Participants)

The attractiveness and visual appeal of the interface were positively evaluated by participants (M = 4.4, SD = 0.08), especially regarding the elements used to represent content and outcomes. 70% of participants stated that the visual elements were self-explanatory, interesting, and important for understanding TGD. As highlighted in: "[PB05] *I thought the visual response you included was really nice, the little bars*". Another participant also noted: "[PB10] *(About important information) The elements, right? They guide you, like autonomy, relatedness, and kindness [...] I really liked that system*".

Perceived usability showed a positive value (M = 3.9, SD = 0.6), representing good usability of the application. This is supported by interview data, such as: "[PB09] *As I started playing, I realized it was much simpler*" and another participant noted: "[PB05] *I liked how the end-user indexes were presented. From the beginning, they were very clear, and I could check them later*".

The Reward Factor (M = 3.7, SD = 0.6) and Focused Attention (M = 3.6, SD = 0.58) dimensions were rated positively but remained close to neutral. Participants reported that the content presented during the interaction sparked their curiosity, as noted in: "[PB05] *I was curious to see how much this [critical game] resembled some other games*". However, they also pointed out the predictability of their choices, as mentioned in the interview: "[PB06] *I found it very predictable which rewards each answer would give [...] I tried answering what I thought would increase the kindness level, and they actually did go up*".

Qualitative data from the interviews revealed that 90% of participants were able to associate the mechanics presented in the critical game with prior experiences in other games. For example: "[PB02] *I've seen some games like this, where you make decisions and you see bars going up and down [...]*". These participants reported having encountered some of the patterns featured in the critical game in other games they had previously played.

Beyond engagement with digital games, 60% of participants reported that the critical game prompted them to reflect on ethics and awareness in games. Regarding ethics, one participant commented: "[PB02] *I think there are some decisions of this kind that are more ethical, moral, and I think that's really emphasized in the game*". On the topic of awareness in games, one participant stated: "[PB10] *I think the main purpose is to put the player through these situations so they can see how they would act as a result of them, you know, the consequences*". This highlights that the proposal to promote critical reflection on the use of patterns in game design was perceived by the participants.

As for participants' perceptions of TGD's purpose, 50% understood that the critical game aimed to introduce game mechanics to people interested in game development, as noted in: "[PB05] *it's exactly to demonstrate [these patterns] to game devs or people who are interested in the field*". Another 40% perceived that the application aimed to raise awareness about the impact of design pattern choices on players' lives, as reflected in: "[PB01] *I think it really puts you in the developer's shoes and makes you realize it's not that easy. You're dealing with people's emotions, you're directly affecting their lives*". Only one participant stated that TGD had a purely recreational purpose, as highlighted in: "[PB09] *I think the goal was for people to have fun, for it to be something quick, simple, and practical*".

Regarding the interest sparked in design patterns for digital games, 60% of participants reported being interested, while 20% stated they were not interested, and the remaining 20% expressed partial interest. Participants who showed interest mentioned that the way the patterns were presented made TGD engaging. For example: "[PB03] *I got really interested, especially in that part about choosing [design patterns]. I had never thought about how that influences things*". Those who were not interested highlighted that they were already familiar with the topic, as in: "[PB06] *Well, if I didn't know as much, maybe it would have sparked more [interest]*". Finally, the participant who expressed partial interest also pointed to prior knowledge but acknowledged lingering curiosity: "[PB07] *[About design patterns] I already knew about it, so it wasn't that surprising. It was moderate, it didn't spark that much curiosity*".

In summary, the Beta Test revealed a generally positive evaluation of both player experience and engagement with the critical game. Participants appreciated the visual appeal and usability of the interface, found the mechanics intuitive, and responded positively to the immediate feedback system. Although the immersion dimension received lower scores, mainly due to the brief gameplay time and initial information overload, the overall reception indicated that TGD was effective in stimulating reflection on ethical and design-related issues. Most participants demonstrated a clear understanding of the game's critical purpose and expressed interest in exploring the implications of design patterns in digital games. The results support TGD's potential as a tool for fostering awareness and critical thinking, particularly among players and aspiring developers.

In terms of pattern selection, the overall average selec-

tion of alternatives based on RPs was suboptimal, reaching only 46.66%. None of the challenges had an RP chosen by all participants. The pattern that came closest was World Creation in Challenge 4, which was selected by all participants except PB08. On the other hand, in Challenge 3, which offered the RP Different Difficulty as an option, none of the participants chose the RP (Table 5).

Table 5. Patterns choice by participants in each challenge (C) for Beta test. RP = Radiant Pattern and DP = Dark Pattern.

ID	C1	C2	C3	C4	C5	C6	RP Rate
PB01	DP	DP	DP	RP	DP	RP	33,33%
PB02	RP	DP	DP	RP	RP	RP	66,66%
PB03	DP	DP	DP	RP	DP	DP	16,66%
PB04	RP	DP	DP	RP	RP	DP	50%
PB05	DP	DP	DP	RP	RP	DP	33,33%
PB06	DP	DP	DP	RP	RP	DP	33,33%
PB07	RP	RP	DP	RP	RP	DP	66,66%
PB08	RP	DP	DP	DP	DP	DP	16,66%
PB09	RP	DP	DP	RP	RP	RP	66,66%
PB10	RP	RP	DP	RP	RP	RP	83,33%
				Average		46,66%	

At the end, the participants achieved the following final outcomes: *The Good Dev* (10%), *The Bad Guy* (40%), and *The Meh Dev* (50%). The only participant to reach The Good Dev! status (P10) based his choices on getting the best possible result, unlike the other participants who were guided by previous experience. "[P10] *My goal was to get 100% [...] in the four little things. Also 100% in the good things, without becoming totally poor*".

7 Discussion

The discussion of this study is grounded in the understanding that the critical game developed here should serve as a stimulus for players to reflect on the ethical and critical use of design patterns. TGD was evaluated and showed positive results in encouraging users to reflect on ethics and awareness regarding the use of DPs in digital games. Additionally, TGD demonstrated positive indicators of player engagement and experience. These results highlight key discussion topics that will be explored in the following sections.

7.1 Did the Game Encourage Reflection?

The surprise with the consequences of players' decisions – especially regarding the developer attributes (malice and wealth) – was a recurring theme in both test phases. Comments such as "*Oh my God, I'm evil!*" and "*(I made) a lot of evil choices in a row, even though I didn't mean to*" reveal the emotional intensity of these reactions.

This point becomes even more significant when we consider that the DPs presented in the game are, in fact, common elements in players' everyday experiences with digital games. These patterns are present in games across different genres and developers, as documented by Zagal *et al*. [2013] in his catalog of *Dark Games*[9]. The familiarity with these patterns, so deeply rooted in gaming culture, may have led to a normalization of their negative effects, rendering them almost "invisible" to players at first glance.

The frustration of realizing that seemingly positive choices – such as increasing player engagement – led to negative outcomes, like the developer's enrichment at the expense of the player's well-being, suggests that the game is actively deconstructing this normalization. By bringing the implications of DPs to the forefront, TGD challenges players' expectations and promotes critical reflection on practices that often go unnoticed.

It is noteworthy that, during the interviews, players were able to draw parallels between the DPs presented in the game and real-life situations – observed in both the Alpha and Beta tests. This indicates that the reflection stimulated by TGD transcends the virtual context. For example: "[PA02] *it reminded me of times when I had trouble navigating websites or games because of this (negative patterns)*" and "[PA04] *I tried applying things I had already seen in games, things that attract me in games. I ended up realizing that these [choices] might not be such a good thing*". This transfer of learning to real-world contexts reinforces the potential of the critical game as a tool for raising awareness and empowering players.

The positive evaluation of enjoyment demonstrates that TGD succeeds in entertaining while simultaneously fostering reflection on serious topics. Praise for the way content is presented and for the game components reinforces the effectiveness of TGD's playful yet critical approach. Qualitative data reveal that the critical game stimulated reflection on ethics and awareness in digital games. Players' ability to recognize DPs in other games and to question their ethical implications highlights the potential of TGD to promote behavior change.

7.2 Is Prior Knowledge Necessary to Understand *DPs*?

Deceptive design patterns are already well-known and explored in the literature. However, players who are not familiar with strategies aimed at suppressing the use of these patterns often fail to identify the negative consequences they may cause for players.

Despite TGD's intuitiveness and the presence of explanatory text, the level of knowledge acquired and the perception of the game's objective varied among participants. This variation suggests that prior knowledge about DPs and SDT influences players' understanding of how these patterns affect well-being.

Even experienced players, who were familiar with the DPs present in TGD, as illustrated by: "[PB06] *all of the options there, I've seen in several games*" did not always recognize their negative consequences. This lack of recognition may help explain why only 40% of users explicitly stated that TGD's purpose was related to raising awareness about the use of *DPs*.

However, based on the results analyzed, understanding SDT is not essential for identifying TGD's objective or for promoting awareness and reflection. It serves as a starting point for associating the use of DPs with the frustration of players' basic psychological needs, as reported in the study by Uysal and Yildirim [2016].

The comparison between Alpha Test participants (familiar with SDT) and Beta Test participants (with no prior

[9] Healthy and Dark Games library, which includes a list of DPs: `https://www.darkpattern.games/` Accessed on 10 Dec 2025

knowledge of SDT) illustrates this distinction. Players from the Alpha Test connected the negative effects of the patterns to SDT and well-being, as evidenced by the statement: "[PA02] *for someone who is starting to learn about SDT, I thought it was at a good level [...] showing how it can be applied in games to promote player well-being*". This association was made possible due to the participants' prior knowledge of SDT.

In contrast, players from the Beta Test associated the patterns with ethics in games and awareness, without mentioning SDT or well-being. This indicates that they recognized the negative impacts, such as compulsive behavior "[PB01] *[About the patterns] even though they're kind of bad, it's like the game gets you kind of addicted to them*" even without identifying a connection to SDT. This result aligns with the findings of Aagaard *et al*. [2022], who, after interviewing a group of researchers and interface users about DPs, found that while they recognized ethical issues, they did not mention ways to mitigate those patterns. The only Beta Test participant familiar with SDT acknowledged its application in the game design, stating: "[PB02] *Since I do research in the area, I started recognizing some important elements related to SDT*".

The results show that TGD successfully raised users' awareness of ethics, decision-making, and consequences in digital games, an important step toward understanding DPs. However, a deeper understanding of the relationship between these patterns and player well-being, as defined by SDT, still needs to be further explored. Including elements that explain SDT in a more accessible way and more explicitly connect DPs to the frustration of basic psychological needs could enhance TGD's impact and facilitate content assimilation for players without prior knowledge of the theory.

7.3 Recognizing *DPs*: A Matter of Familiarity?

Players compared the critical game to popular commercial titles such as *Reigns* [Nerial, 2016], *The Sims* [Maxis, 2000], *Game Dev Tycoon* [Greenheart Games, 2012], *Lapse: A Forgotten Future* [Cornago, 2017], *Nirvana - Game of Life* [GoldTusks, 2022], *AFK Arena* [Lilith Games, 2019], *BitLife* [Candywriter, 2018], and *Genshin Impact* [miHoYo, 2020]. These comparisons revealed two important aspects: the recognition of *DPs* present in commercial games, and familiarity with the decision-making mechanics adopted in our game.

The game mechanics used to demonstrate DPs in this study were based on the existing model of DPs in digital games presented by Zagal *et al*. [2013]. These patterns are present in well-known games across various genres and manifest in different ways. They may be employed solely as aesthetic manipulation – through "cute design" [Stockman *et al*., 2024] – or applied systematically, resulting in activities that negatively affect users' needs and potentially lead to a cycle of frustration and compulsive behavior [Jčius and Frestadius, 2022].

Players recognized the presence of the *DPs* featured in the critical game in commercial titles, particularly in gacha games such as *AFK Arena* and *Genshin Impact* ("[PB05] *Examples of games that came to mind were mainly some gachas, like AFK Arena and Genshin Impact*"). However, the association was not direct, as the patterns were presented conceptually – using icons and definitions (Figure 13) – rather than as fully implemented mechanics. This simplified approach proved effective, as there were no reports of patterns going unrecognized.

Figure 13. *Daily Rewards* in *Genshin Impact* and representation of the same pattern in the critical game

The choice of decision-making mechanics for the critical game proved to be effective, as evidenced by comparisons with popular games such as *Reigns*, *Lapse*, and *Nirvana*. This familiarity with the mechanic, present in commercial games of the same style, contributed to a positive player experience, even among those without prior knowledge of critical or serious games.

The analogy with decision-making in resource management, similar to approaches used in other studies [Johannes *et al*., 2021; Marini *et al*., 2018; Souza *et al*., 2021; Ghodsvali *et al*., 2022], allowed players to experience the role of a developer and understand the impact of their choices on users' well-being. This immersive and reflective approach is central to the success of the critical game in raising awareness about *DPs*.

Examples of this recognition are found in comments such as: "[PB10] *Like I said, Reigns is in that style, choice and consequence*", "[PB06] *Yeah, like this [...] I think so, the game Lapse*", and "[PB04] *[About the style] It looks like Nirvana (the game)*". Although these are not serious games, all three build their gameplay and narrative around decision-making mechanics, just like the evaluated game. In all of them, decision-making allows players to choose different actions based on the presented options. These decisions affect resources, which increase or decrease based on their consequences [Souza *et al*., 2021].

During the analysis of the results, no participant made reference to any specific serious or critical game. This outcome was expected, as none of the participants reported being familiar with the concept of serious or critical games during the profile-building stage. The absence of references to specific serious or critical games, despite participants showing interest in the game and its theme, reinforces the relevance of the developed game. The approach enabled the discussion of a complex topic in an accessible and engaging way, using mechanics familiar to players and promoting reflection on the ethical implications of game design.

7.4 How to Balance Engagement and Learning in Critical Games?

Creating critical games that engage users while simultaneously promoting learning on complex topics is a constant challenge [Lamb *et al*., 2018]. The inherent educational nature of these games directly influences both concept development and narrative construction. Therefore, pedagogical tools must be carefully integrated into the player's experience so that the game retains its appeal and immersive potential, as also emphasized by Muri *et al*. [2023]. While games purely focused on entertainment may prioritize fun, critical games

must ensure that the learning tools are effective and relevant so as not to undermine reflection on the topic [Spyridonis and Daylamani-Zad, 2019].

Although this critical game showed positive results in terms of player engagement and experience, it raised questions regarding content assimilation through the narrative and the players' understanding of the consequences presented via feedback during the Alpha Test.

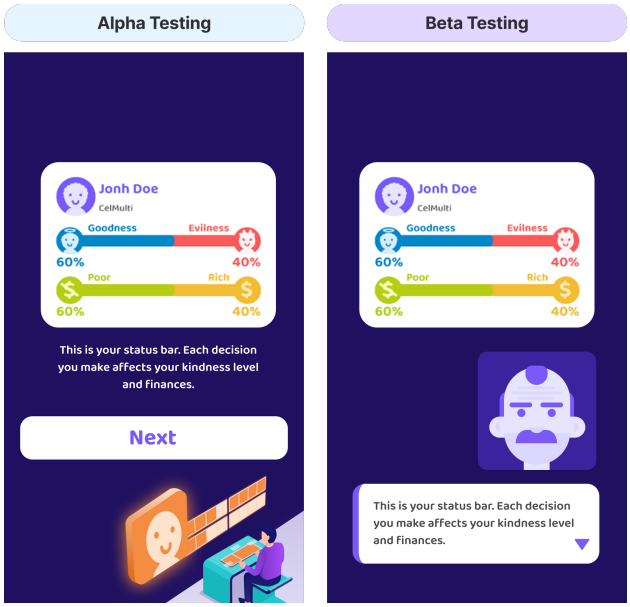


Figure 14. Example screenshot showing interface changes, including the addition of the boss character to provide narrative context for players.

After the Alpha Test, it became evident that it was necessary to add a non-playable character (NPC) in the role of a boss, whose function was to introduce TGD's narrative and guide the protagonist through its stages. This addition was motivated by participants' reports of difficulty in understanding TGD's objective and interactions. Developers implemented this NPC with the goals of presenting TGD's narrative, clarifying the objectives, and introducing the needs of the main character (Figure 14).

This change was essential, as proper understanding is a crucial factor in games played without mediators [Neset *et al.*, 2020], directly impacting both engagement and player experience, as evidenced in foundational studies on SDT [Ryan *et al.*, 2006]. The qualitative results from the Beta Test reveal that this group of participants demonstrated a better understanding of TGD's objective and narrative.

Participants reported that the text quality and the descriptions of the patterns were appropriate. However, the feedback responses after each stage and at the end of the gameplay session were considered surprising by some participants, a positive factor in this context. As reported: "[PB02] *it was a bad decision I made during the game, which I thought would have a more positive effect*". This surprise may have resulted from participants projecting their prior knowledge and experiences with digital games onto the selection of patterns, as also observed by Neset *et al.* [2020].

Regarding the patterns and their consequences, they were empirically constructed by the evaluators using SDT and the concept of DP in digital games presented by Zagal *et al.* [2013]. Thus, although players reported being familiar with these patterns, their lack of knowledge about the negative consequences and the absence of theoretical understanding of the subject may have led to unexpected outcomes. This may result in frustration among players who seek to achieve the best possible outcome [Mills *et al.*, 2018].

Therefore, it is necessary to adopt an approach that promotes users' reflective learning, one in which they do not rely solely on prior knowledge, but instead analyze each component of the available alternatives before making a decision. Through reflective learning embedded in decision-making practices, we aim to enhance learning outcomes and increase player engagement and involvement, as previously highlighted by Flood *et al.* [2018].

7.5 If They Are Positive, Why Aren't Players Choosing the Radiant Patterns?

Comparing the results of the two evaluations, we can see that the selection rate of RPs reaches or stays below half of the choices: 50% of the patterns selected in the alpha test were RP, while in the beta test this figure was 46.66%. There are several reasons for this relatively low average. The first is the disparity between the pattern options available in each challenge: three of the patterns were negative, while only one was positive. So even if the participant didn't know what to choose and decided to act randomly, there was a 75% chance of choosing a DP. Consequently, the 46.66% selection rate in the beta test significantly exceeds the 25% probability of random selection, suggesting a non-random inclination toward Radiant Patterns despite the structural bias of the options.

The choices were also influenced by the players' previous experience. Some participants reported that their decisions were based on personal preferences "[PB02] *I could have gotten it right, but I went more for my taste"* and on previous experience with digital games "[PB10] *So, because a lot of what I answered, I answered based on what I've already experienced"*. These responses indicate that players often prioritize game feel and established genre conventions over ethical considerations. Participant [PB02]'s reliance on taste suggests that if a Radiant Pattern feels unfamiliar or less 'fun' due to its lack of predatory urgency, it may be rejected despite its positive intent. This highlights a conflict between player-centered ethics and traditional entertainment expectations.

Although RPs are based on patterns and mechanics present in games already on the market, their presence tends to be more niche, generally restricted to specific styles and genres (e.g., item evolution is common in RPGs, action-adventure games, Metroidvanias and similar genres). On the other hand, DPs are widely used in digital games, as they are often replicated due to their effectiveness in generating income and maintaining player engagement. However, this market 'effectiveness' focuses on business metrics rather than the psychological well-being or autonomy of the player, creating a familiarity bias that RPs must overcome. The preference for familiar DPs over niche RPs suggests that players may perceive Dark Patterns as supporting their competence through well-known progression loops, even if those loops undermine their autonomy. Future iterations of RPs must bridge this gap by making ethical patterns as intuitively rewarding as their deceptive counterparts.

Finally, when comparing the percentages for choosing RPs, we found that the rate in the alpha test was slightly higher than in the beta test: 50% versus 46.66%. This result can be explained by the fact that the alpha test participants were already familiar with SDT and the study of design patterns in digital games. As such, their experience and style of play were already more inclined to select patterns that prioritized the player's well-being and satisfaction of basic psychological needs "[PA02] *I thought a lot about SDT because that's something I study. So it reminded me a lot of that, too."* This confirms that the Alpha phase functioned as a verification of the framework's legibility among experts, whereas the Beta phase provided a more authentic measure of how non-specialist players interact with these concepts without prior theoretical bias.

8 Limitations

This study contributes to ethical game design while facing several constraints. The Alpha and Beta phases used convenience sampling at a single Brazilian university. Recruiting technology students and professionals likely introduced selection bias. This approach sufficed for an exploratory study focused on identifying problems and refining the Radiant Pattern concept. The methodology met the initial goals of concept refinement rather than seeking to generalize results to all players.

Convenience sampling allowed for rapid testing at a low cost. Participants delivered detailed feedback on design elements. Their input helped improve narrative and reflective mechanics. Broadening future recruitment to include casual players and non-technical users from diverse cultures would increase result generalizability.

Short test sessions averaging five minutes may have prevented deep reflection. Methodological rigor came from using validated instruments like PX-Br and UES-Br. The data relied on self-reported experiences. Longitudinal studies should follow this work to track how reflection persists over longer periods.

RPs lack independent validation outside this specific game. The project simulated decisions narratively but did not isolate the impact of each pattern through controlled experiments. This gap makes it difficult to treat these patterns as precise experimental variables. It also prevents a direct comparison between Dark Patterns and Radiant Patterns. Future A/B testing or comparative studies could measure how these patterns change user autonomy and competence in real scenarios.

The results confirm that critical game design is feasible. Using Radiant Patterns successfully raises awareness about design consequences in gaming.

9 Research Ethics

This study adhered to ethical research practices, with all participation being voluntary. Prior to the sessions, each participant was provided with and signed an Informed Consent Form (ICF) that detailed the study's objectives, procedures, potential benefits, and any possible discomforts. The ICF also guaranteed participants' anonymity and the right to withdraw from the study at any time without penalty, with the option for immediate deletion of all collected data upon request.

To ensure confidentiality, all participant data were anonymized using coded identifiers instead of names. All collected information, including recordings and transcripts, was stored on a secure server with access restricted solely to the research team.

Although formal approval from an Ethics Committee was not required for this initial exploratory study, which focused on concept testing and refinement of the critical game TGD, we acknowledge its importance for future research. Accordingly, a subsequent project that builds upon this work has already been submitted to and approved by the Ethics Committee of the Federal University of Ceará, ensuring that all future research aimed at expanding this study and generalizing these results will adhere to the highest ethical standards.

10 Conclusion

This study presented a twofold contribution to the HCI and game design communities. First, it detailed the refinement of the concept of RPs and the expansion and operationalization of its framework, transforming it into a structured tool capable of guiding the development of more ethical, well-being-oriented games. Second, it detailed the design and evaluation of TGD, the first critical game to implement this refined framework as a practical tool for fostering critical reflection on the use of design patterns in the game industry.

The expansion of the RPs framework provides a tangible alternative for developers seeking to avoid Deceptive Patterns. However, as the evaluation of TGD revealed, the mere existence of "positive" patterns does not guarantee their selection. The average choice rate of RPs by players highlights the need for a broader discussion on how to make these ethical alternatives not only viable but also as attractive as the consolidated DPs already prevalent in the market.

The evaluation of TGD demonstrated the effectiveness of a playful and reflective approach to raising awareness. The findings confirm that while players often recognize DPs from their gaming experiences, they are largely unaware of the underlying psychological impacts. The surprise and frustration reported by participants upon seeing the consequences of their choices emerged as powerful motivators for learning, pushing them to question normalized design practices and seek more ethical solutions. The game proved successful in balancing learning and engagement, achieving positive results in playability and player experience, and reinforcing the potential of critical games as tools for player empowerment.

Future work follows two paths. First, we will expand the Radiant Patterns concept into a structured catalog. Controlled studies will then isolate these patterns to measure their empirical impact on the three psychological needs of Self-Determination Theory: autonomy, competence, and relatedness. For TGD, we will address current limitations by extending gameplay duration and reducing initial information overload. Refining the narrative complexity will allow for deeper reflection, moving beyond immediate reactions to sustained critical engagement. These efforts aim to test whether the awareness gained in-game actually translates to the navigation of real-world digital environments.

Ultimately, we present our findings as both a contribution

and a direct design challenge to the community: to shift the focus from merely identifying DPs to actively creating healthier, radiant alternatives, ensuring that ethical, player-centered design becomes not just an option, but the standard.

Declarations

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Authors' Contributions

- **Luiz Santos Filho:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology and Writing.
- **Nayana Carneiro:** Validation, Writing, and Text Review.
- **Alairton Sousa Junior:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Visualization and Writing.
- **Ticianne Darin:** Conceptualization, Investigation, Methodology, Project administration, Funding acquisition, Resources, Supervision, Validation and Writing.

Competing interests

The authors declare that they have no competing interests.

Availability of data and materials

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