Article:
Tang, Ziao and Kirman, Ben (2025) Designing for curiosity: Understanding player engagement with treasure chest mechanics in open-world games. International Journal of Human Computer Studies. 103575. ISSN: 1071-5819

https://doi.org/10.1016/j.ijhcs.2025.103575

Designing for Curiosity: Understanding Player Engagement with Treasure Chest Mechanics in Open-World Games

Ziao Tang, Ben Kirman

The University of York, United Kingdom

*Corresponding author: Ziao Tang; Email: zt875@york.ac.uk

Abstract

Open-world games increasingly rely on treasure chests as core gameplay mechanics, yet their impact on player engagement remains understudied. This research investigates how treasure chest design influences player curiosity and engagement in open-world games, using the Assassin's Creed series as a case study. Through semi-structured interviews with 19 experienced adult players and employing reflexive thematic analysis, we identified four interconnected themes: (1) Multidimensional Motivational Drivers, (2) Player-Chest Dynamic Interactions, (3) Chests as Game Progression Catalysts, and (4) Emotional Resonance of Chest Interactions. These themes reflect various dimensions of player curiosity, including Perceptual Curiosity (PC), Curiosity about Complexity and Ambiguity (CCA), Future Rewards Maximization Curiosity (FRMC), Epistemic Curiosity (EC), and Social Curiosity (SC).

Key findings indicate that treasure chest design effectively triggers multiple types of player curiosity simultaneously, with their impact heavily dependent on the balance between predictability and surprise in reward mechanisms. Player engagement with treasure chests evolves dynamically, transitioning from initial visual attraction to complex strategic optimization based on reward patterns and game progression. The effectiveness of treasure chests in sustaining player engagement relies on careful integration with game progression systems and intelligent reward distribution that adapts to player behavior. Additionally, players' emotional responses to treasure chests are multifaceted, encompassing achievement,

control, belonging, and potential fatigue, particularly when chest frequency exceeds optimal thresholds.

This study advances both theoretical understanding of curiosity in game design and practical implementation of treasure chest mechanics. The resulting design recommendations aim to enhance player engagement through balanced stimulation of different curiosity types, potentially increasing game richness and longevity. While focused on the Assassin's Creed series, our findings have broader implications for open-world game design and reward system development.

Keywords: human-computer interaction, user engagement, interaction design, curiosity, game mechanics, game design, reflexive thematic analysis

1. Introduction

From a human-computer interaction perspective, understanding how game mechanics influence player behavior and engagement is crucial for creating effective interactive systems. The choice and arrangement of game mechanics are key to how games are experienced by players, as documented in fundamental game design literature (Tekinbaş & Zimmerman, 2004), and appeal to players in a wide variety of ways. Players exhibit different patterns of involvement and motivation (Billieux et al., 2015), engaging with games through activities such as exploration (Scharkow et al., 2015), achievement (Cruz et al., 2017) and social connection. These engagement patterns can be viewed as manifestations of different types of curiosity in games (Tang & Kirman, 2024). In the current paper, we examine how curiosity drives player interaction with a specific and ubiquitous game element - treasure chests.

Treasure chests are ubiquitous elements in games, playing a crucial role in both design architecture and gameplay construction. They are widely recognized as significant enhancers of player experience and immersion through various mechanisms, including reward distribution, narrative enhancement, challenge creation, and exploration encouragement (Bradford, 2020; Drummond & Sauer, 2014). This enhancement directly impacts player engagement time—a key metric for measuring a game's commercial value. The effectiveness of game elements like treasure chests in driving engagement has led to their adoption beyond entertainment games, finding applications in serious games and gamified systems (Sailer et al., 2016; Nacke & Deterding, 2019), where they serve to maintain player curiosity and motivation (Deterding et al., 2011).

This design strategy of using treasure chests to extend gameplay duration is particularly prominent in open-world games. In these games, chests often serve as rewards for map exploration, level completion, and quest fulfillment, corresponding to a more

substantial time investment compared to other game genres (Lichtenberg et al., 2021). Consequently, treasure chests occupy a more critical role in open-world games as design elements that attract players and increase playtime. Despite this significance, systematic guidance or exploration specifically addressing treasure chest design in games remains limited. Existing literature primarily either discusses chests as a subcategory within broader reward systems (Nagle et al., 2014) or examines them in specific contexts such as Winter's (2022) study, which focused on treasure chests as interactive objects for storing in-game archives rather than exploring their core design principles.

This treatment of treasure chests as peripheral elements overlooks their significant role in modern game design. Treasure chests are not merely reward containers but serve multiple important functions in games: they provide mechanisms for progression acceleration, character customization, and narrative discovery (Drummond & Sauer, 2018). Research demonstrates that diverse reward mechanisms substantially influence player engagement and satisfaction, with the synergistic combination of different reward types generating enhanced positive effects on player experience (Phillips et al., 2018). As demonstrated in recent research on open-world game motivation (Hughes, 2023), they function as valuable tools for pacing game progression and maintaining player interest. This aligns with broader research on how games satisfy basic psychological needs for competence, autonomy, and relatedness (Przybylski et al., 2010). In open-world environments, treasure chests serve as exploration markers that influence how players navigate and interact with game spaces, while simultaneously acting as narrative vehicles that contribute to world-building and player immersion (Totten, 2017).

Therefore, understanding how treasure chests influence player behavior and engagement is important for developing more effective game design strategies. Although traditionally studied only as part of broader reward systems, we argue that their fundamental

and pervasive presence in open-world game design warrants investigating them in isolation to understand what makes them particularly effective as design elements. This targeted investigation is especially relevant for open-world games, where chest placement and design can significantly shape both player exploration patterns and overall game engagement.

To address this gap, we explore players' perceptions of the role and function of treasure chests by examining the Assassin's Creed series as a case study of open-world game designs. We approach this investigation through the lens of curiosity, a perspective that offers unique insights into player engagement and motivation. This theoretical framework proves particularly valuable as it can inform the development of more engaging game designs by leveraging different facets of curiosity (Loewenstein, 1994; Przybylski et al., 2010), provide insights into player behavior and motivation (Ryan et al., 2006; Yee, 2006), and potentially improve long-term player retention (Hamari & Keronen, 2017; Teng, 2010).

This study utilizes a comprehensive curiosity classification framework for games (Tang & Kirman, 2024) that synthesizes multiple theoretical foundations. This framework builds upon classical curiosity theories (Berlyne, 1954; Kreitler et al., 1975) and their modern applications in game studies (To et al., 2016), while incorporating recent theoretical developments in reward-driven curiosity (Dubey & Griffiths, 2020). Through semi-structured interviews with experienced adult players and subsequent reflexive thematic analysis, we seek to uncover the connections between treasure chest design and player curiosity, ultimately developing a set of guidelines for treasure chest design in games.

The main objective of this study is to explore the relationship between treasure chest design and player curiosity in open-world games, specifically focusing on the Assassin's Creed series. By understanding this relationship, the study aims to provide design recommendations that can support designers in creating games that foster meaningful and engaging player experiences, with findings expected to enhance the appeal and stickiness of

chests for players. Although this study primarily focuses on the Assassin's Creed series as a core case study, it also incorporates and synthesizes chest design features from other relevant games mentioned by interviewees. Consequently, the findings possess a degree of universal applicability and can be referenced across a wider range of domains. While using a commercial game series provides rich, real-world data and ecological validity through studying established design patterns, we acknowledge that this approach limits our ability to experimentally manipulate chest design variables.

However, the ecological validity gained through studying an established game series outweighs this limitation, as it allows us to examine design patterns that have been tested and refined through actual player experiences.

This study addresses three interconnected research questions:

RQ1: Player Curiosity and Chest Design

a) How do different aspects of treasure chest design trigger various types of player curiosity?

b) Which types of curiosity are most prominent in player-chest interactions?

c) How do these different types of curiosity interact with and influence each other?

RQ2: Player Perception and Experience

a) What are players' overall views and impressions of treasure chests in games?

b) How do these perceptions evolve through extended gameplay?

c) What factors influence players' sustained engagement with chest mechanics?

RQ3: Design Implications

a) How can understanding curiosity inform more effective treasure chest design?

b) What specific design principles can be derived from players' curiosity-driven interactions?

c) How can these principles be applied to enhance player engagement?

1.1 The Concept of Treasure Chests in Games

In computer games, treasure chests are single-use vessels housing randomized rewards (Lawrence, 2017). These chests are obtained through specific achievements or behaviors, such as overcoming challenges, playing for a certain duration, or exploring the game world. They tend to encourage players to engage with the game for longer periods and undertake increasingly difficult tasks (Koeder et al., 2018). The rewards within these chests are randomized, preventing players from knowing the specific contents prior to opening. However, in many instances, players may be familiar with the potential reward pool or can discern patterns in the chest contents, as these are often governed by a predetermined set of rules (Koeder et al., 2018; Lawrence, 2017).

The contents of treasure chests can serve various functions and take multiple forms. Typically, players can utilize these rewards to accelerate their progress, modify their character's appearance, or gain deeper insights into the game world (Drummond & Sauer, 2018). However, it is important to note that treasure chests are not generally considered to be the source of all in-game rewards, such as the social value rewards associated with high game rankings (Christy & Fox, 2014).

For the purposes of this study, we define treasure chests specifically as interactive objects with a container-like representation that players must actively discover and engage with to reveal randomized rewards. Our definition intentionally focuses on traditional visual representations of chests (e.g., wooden boxes, metal containers, ornate coffers) (Figure 10) rather than conceptually similar objects that might serve similar gameplay functions (such as glowing interactable points in the Persona series (Figure 11) or Pokéballs found in the environment within Pokémon). While we acknowledge that these conceptually similar objects may trigger comparable psychological responses in players, limiting our scope to traditional chest representations allows for more precise analysis of design elements specific

to these ubiquitous game objects. This definitional boundary also aligns with the chest implementation in the Assassin's Creed series, which consistently employs traditional chest iconography across its titles.

It is worth highlighting that the acquisition methods for treasure chests vary across different games. The primary distinction is between chests obtained through gameplay interactions versus those acquired through in-game purchases. The former corresponds to the player's investment of real time, while the latter relates to the player's monetary expenditure. In cases where players earn in-game currency through interactions to purchase chests, a form of virtual work, such transactions are generally categorized under monetary investment.

The second distinction pertains to the manifestation of treasure chests. The first category comprises system-awarded chests, where players cannot refuse to open or receive the chest. The other category comprises player-explored chests, which are obtained through the player's active exploration of the game content. In this case, players have the option to forgo exploration and thus not acquire the chest, or they may choose not to open it even after acquisition. This study primarily focuses on player-explored treasure chests in the Assassin's Creed series, which require players to invest real time to obtain them.

1.2 Current Research on Treasure Chests in Games

Treasure chests have a long history in game design, with their implementation evolving significantly over time. Existing literature has examined chests from several important perspectives that inform our current study.

Game design theorists have recognized chests as important elements in reward distribution systems. Schell (2008) explored how random reward mechanisms like chests enhance player motivation through anticipation, establishing psychological foundations for chest design. Adams and Dormans (2012) analyzed chests as elements of game economies, demonstrating how they contribute to resource distribution and economic balance. Adams

(2014) further developed design principles for chest implementation, particularly emphasizing their role in overall reward system balance. These foundational works establish treasure chests as multifunctional design elements that serve both mechanical and psychological purposes in games.

Beyond general game design principles, some researchers have examined the specific implementation of chests in particular contexts. Winter (2022) studied chests as interactive objects for storing in-game archives, focusing on their narrative and world-building functions. Lee and Kim (2016) explored applications of treasure chest mechanics in environmental protection education, demonstrating their potential pedagogical value. It is also worth noting that some research has adopted broader conceptualizations of treasure chests beyond traditional physical containers. To et al. (2016), for instance, examined how conceptually similar objects like Pokéballs found in Pokémon games function as treasure chest equivalents that trigger player curiosity. Their work highlights that the psychological mechanisms underpinning player engagement with reward containers can apply across varied visual representations. This expanded conceptualization raises important questions about what constitutes a "chest" in games—a definitional challenge we address in the current study.

Perhaps the most developed research area concerning treasure chests examines the relationship between real-money chests and gambling behaviors. Spicer et al. (2022) conducted extensive studies on this correlation, raising important ethical and regulatory questions about monetized random rewards in games. This research stream tends to focus more on psychological impacts and potential harm rather than on design effectiveness.

More specific design-focused research remains limited. Perez (2016) offered design suggestions for chest placement in maps and triggering chest-finding quests, but primarily as practical design guidelines rather than empirically grounded principles. Nagle et al. (2014)

discussed chests as a subcategory within broader reward systems, focusing on reinforcement scheduling rather than chest-specific design elements.

This existing work provides valuable foundations for understanding treasure chests, establishing their importance in game economies (Adams & Dormans, 2012), psychological impact (Schell, 2008), and potential applications beyond entertainment, such as environmental protection education (Lee & Kim, 2016) and cryptography & mathematics education (Tsoupikova et al., 2006). However, several significant gaps remain. Despite their ubiquity, treasure chests are rarely studied as design elements, instead typically subsumed within broader discussions of reward systems. The specific relationship between chest design and player curiosity remains underexplored, particularly in the context of open-world games where chests often play a critical role in exploration motivation. Additionally, there is limited empirical work capturing player perspectives on chest design, creating an opportunity for qualitative investigation of player experiences.

The current study builds upon this foundation while addressing these gaps, using curiosity theory as a framework to systematically analyze player experiences with treasure chests in open-world games. By focusing specifically on the Assassin's Creed series as a case study, we aim to contribute more detailed insights into how different aspects of chest design trigger and maintain various types of player curiosity.

1.3 The Relevance of Curiosity to Treasure Chest Design in Games

Recent studies have expanded our understanding of how game design elements influence player exploration and curiosity. Gómez-Maureira and Kniestedt (2019) developed a comprehensive framework for understanding how games invoke curiosity, while Gómez-Maureira et al. (2021) identified specific level design patterns that effectively trigger exploratory behavior. In the context of procedural content generation, Acevedo et al. (2022,

2024) demonstrated how spatial layout, and secondary tasks can enhance player exploration motivation. Furthermore, Kao (2019) examined the psychological mechanisms of loot box systems, providing valuable insights into how randomized rewards affect player behavior.

The adoption of curiosity as a theoretical lens for analyzing treasure chest design yields particularly valuable insights. In contrast to traditional reward-system analyses focusing primarily on behavioral outcomes, curiosity theory provides a framework for understanding the psychological mechanisms that drive player engagement with treasure chests. This approach offers several distinct advantages:

Engagement Optimization: Understanding how curiosity drives player interaction with treasure chests can facilitate the development of more engaging game designs (Loewenstein, 1994). Through the strategic utilization of various curiosity dimensions, developers can create experiences that maintain player interest over extended periods, potentially enhancing both player retention and satisfaction metrics (Przybylski et al., 2010).

Behavioral Insights: Analyzing treasure chests through curiosity frameworks yields comprehensive insights into player behavior and underlying motivations (Ryan et al., 2006). This understanding can inform not only the design of treasure chests but also broader game mechanics and narrative structures, contributing to a more cohesive, psychologically nuanced, and rewarding player experience (Yee, 2006).

Cross-Disciplinary Application: have significant applications beyond the game domain (Berlyne, 1954), informing user experience design across various digital interfaces and interactive platforms, educational software, or even physical product design (Hassenzahl & Tractinsky, 2006).

Cognitive Load Optimization: Understanding how different types of curiosity interact with treasure chest mechanics can help manage cognitive load (Sweller, 1988), ensuring that game systems enhance rather than detract from the player experience (Paas et al., 2003).

Specifically, well-designed chest systems can balance intrinsic cognitive load (complexity of learning chest patterns), extraneous cognitive load (effort spent processing irrelevant chest design elements), and germane cognitive load (effort invested in understanding strategic chest interactions). Our findings in Sections 3.2.1 and 3.2.2 demonstrate how players develop strategies to manage cognitive resources when engaging with chests, particularly through establishing optimal balances between predictability and surprise.

Long-term Player Engagement: Creating treasure chest systems that continually engage various aspects of player curiosity may contribute to sustained player engagement. While Teng (2010) identified factors affecting online gamer loyalty such as customization and immersion satisfaction, direct evidence linking chest design to long-term retention remains limited. Nevertheless, our findings suggest potential applications to engagement patterns that warrant further investigation, particularly given the importance of player retention in modern service-based game models (Hamari & Keronen, 2017).

To effectively analyze the role of curiosity in treasure chest design, it is essential to understand the various types of curiosity that can be evoked. Previous research has categorized curiosity in games into seven types (Tang & Kirman, 2024):

Perceptual Curiosity (PC): This type of curiosity is fundamentally rooted in human sensory experiences. In the context of treasure chests, PC manifests through their visual and auditory aspects, including appearance and associated sounds. The design of a chest's exterior and the audio cues when discovering or opening it can significantly impact player engagement. Additionally, PC in games can be facilitated through hidden missions or treasures strategically placed within the game landscape, making the discovery and subsequent opening of chests through map exploration an aspect of PC.

Manipulatory Curiosity (MC): This involves interest in interactions and their outcomes. For treasure chests, MC is triggered by the act of opening the chest and anticipating the results of this action.

Curiosity about Complexity and Ambiguity (CCA): This type of curiosity is directed towards unraveling and understanding complex or ambiguous situations. In treasure chest design, CCA is engaged through the uncertainty of chest contents and the potential for surprising rewards.

Epistemic Curiosity (EC): EC refers to the pursuit of knowledge and understanding of game mechanics. For treasure chests, this might involve players trying to decipher the reward patterns or probabilities associated with different types of chests. The main difference between CCA and EC in games is that the former aims to experience the unknown, with pleasure and attraction derived from exploration itself. The latter, however, aims to understand and master the unknown, with curiosity satisfaction coming from decoding the unknown.

Adjustive-Reactive Curiosity (ARC): This relates to the desire for physical feedback similar to reality. In treasure chest design, ARC could be engaged through realistic opening animations or tactile feedback in controller vibrations.

Social Curiosity (SC): SC involves understanding and exploring social aspects, including social dynamics, cultural knowledge, and identity roles. Tang and Kirman (2024) define this curiosity type as encompassing interest in social information, norms, and roles. In the context of single-player games like Assassin's Creed, SC may manifest primarily through narrative engagement, cultural exploration, and role identification rather than direct social interaction. Treasure chests potentially engage SC by providing items that contribute to narrative understanding, cultural context, or role immersion within the game world, though this connection requires careful examination.

Future Rewards Maximization Curiosity (FRMC): This type of curiosity drives players to seek or adjust strategies to achieve desired outcomes. In the context of treasure chests, FRMC motivates players to develop strategies for obtaining the most valuable rewards. The key difference between this curiosity and CCA is that the later doesn't necessarily seek to maximize rewards; its core lies in experiencing the unknown.

These different types of curiosity interact in complex ways to influence player behavior and engagement with treasure chests throughout the gaming experience. By understanding these interactions, game designers can create more compelling, satisfying, and ethically sound gaming experiences (Rigby & Ryan, 2011). For the reader to read and understand these curiosity acronyms more smoothly in the full text, we have organized them into a table (Table 0) in the Appendix.

1.4 The Current Study

While research on treasure chests exists, it has primarily focused on topics not closely related to the core of gaming, such as applications in non-gaming fields and discussions of moral and legal issues. Although almost every book on game and level design discusses chests, they are generally embedded within the broader context of reward systems, neglecting their unique role. Specifically, there is a lack of systematic research focusing on their design principles and psychological impact, particularly regarding how different design aspects trigger and maintain player curiosity. Furthermore, the effect of treasure chest design on long-term player engagement in open-world games remains poorly understood.

This study aims to bridge these gaps by investigating how treasure chest design influences player curiosity and engagement in open-world games. Using the Assassin's Creed series as a case study, we seek to develop empirically grounded design principles focused on treasure chest mechanics. Specifically, the study seeks to uncover how different aspects of chest design trigger various types of curiosity, how these curiosities interact and evolve

during gameplay, and how they collectively shape player engagement and the overall game experience. Through systematic analysis of players' subjective experiences and perspectives, the goal is to develop a nuanced understanding of the psychological mechanisms underlying the appeal of treasure chests, providing insights that can inform more effective and engaging game design practices.

Participants were selected from experienced players of the Assassin's Creed series. While the series represents a significant and commercially successful example of open-world game design featuring widespread implementation and evolution of treasure chests, it has also faced criticism. Game critics have noted a somewhat formulaic approach to world design and exploration (Schreier, 2018; Kuchera, 2020), suggesting it may be less innovative in curiosity-driven exploration compared to titles like *The Legend of Zelda: Breath of the Wild* (Kohler, 2017) or *The Elder Scrolls V: Skyrim* (Bogost, 2016). Nevertheless, Assassin's Creed provides a rich context for studying established chest design patterns due to its many distinct chest types and consistent player community interest in chest mechanics. By interviewing skilled players, we aimed to clarify attitudes towards chests in this specific style of open-world game.

The results of this investigation are intended to enrich existing knowledge about curiosity and chest design, specifically within Assassin's Creed-style open-world games. The study's primary contribution lies in its detailed examination of player experiences within this specific context, offering insights for developers working on similar games, rather than establishing universal principles. While the specific design practices may not generalize directly to all open-world games or genres, understanding how curiosity can be effectively triggered and sustained through reward mechanisms like treasure chests may also offer broader implications for improving engagement in various non-gaming contexts.

2. Method

2.1 Participants

Participants were recruited through Reddit forums, university emails, online surveys distributed through researchers' contacts, and offline poster advertisements. The study specifically targeted players with substantial experience in Assassin's Creed to understand their perception of treasure chests in such games. Participants were included only if they were at least 18 years old, had played Assassin's Creed for 50 to 500 hours, and had gaming experience with Assassin's Creed within the past week. Participants who did not meet any of these conditions were excluded.

This screening was implemented for several methodological reasons. First, focusing on experienced players allowed us to gather data from participants who could provide informed reflections on how chest designs impact gameplay over time, revealing evolutionary patterns in curiosity and engagement. Also, the study did not want to include individuals unfamiliar with the game because it could lead to unstable research results due to immature understanding of in-game chests (Reitter & Grossklags, 2019).While we acknowledge that this approach cannot capture the initial curiosity experienced by new players encountering chests for the first time—an important limitation of our study—it provides more nuanced insights into sustained engagement mechanisms.

Second, we excluded extremely experienced players (>500 hours) because an unusual affinity for the game might result in blind experiential preferences (Smith et al., 2020) or expert blind spots regarding game mechanics that have become automated through extensive play. The 50-500 hour range was determined using the mean ± 1 standard deviation from Steam platform data, which provided an empirical basis for defining "experienced" yet not "expert" players. We recognize that using the median rather than the mean might have

reduced potential bias toward long-term players further away from novelty experiences, which represents another limitation of our approach.

Third, recency of play experience (within one week) was crucial for ensuring accurate recall of subtle emotional and cognitive responses to chest interactions, following established memory research on recall accuracy (Ebbinghaus, 1880).

The study recruited 19 eligible participants, all of whom completed the interviews. As we were studying players' understanding of in-game chests from an overall perspective, participants' information remained anonymous throughout and was not considered in this study.

2.2 Design

A qualitative methodology was employed to examine player experiences. This approach facilitates the acquisition of comprehensive, novel insights about the core concepts being studied (Willig, 2019), allowing for a deeper understanding of expanding research areas. Eligible participants had engaged with the game within the previous week, so they were not required to play Assassin's Creed series games again before the interview. Participants were asked to participate in a 30–60-minute online interview about their experience with chests in this type of game.

The interviews were semi-structured to facilitate detailed data collection and investigation of unexpected ideas while maintaining consistency in questions (Harrell & Bradley, 2009). Reflexive Thematic Analysis (RTA; Braun & Clarke, 2019) was used to analyze the data, and the resulting themes were interpreted with reference to the research questions.

2.3 Materials

2.3.1 Assassin's Creed Series Games

The Assassin's Creed series was selected as the primary case study based on several compelling factors. Firstly, it exemplifies a large open-world game franchise that has been in continuous development for 18 years, with 14 mainline titles released between 2007 and 2025. Economically, the series has achieved significant commercial success, generating approximately €4 billion in revenue over the past decade (Ubisoft, 2024). This underscores its substantial market reach. When compared to other renowned franchises, Assassin's Creed leads in sales, surpassing the Legend of Zelda series, which has sold over 150 million copies as of 2024 (Statista, 2024), and the Resident Evil series, Capcom's highest-selling series with 167 million units sold by December 2024 (Statista, 2024). Notably, the Assassin's Creed series had already exceeded 200 million copies sold by September 2022 (Statista, 2022). Furthermore, the series has received critical acclaim, with all major titles averaging scores above 80 on Metacritic, highlighting its broad appeal and sustained player engagement. Most importantly, Assassin's Creed has maintained a stable core mechanic while iteratively evolving its design, providing an ideal backdrop for exploring how different design approaches affect player curiosity and interaction. Additionally, the series' diverse implementation of treasure chests (Figure 1,7,8,9) - from simple reward containers to complex puzzle elements - provides a comprehensive spectrum of design approaches to analyze. Moreover, treasure chest elements play a crucial role in this game series, even more so than in general open-world games. Discussions surrounding the Assassin's Creed series' treasure chests have been a perennial hot topic in the gaming community, making it more meaningful as a representative for studying treasure chest design (Game Informer, 2021; Gamingbible, 2021).

2.3.2 Interview Structure

The interview protocol was developed based on core theoretical concepts from the literature, posing questions about players' PC, FRMC, CCA, as well as questions related to EC and MC when interacting with chests in the game. Interviews began with closed-ended questions to facilitate participant acclimation to the interview process, followed mainly by open-ended questions and follow-up investigations to establish rapport and elicit detailed responses to their personal experiences and views in detail.

In the interviews, treasure chest design was used as the primary case to explore how players identify and perceive types of curiosity in games. Specific questions covered:

1) The source of players' initial interest in chest interaction, such as appearance, sound effects, or potential contents.
2) Whether players notice patterns in chest contents and how this affects their strategies.
3) How players evaluate the value and interest of different types of chests.
4) The impact of changes in chest appearance and content on players' interest.
5) The relevance of chest contents to players' previous actions and its impact.
6) The importance of balance between predictability and surprise in maintaining curiosity.
7) The impact of curiosity on players' overall game engagement.
8) The difference between looting spoils and opening chests, and its impact on player behavior.

The interviews aimed to gain an in-depth understanding of players' multidimensional experiences when interacting with chests in the game through these questions, thereby revealing the important role of curiosity in game design.

2.4 Measures

2.4.1 Procedure

The recruitment process yielded 68 initial respondents across all platforms. Reddit forums generated 31 responses, university email distributions produced 14 responses, researcher contacts yielded 18 responses, and offline poster advertisements resulted in 5 responses. All respondents completed a screening questionnaire assessing their Assassin's Creed gameplay experience and recency of play. Of the 68 respondents, 25 met all eligibility criteria, and we selected the first 19 eligible participants for interviews.

Their Assassin's Creed gameplay experience ranged from 58 to 472 hours (mean = 187 hours, SD = 112.3). All participants had played at least one Assassin's Creed title within the past week, with 13 participants having played multiple titles in the series. The interviews were conducted via video conferencing software, with an average duration of 47 minutes (range: 32-64 minutes).

The semi-structured interview protocol underwent two rounds of piloting. The first round with two non-participant volunteers identified unclear questions and terminology, leading to refinements in wording and the addition of follow-up prompt examples. The second evaluated question relevance to the research aims, resulting in the addition of questions specifically targeting the balance between predictability and surprise in chest design.

It should be noted that there is no definitive standard for how many people should be recruited for qualitative research. Methodological guidelines indicate that researchers should base sampling decisions on multiple criteria, such as the requirements for participants and the quantity, quality, and relevance of data collected in each interview (Braun & Clarke, 2021). Data saturation guided our decision regarding sample size. After conducting 10 interviews, we observed clear data patterns and thematic clustering, suggesting initial saturation of core

themes. However, we continued interviews because: 1) some participants were providing unique insights about non-overlapping chest designs from other games that enriched our understanding of the phenomenon; 2) we had not yet reached consensus on specific aspects of chest design such as optimal transparency levels and emotional responses; and 3) we wanted to ensure demographic diversity in our participant pool. By the 19th interview, we determined we had reached sufficient data saturation when: a) no substantially new themes emerged in three consecutive interviews; b) the range of perspectives on key questions appeared to be comprehensively documented; and c) the data demonstrated rich thematic depth while maintaining focus on the research questions. This approach aligns with qualitative methodological guidance suggesting that sample adequacy should be judged by data quality and relevance rather than predetermined numerical thresholds (Braun & Clarke, 2021).

During the early recruitment of participants, researchers briefly introduced the research process to participants through recruitment materials and informed consent forms. Overall, participants only needed to ensure they met the screening criteria and participated normally in the interviews. After the interviews, we reported to the participants and thanked them for their contributions, and after the conclusion, the interview content was manually transcribed, and the obtained data was analyzed, interpreted, and written in a report.

2.4.2 Ethical Considerations

Prior to data collection, approval was secured from the University Ethics Committee. Upon recruitment, participants were provided with electronic information sheets and consent forms that detailed the study's purpose and specifics. They were informed of their right to withdraw from the study at any time during data collection and until the study's findings are published in any form. Participation was voluntary, confidential, and fully anonymous, with all identifiable personal information removed from the data. Authorization was granted to

audio-record and store the data for use in preparing the report. Additionally, all sensitive data was encrypted before transcription, with only anonymized transcripts retained on the University system. Two years after the study's commencement, the data may be deleted or kept for future use as necessary.

While no adverse psychological impacts were anticipated from participation, qualitative research may involve sensitive topics that could cause discomfort. Therefore, participants were informed they could skip any questions they found uncomfortable and were provided with contact information of the project supervisor in case they experienced distress after the interview. The researcher would then direct them to appropriate support services if needed. Each interview concluded with a debriefing session and expressions of gratitude to ensure proper closure of the study process. Participants were compensated with a £15 Amazon voucher. This compensation acknowledged their time and contribution without creating a sense of obligation to participate in a specific manner.

2.5 Analysis

Reflexive Thematic Analysis (RTA) is a systematic approach to identifying meaningful patterns in qualitative data. Researchers generate themes through iterative engagement with data mediated by their existing skills, theoretical knowledge, assumptions, and research values (Braun & Clarke, 2019, 2021). Specifically, RTA encourages reflection on how researchers' personal influences affect data generation and interpretation (Braun & Clarke, 2019).

In this study, researchers acknowledged that their own fondness for treasure chest experiences in open-world games represented by the Assassin's Creed series, as well as their interest in using curiosity as a method to explain these experiences, generated assumptions about others' experiences (e.g., how various types of curiosity match the interactive facts of treasure chests and connect with the resulting outcomes). Prior to data collection, researchers

engaged in extensive gameplay of the recent Assassin's Creed game “Assassin's Creed: Valhalla” to familiarize themselves with the game, which helped better understand the specific content of the game but might lead to bias due to personal views on the game. Therefore, they tracked the deepening of their understanding of the game in reflective diaries and reconsidered their initial views when appropriate. Importantly, this may reduce but not eliminate bias; researchers' interpretations of the data may still be influenced by their past experiences. Following Braun and Clarke's Reflexive Thematic Analysis (RTA) method, and referring to Byrne's (2022) latest interpretation, the analysis process followed the six-step approach, allowing for a systematic yet reflexive engagement with the data.

3. Results and Discussion

The reflexive thematic analysis yielded four distinct core themes, and twelve sub-themes related to the research focus - real-time player-explored treasure chests in open-world games represented by Assassin's Creed, encompassing players' interactions and experiences with chest mechanics in games primarily represented by Assassin's Creed. Each sub-theme underwent individual analysis and attempted to link them to various types of curiosity in games (Table 1).

Before presenting our findings, it is important to establish a conceptual distinction between two related but separate phenomena that emerged in our analysis: (1) curiosity-driven engagement with chests themselves and (2) utility-driven engagement with chest contents. While these aspects are interconnected, they represent different psychological processes:

- **Curiosity-driven engagement** refers to the psychological attraction to and interaction with treasure chests as objects of interest in themselves. This includes the desire to discover unknown chests, the anticipation of opening them, and the pleasure derived

from the exploration and discovery process itself. This engagement is primarily driven by intrinsic motivation and various forms of curiosity (PC, CCA, EC, etc.).

- **Utility-driven engagement** refers to the instrumental value players derive from the actual contents of chests after opening them. This includes the usefulness of acquired items for game progression, character customization, or other gameplay advantages. This engagement is primarily driven by extrinsic rewards and their functional benefits.

While these two forms of engagement often occur together and reinforce each other, they can also operate independently—players may be curious about chests even when their contents have limited utility, or they may seek chest contents purely for instrumental reasons without experiencing significant curiosity. Throughout our findings, we attempt to distinguish between these processes where relevant, while also acknowledging their complex interactions.

3.1 Theme One: Exploring Multidimensional Motivational Drivers

Player motivation for chest interaction stems from multiple complex factors. Although we list four relatively independent reasons under this theme, this does not imply discrete or mutually exclusive motivational factors for individual players. The act of opening chests often involves multiple types of curiosity, which interact and constrain each other, manifesting in the player's behavior.

3.1.1 Unknown Contents as Curiosity Triggers

Among the identified motivational factors, one point mentioned by almost all participants is the curiosity brought by unknown contents. “The unknown contents of the treasure chests stimulated my curiosity” (P15). This manifestation of curiosity directly corresponds to CCA, which is not limited to individual chests but extends to the exploration

of the entire game world. In other words, almost every encounter with a chest triggers internal motivation in players. “Every time I see those treasure chests; I can't resist wanting to open them” (P7).

As discussed earlier, the random rewards from chests in current game mechanisms are pseudo-random, meaning players can understand the chest output mechanism through multiple chest openings, corresponding to EC. However, due to the shallow reward pool of chests on the map, players can easily realize what kind of rewards might be in the chests, and this process only takes “3-5 times” for most interviewees. One participant explained, “It's partly because I have rich gaming experience, it's easy to figure out the general idea” (P3). However, players with relatively less gaming experience among the interviewees did not give a significantly higher number of attempts than 3-5 times. Particularly, as one participant said, “More than ten times, I can't stand it” (P8). The shallow chest reward pool means players may quickly identify possible contents. After completing basic identification, the curiosity-driven motivation diminishes significantly, and if this homogeneous content without surprises continues, this chest experience quickly becomes quite uninteresting and unattractive.

However, in the interviews, several participants (P5, P11, P16) indicated that new content could renew diminished curiosity. As P11 expressed: 'Then you can imagine, 'Oh, they added a new treasure chest today, what kind of things might be inside?' This suggests that appropriate content updates may potentially interrupt the declining curve of curiosity and restart the cycle, though the longevity of such renewed interest would require further investigation.

3.1.2 Goal-Oriented Exploration

Treasure chests frequently function as quest objectives and completion conditions, guiding players in goal-directed exploration behavior (Figure 2). This demonstrates that chests serve not only as curiosity triggers but also as important elements in game progression,

closely integrated with the game's quest system and exploration mechanisms. This sub-theme explores how chests function as quest objectives and completion conditions, guiding players' goal-oriented exploration behavior.

Multiple participants emphasized the importance of chests as game objectives. P2's view is particularly representative: “The existence of treasure chests and hidden items makes me more willing to accept additional challenges, because completing these extra tasks also comes with these rewards. The contents of the boxes also enrich the world-building and provide equipment and skills. In any case, it makes me more likely to explore the game world more, accept extra challenges, and then makes me willing to spend more time playing it.” This suggests that chests are not simply reward containers but also motivators for players to delve deeper into the game world.

Chests also serve as conditions for triggering and completing quests, further enhancing their importance in the game. One participant mentioned: “For example, through game puzzles, don't you often need to use items to pass to the next level?” (P6) Another participant added: “Some quests require you to open items from those treasure chests to activate or complete those special tasks” (P13). This indicates that chests are not only sources of rewards but also key elements in driving game narrative and quest progression.

The above-mentioned performances of treasure chests are mainly achieved by triggering FRMC and EC. In this case, players don't have curiosity about the contents because they clearly know these are “quest items,” meaning the chest itself and its contents don't have obvious significance; what's meaningful is what happens after obtaining the contents. So, the curiosity triggered here is EC. By opening this type of chest, players can learn about the game world and storyline through related items or unlocked quests, gaining richer information. At the same time, this form also involves FRMC. Because if experience tells players that they can obtain richer information and quests from chests, then driven by

EC, they will change their game strategy, spending more time opening chests in hopes of getting the desired rewards.

3.1.3 Reward Incentives

As previously established, treasure chests influence player strategies through FRMC activation. This phenomenon manifests not only in quest-specific chests but predominantly through high-value chest encounters. For instance, P16 mentioned: “Every time I encounter those randomly spawning enemy outposts, I can't help but clear them out, actually because I see treasure chests inside their bases.” (Figure 3) This observation demonstrates that chest placement not only directs exploratory behavior but also influences their interaction with other elements in the game world.

In this form, CCA and FRMC play complementary roles. Since chests rewarded for defeating enemies often have higher value and richer outputs, they reasonably trigger players' CCA. At the same time, players who know from experience that such chests have higher value are also driven by FRMC. This may lead them to spend more time challenging tasks and levels they might otherwise avoid, opening specific chests and obtaining more valuable equipment and items in the game. As one participant said: “Those secret chests can yield purple and gold equipment, and I'm quite interested in that gear. Basically, the higher the level of equipment I get, the more interested I am” (P4).

It's worth noting that chest opening driven by FRMC isn't necessarily for new unknown high value items but could also be for specific items that players need, such as “Training materials, and these special action emblems and such, which can be used to decorate the actor themselves” (P9).

P7 was more direct: “I really like using the hidden blade, and crafting materials can be directly obtained from specific chests, so I often go to open chests.” Players will use their experience to find chests that are more likely to contain these items.

This is the essence of FRMC, which doesn't seek the unknown, but rather high-value rewards that match players' needs based on their experience. The behavior driven by curiosity is a continuous exploration to achieve this optimal result. It's noteworthy that FRMC is driven and optimized by experience, so if the game's progression results break the expectations they've gained through experience, it will greatly impact the survival of this curiosity. For example, P11 mentioned this situation: “When a place that's obviously more difficult to get a chest from often doesn't yield particularly valuable content, or when challenging high-level monsters at a low level doesn't seem to give any reward bonus. That's quite uninteresting.”

3.1.4 Visual and Auditory Design Elements

This sub-theme examines the manifestation of PC through visual and auditory design elements. Aligning with established findings, the appearance of treasure chests indeed has an attraction for players. As one participant noted, “Initially, I was interested in these treasure chests mainly because I thought their appearance was quite elaborate and attractive” (P1). The attractiveness criteria demonstrate clear patterns: “… chests that seem valuable, make me want to open them more” (P12). However, a noteworthy detail is P9's mention of appearance: “Also, each type of chest has a different design style, which matches well with the game's storyline, historical background, and environment. It doesn't feel out of place.” Several participants viewed this as an important aesthetic principle to follow (Figure 4). Another point aligning with common sense is sound design. Most participants mentioned, “The sound effect when opening the chest, that 'click' sound, I really like it” (P5).

Beyond these intuitive findings, an important observation is that the stimuli corresponding to PC may not be long-lasting, and might only arouse curiosity on first appearance, later serving more as a visual anchor. Participants' responses indicate that their curiosity about the chest contents has a greater focus and durability than the appearance:

"This (appearance) would also have some influence, but not as much as directly changing the content of the chest" (P14). "… the items inside should be as diverse as possible" (P18).

Lastly, the almost one-time PC is, to some extent, mixed with players' MC and CCA. "I would want to open chests with new appearances to see what would happen or what's inside" (P17). This sentiment corresponds to players' curiosity about the result of opening new chests and curiosity about their contents. However, since the dominant PC is a one-time event, if the contents do not essentially change upon opening, then the other two curiosities will also expire after one. This means that merely changing the appearance of a treasure chest may only pique the player's interest in the short term, and unless the contents change along with it, the novelty will soon wear off.

The multi-faceted nature of player motivation was evident across participant responses. Most participants (15/19) emphasized unknown contents as their primary motivation (CCA), while some (P4, P7, P16) were driven by high-value rewards (FRMC). Goal-oriented behavior was commonly reported, with P2 and P13 highlighting quest-related motivations. Visual and audio elements received mixed responses: P1 and P12 were strongly attracted by appearance, while P14 and P18 prioritized content diversity. These variations suggest different types of curiosity dominate at different gameplay stages and for different player types.

The audiovisual design elements described by the participants are consistent with research on "juicy feedback" in games - a mechanism that creates a sense of satisfaction by providing sensory rewards for player actions through enhanced visual and auditory responses. mechanism that creates satisfaction by providing sensory rewards for player actions through enhanced visual and auditory responses. Research has shown that these "juicy" elements have a significant impact on player experience: Hicks et al. (2018) found that moderately rich feedback increased player playtime and experience in an action role-playing game; Kao et al.

(2023) demonstrated that rich game feedback motivates players primarily by stimulating curiosity and a sense of competence. The visual and auditory design of treasure chests in Assassin's Creed-from their sophisticated appearance to the distinctive “click” sound when they are opened-embodying these principles, providing brief but impactful sensory rewards that complement the long-term strategic rewards they contain.

3.2 Theme Two: Mutual Influence Between Players and Treasure Chests

This theme examines the bidirectional relationship between treasure chest mechanics and player behavior, demonstrating that chests are not just static game components. They systematically influence player behavior through multiple mechanisms, acting on players' curiosity and thus affecting their game strategies. However, the deterministic nature of chest design mechanisms significantly constrains the temporal scope of this influence.

3.2.1 Strategy Optimization

While we've previously discussed how FRMC triggered by changes in chest rewards can lead to strategic changes in players, these strategic adaptations extend beyond binary engagement decisions. In fact, the strategic changes caused by FRMC are quite complex, and this complexity becomes increasingly apparent as players spend more time playing the game and better understand the rules and chest output logic.

Initially, players might simply choose whether to open chests or not, as one participant noted: “I see, after opening chests multiple times, it's mostly low-level treasures, so I rarely open these chests anymore” (P3). This decision-making process demonstrates increasing complexity. For example, in pursuit of maximum benefits, players might strategically invest limited time into higher-value activities: “If I get a new chest and a quest comes up, I can achieve two things” (P8). Another participant mentioned, “For example, sometimes choosing to bypass some seemingly tempting chests at crucial moments, preserving more space to face some more important chests” (P14).

As players develop a deeper understanding of game mechanics, they begin to consciously control the timing and method of opening chests. As one player stated, “The items in chests are based on your level. So, I thought about leaving chests for later” (P6). Driven by FRMC, some players gradually start seeking breakthroughs from sources unrelated to opening chests to get the desired results: “Then, I usually listen to shared information in player community groups about which chests are most worthwhile” (P19). Most notably, some players are willing to overturn their previous strategies and efforts for chests to maximize benefits: “Sometimes if I get powerful enough items from chests, I might change the development direction of my character because of this” (P11).

In this theme, the difference between FRMC and EC in games is once again highlighted. Players' efforts to pursue rules at this time are for the maximization of results, rather than being satisfied simply by knowing the patterns, as with EC.

3.2.2 Balance of Transparency

In our preceding analysis of treasure chest mechanics, we often mentioned the curiosity brought by unknown contents, which is CCA. However, in current games, due to the existence of chest reward pool mechanisms, players rapidly discern underlying reward patterns, potentially diminishing engagement quality. As one participant noted, “If you already know what's inside, there's not much interest in opening it” (P2).

However, this observation does not suggest players seek complete unpredictability. For instance, P6 pointed out: “Sometimes I specifically need a certain item, so I need to know it's inside to open it accordingly.” Players need a sense of control, allowing them to know what they're doing and what the game is doing. As another participant stated, “A game that's too predictable might make me feel monotonous or boring, while a game full of surprises would make me feel confused or at a loss” (P13). One participant (P10) suggested a specific ratio: 'Surprises should be a bit more than predictability, maybe about 60-70% surprises and

30-40% predictability.' While this specific numerical balance represents an individual perspective rather than a consensus finding, it illustrates the general preference expressed by multiple participants for a system that favors surprise while maintaining sufficient predictability to support strategic planning.

The dynamic balance between the predictability and mystery of chest outputs requires finding the optimal ratio between guiding exploration and maintaining suspense. Moreover, from the perspective of extending game time, the current chest reward pool design may not be sufficient to achieve this effect. Regardless of what role chests can play in the game, most of the time they need to rely on one premise - players are not certain what they can get from the chests. And this is not something that the chest reward pool mechanism can accomplish.

This balance is crucial for maintaining player engagement and curiosity. It suggests that game designers need to carefully consider how to implement chest rewards in a way that maintains a level of unpredictability while still providing players with enough information to make informed decisions about their gameplay strategies.

Strategy evolution was consistently reported across participants. Initial strategies focused on comprehensive exploration (P3, P6), while later gameplay showed more selective approaches (P8, P14). Player experience significantly influenced strategy development, from simple completion goals to complex decision-making processes involving chest value assessment and resource management.

3.3 Theme Three: The Role of Treasure Chests in Game Progression

In this theme, as this analysis adopts a macro-level, systemic perspective narrating the role of treasure chests and players' feelings towards them, the emphasis shifts from micro-level chest-player interactions, but on the overall game experience. However, this represents a mapping of players' desire to satisfy curiosity, manifested through the interplay between reward cadence and progression mechanics.

3.3.1 Reward Rhythm

In this sub-theme, participants emphasized how chest rewards synchronize with quest progress and character growth, thereby influencing their level of continued engagement with the game. A consistent finding across all participants was chests should progress along with the game: “The value of the contents from chests increases as the player grows, otherwise it would be too frustrating” (P7). A significant proportion of participants articulated specific expectations regarding this mechanism: “I imagine that the chests are intelligent, they can record my movements, actions, and achievements. For example, if I complete a specific side quest, the chest will hide a unique weapon” (P15).

This reflects two types of curiosity: CCA and FRMC. Players expect to continuously obtain new, unknown content experiences in the game (CCA), and ideally, these contents are unique rewards based on their past “experiences” (FRMC), which would keep them immersed in the game. At the same time, participants' repeated mentions of an intelligent algorithm for chest output logic also implicitly suggest the existence of EC, because an intelligent algorithm essentially adds another interesting and intuitive rule logic to the game. These different types of curiosity demonstrate significant interconnectedness.

This sub-theme highlights the importance of designing chest rewards that evolve with the player's progression, maintaining a balance between predictability and surprise. It suggests that game designers should consider implementing dynamic reward systems that consider the player's actions, achievements, and overall progress in the game, thereby continually engaging multiple forms of curiosity throughout the gameplay experience.

3.3.2 Process Impact

In this subcategory, the main discussion revolves around the further extension of how FRMC influences players' game decisions. Previously, players' discussions mainly reflected how they would change their original game strategies for higher-value goals. However, in

this section, players exhibit stronger reward-seeking behaviors. Specifically, when possible, players consistently demonstrate preference for maximizing reward outcomes at the same time, allowing chests to have a greater impact in the game. This motivational pattern demonstrates clear and specific characteristics.

They expect originally dispersed multiple stimulus points to be arranged together: “I really like that when I find a chest, I also encounter some hidden quests and secret areas at the same time” (P16). Some players show a purer form of “greed”, where their enjoyment in the game seems to be largely defined by the value they obtain in the game, without much patience for parts that cannot bring actual value, such as background information in the game: “Chests actually often contain information fragments, background information, but usually no one wants to read these texts. If these fragments could turn into quests, it would be quite interesting” (P8). They care more about whether information can be transformed into rewards with actual value or achieve some meaningful goal. The information learned in the process of obtaining rewards is just incidental. This also aligns with the behavioral definition of FRMC.

This subcategory highlights how players' desire for maximizing rewards can shape their preferences for game design. It suggests that players value efficiency and tangible progress, often preferring game elements that provide multiple benefits simultaneously. This insight could be valuable for game designers in creating reward systems that feel satisfying and impactful to players, potentially by combining different types of rewards (e.g., items, quests, and lore) in a single interaction point like a treasure chest.

Moreover, the preference for transforming passive elements like background information into active gameplay elements (such as quests) indicates a desire for more interactive and reward-driven engagement with game lore. This could inspire designers to find creative ways to integrate story elements with gameplay mechanics, satisfying both the players' curiosity about the game world and their desire for tangible rewards.

All participants expected chest rewards to scale with game progression, exemplified by P7's comment about increasing value. Integration preferences varied: P15 favored intelligent reward systems, while P8 prioritized immediate gameplay value. The impact on game progression was universally acknowledged but differently valued - some participants (P16) appreciated multi-layered rewards combining items and quests, while others (P8) focused purely on tangible progression benefits. These variations suggest the need for layered progression systems accommodating different player priorities.

3.4 Theme Four: Emotional Experiences Brought by Treasure Chests

This theme examines four emotional responses that emerge from curiosity-driven interactions, which are fundamentally grounded in emotional reactions associated with different forms of curiosity, but they are not entirely limited to curiosity. Discussing them can provide more intuitive and obvious emotional responses of players when facing treasure chests, and this analysis provides insights into modulating these emotional responses through curiosity-based design mechanisms.

3.4.1 Sense of Achievement and Satisfaction

The sense of achievement and satisfaction primarily emerges from the fulfillment of players' FRMC through gameplay outcomes. This is because the sense of achievement and satisfaction basically comes from the feeling produced when players obtain specific rewards after certain behaviors. For example, “When I manage to open a chest through my own efforts and find rare items that I've been anticipating for a long time, I feel very happy and excited at that moment” (P9). This process represents the practical manifestation of FRMC.

However, certain aspects of this process transcend pure FRMC mechanisms, which often come from the part before opening the chest and are specific to groups with certain qualities. For instance, participant P2 expressed: “I'm someone who really enjoys playing puzzles, and getting treasure chests through solving puzzles adds fun and challenge.” (Figure

5) In this process, satisfaction comes not only from the final reward but also largely from the process of solving puzzles. Puzzle-solving is a kind of understanding of rules and information, which belongs to the EC. Similarly, some people may derive this extra satisfaction from exploration itself (CCA), unexpected interactions from poking around (MC), or discovering a chest with a new appearance (PC). One participant described a less commonly reported phenomenon: 'When finding this treasure chest, there's a sense of achievement in exploration, as if I've really become an assassin in the game' (P18). This experience relates to role identity and immersion, which may involve elements of social curiosity as defined by Tang and Kirman (2024)—specifically the desire to understand and explore social roles and identities. However, we acknowledge that this connection requires further theoretical development, as the relationship between role immersion and social curiosity remains an area with limited empirical investigation.

In general, the satisfaction brought by treasure chests is a result shared by multifaceted curiosities. In other words, if we want to enhance this satisfaction, in addition to starting from the most common rewards, we can also consider strengthening from the perspective of other types of curiosity.

3.4.2 Sense of Control

As mentioned earlier, a sense of control doesn't mean players want absolute control over the game: “Since you're playing a game, it's certainly because you hope to encounter some new elements, some uncertainties” (P5). However, regardless of the game or the type of curiosity driving them, people always have logical and normal expectations for game content.

These expectations can sometimes differ. For some players, monsters appearing in chests is unacceptable: “Like those chests in ‘Dark Souls’ that can spawn monsters when opened, I can't understand that. For me, the burden and negative aspects outweigh the positive. Chests should have value” (P14). But this doesn't prevent Dark Souls from having

many fans. Games can cater to different audiences, but the key is that the game's internal logic should be consistent. Simply put, if the game initially sets orange as high-level chests and wandering in the wilderness can trigger new chests, and players accept this and start playing, then subsequently, situations where opening an orange chest only yields a bunch of junk items or exploring the entire map without finding a single chest, shouldn't occur. This is because although orange color and map exploration correspond to PC, since chests naturally produce a result (output rewards), the opening of each chest will inevitably correspond to FRMC.

This type of curiosity is driven and optimized by experience, so if the game's progression results break the expectations they've gained through experience, it will greatly impact the survival of this curiosity. For example, P11 mentioned this situation: “I think sometimes it's not very satisfying when a place that's obviously more difficult to get a chest from often doesn't yield particularly valuable content, or when challenging high-level monsters at a low level doesn't seem to give any reward bonus. That's quite uninteresting.”

This insight emphasizes the importance of maintaining consistent game logic and meeting players' expectations based on their experiences. Game designers should consider how to balance unpredictability with a sense of control, ensuring that players feel their efforts and strategies are rewarded appropriately. This balance can help maintain player engagement by satisfying their FRMC while still providing elements of surprise and challenge.

3.4.3 Sense of Belonging

Just as finishing a book can immerse one in its story, players also develop feelings for the games they play. These feelings project into reality, partly anchoring to real objects and partly evolving into an alternative form of social emotion that projects back into the game. This belongs to social curiosity in games.

Treasure chests play a role in this process mainly due to the items they produce. For instance, they output information that enriches the game world: “Because many chests are obtained through deciphering situations in the world background, or finding information fragments about the game world, it gives me a sense of reality. It makes the game world feel more meaningful to me” (P7). They also provide a form of “companionship” to the player: “Chests often yield some phase-specific top-tier equipment that you'll use for a long time. To be honest, even if I don't use them later, I won't throw them away. It's like having an emotional attachment to the items” (P12). They can even be a record of experiences: “Games often have chest statistics. When you've played for a long time and come back to see how many chests you've opened, whether you've achieved any system achievements, it's not just a sense of accomplishment. For me, it's more like a fond remembrance of 'oh, I've experienced so much here'” (P3).

In games like Assassin's Creed, chests also play a role due to their background environment: “These chests are basically closely tied to the world view and plot. The hidden locations of the chests are also basically in places of historical significance, or they are associated with specific historical figures or events” (P16). As mentioned earlier, the role-playing aspect of being an assassin is also part of this. Together, these elements deepen the player's attachment to the game and extend their playtime.

This theme highlights how treasure chests contribute to building a deeper connection between the player and the game world. By providing meaningful items, historical context, and a sense of progression, chests become more than just reward mechanisms - they become integral parts of the player's journey and emotional investment in the game. This insight can be valuable for game designers in creating more immersive and emotionally resonant game experiences, leveraging the social curiosity aspect of gaming to enhance player engagement and satisfaction.

3.4.4 Sense of Fatigue

In the Assassin's Creed series and many other large open-world games, treasure chests face a persistent issue: player fatigue caused by excessive chest exposure or overly dense distribution. The issue of reward saturation emerged as a complex and critical factor affecting player engagement. Our analysis revealed multiple dimensions of this phenomenon:

Participants reported that frequent chest encounters within short time periods led to diminished engagement. As P17 noted, "...if the entire game is very dense, constantly providing surprises, it becomes very tiring." This suggests a need for carefully paced chest distribution across gameplay time. (Figure 6)

The physical placement of chests within the game world significantly impacts player experience. P8 described the frustration of oversaturated areas: "These chests take time to acquire... Too many of these can be annoying, but I can't help but drive it, very mixed emotions." This indicates that chest density in specific game areas needs careful consideration.

When chest frequency increases, players reported heightened sensitivity to the value-effort ratio. P11 expressed this concern: "When a place that's obviously more difficult to get a chest from often doesn't yield particularly valuable content... That's quite uninteresting." This suggests that higher chest frequency demands more careful balancing of reward values.

Drawing from behavioral economics principles (Etemadi et al., 2023), the perceived value of rewards diminishes with increased frequency - a phenomenon known as diminishing marginal utility. This explains why participants reported decreased satisfaction with frequent chest encounters. Furthermore, the scarcity principle (Kovalenkov & Wooders, 1999) suggests that rarer chest encounters may enhance perceived value and maintain player interest. Players demonstrated psychological adaptation to frequent rewards, leading to decreased emotional response over time. This aligns with habituation theory in psychology

(Hall & Rodríguez, 2020), suggesting that maintaining engagement requires variable reward schedules and strategic scarcity.

Participants demonstrated diverse emotional responses to chest interactions. Achievement satisfaction varied by source: P9 valued rare item discovery, while P2 emphasized puzzle-solving satisfaction. The sense of control was crucial, with P5 and P14 expressing different tolerance levels for unpredictability. Social and belonging aspects emerged through P7's connection to world-building and P12's emotional attachment to items. Fatigue responses were consistent but triggered differently - P17 cited density issues while P8 noted value-effort imbalances. These variations highlight the need for balanced design addressing multiple emotional dimensions.

4. General Discussion

This investigation examined the complex relationship between treasure chest design mechanics and player curiosity/behavior in open-world games through interviews with experienced players of the Assassin's Creed series. The analysis generated four themes: (1) Exploring multidimensional motivational drivers, (2) Mutual influence between players and treasure chests, (3) The role of treasure chests in game progression, and (4) Emotional experiences brought by treasure chests. Each theme is analyzed through the lens of distinct curiosity types.

4.1 Exploring Multidimensional Motivational Drivers

Under this theme, we observed how six types of curiosity drive player interaction with treasure chests, aligning with and extending Loewenstein's (1994) information gap theory:

:

Perceptual Curiosity (PC): PC manifests primarily through the visual and auditory design elements of chest mechanics. Optimized chest aesthetics demonstrate significant capacity to stimulate exploratory behavior, especially those that look “valuable” or

“elaborate”, as well as sound effects that meet players' expectations or experience. However, the impact of perceptual curiosity seems relatively short-lived, with players more concerned about the diversity and value of chest contents than their appearance and sound.

Curiosity about Complexity and Ambiguity (CCA): This curiosity is mainly manifested in players' interest in the unknown nature of chest contents. Players exhibit consistent attraction to the probabilistic nature of chest contents, which drives them to continuously explore the game world. However, the current pseudo-random reward system in games may limit the persistence of this curiosity, with most participants stating they could roughly understand the content pattern of chests after 3-5 attempts.

Future Rewards Maximization Curiosity (FRMC): This curiosity plays a central role in chest design, driving players to adjust their game strategies based on potential rewards. Players decide whether to invest time in opening chests based on the high-value items they might contain. The study also found that players' strategies evolve as the game progresses, from trying to open all chests in the early stages to being more selective later.

Epistemic Curiosity (EC): EC is mainly manifested as players trying to understand game mechanics and chest reward logic. Players explore patterns by repeatedly opening chests, which both satisfies their epistemic curiosity and helps them optimize game strategies. However, the current chest system in games may be too simple, causing players to quickly understand its logic.

Social Curiosity (SC): Although chest design is not primarily aimed at SC, it does touch on this curiosity in some aspects. This is mainly reflected in how chests can enhance players' emotional connection to the game world - players deepen their understanding and emotional investment in the game world through items and information fragments obtained from chests.

Manipulatory Curiosity (MC): MC is relatively less reflected in chest design but still exists. It is mainly manifested in players' interest in the process of opening chests, especially when chest design includes puzzle elements.

The chest system simultaneously triggers multiple types of curiosity, and there are complex dynamic interactions between these curiosities. For example, PC is usually the initial reason players are attracted to chests, but it quickly transforms into CCA and FRMC. However, this transformation is not a linear process. Instead, different types of curiosity alternately or even simultaneously dominate player behavior throughout the game, forming a complex cyclical system. This dynamic transformation of curiosity is consistent with Berlyne's (1960) theory of curiosity, while also extending the application of this theory in digital game environments.

4.2 Mutual Influence Between Players and Treasure Chests

This theme explores how chest design influences player behavior, and how players adjust strategies to deal with different chest systems. The data reveals complex bidirectional relationships between chest design elements and player behavioral patterns. PC and MC influence players' initial interactions, while CCA drives players to seek a balance between predictability and mystery.

FRMC and EC jointly drive players to dynamically adjust game strategies. Players demonstrate systematic optimization of exploration strategies and prioritization frameworks based on their understanding of the chest system. For example, some players prioritize clearing enemy outposts containing chests or specifically seek chests containing certain materials in the late game.

Players generally seek some balance between predictability and mystery, with several participants expressing preference for systems that favor surprise while maintaining sufficient

predictability to support strategic planning. This equilibrium requirement aligns with and provides empirical support for Berlyne's (1960) optimal arousal theory.

The interaction of curiosity shown here aligns with the multidimensional model of curiosity proposed by Kashdan et al. (2009), but our study further reveals how these differences influence players' behavior and strategy choices in specific game contexts.

4.3 The Role of Treasure Chests in Game Progression

This theme focuses on how chests affect the overall game progression, difficulty curve, and long-term player engagement. Chests are not only part of the reward system but also influence the game's rhythm, difficulty curve, and narrative development. FRMC drives players to expect chest rewards to change with game progression, echoing Csikszentmihalyi's (1990) flow theory, suggesting that the chest system can be a tool to balance game difficulty and player skill.

EC prompts chests to become conditions for quest triggering and completion, involving not only the reward system but also game narrative and quest design, providing additional depth and complexity to the game. SC closely connects the location and design of chests with the history and background of the game world through, increasing the credibility of the game world and enhancing player immersion. In fact, a well-designed chest system can significantly extend the game's lifecycle by encouraging continuous exploration and engagement.

4.4 Emotional Experiences Brought by Treasure Chests

This theme explores how chests affect players' emotional experiences, including sense of achievement, control, and possible fatigue. Chest design significantly impacts players' emotional experiences. FRMC and EC jointly contribute to players' sense of achievement and satisfaction, especially when they obtain rare or high-value items through their own efforts.

However, excessive exposure to chests can also lead to fatigue, particularly when chest content becomes predictable or disproportionate to the difficulty of acquisition. This duality of emotional experience highlights the importance of balance in chest design, echoing the principle of "meaningful choices" in game design described by Tekinbaş and Zimmerman (2004).

Sense of control is also an important aspect. Players want to maintain a certain degree of control in the chest system, on one hand hoping to influence the acquisition and opening process of chests through their actions and decisions, and on the other hand expecting the items produced from chests to be surprises within their acceptance range rather than shocks. This sense of control is closely related to the transparency and predictability of the chest system, reflecting the balance between EC and CCA.

SC also plays a role in this process. Chests deepen players' understanding and emotional investment in the game world by providing items and information fragments related to the game world.

5. Research Limitations

Before presenting our conclusions and implications, it is important to acknowledge the limitations of this study to provide appropriate context for interpreting our findings.

Despite its contributions, this study presents several methodological and theoretical limitations. Qualitative methods, including RTA, are inherently subjective; researcher positionality and theoretical presuppositions inherently influence thematic analysis outcomes (Braun & Clarke, 2019). While multiple measures were implemented to address potential biases before data collection, their impact cannot be eliminated.

The sample's concentration on experienced Assassin's Creed players constrains the generalizability of our findings. This specialized demographic may exhibit distinct behavioral

patterns and attitudinal characteristics towards treasure chests compared to casual players or those from other game genres.

The adoption of a commercial game series as our primary research context, while providing ecological validity, presented certain methodological constraints. In contrast to controlled laboratory experiments where different design variations could be tested systematically, our analysis was constrained by pre-existing design implementations in the Assassin's Creed series.

Our study focused primarily on player-explored treasure chests obtained through gameplay, deliberately excluding monetization aspects such as loot boxes and microtransactions. While this decision allowed us to focus on core gameplay mechanics, this creates a notable gap in understanding how monetization affects player curiosity and engagement with treasure chest systems.

While our study identified the relationship between chest frequency and player disengagement, we acknowledge limitations in quantifying optimal reward frequencies. This knowledge gap is particularly significant as it affects both game design and player retention strategies.

Additionally, participants' awareness of being part of a study on treasure chests may have influenced their behavior and responses. Some participants might have paid more attention to treasure chests or persisted in interacting with them more than they would in typical gameplay scenarios due to their participation in the research.

The semi-structured nature of the interviews and the potential for varied gameplay experiences among participants at the time of interviewing could have affected the depth and breadth of insights gathered about different aspects of treasure chest design. Players who had progressed further in the game might have encountered a wider variety of chest types and had more time to develop strategies, potentially influencing their perspectives.

6. Conclusion and Contributions

Despite these limitations, this study makes several significant and novel contributions to game design research. First, it provides the first systematic analysis of treasure chest design through the lens of curiosity theory, offering new insights into player motivation and engagement. Second, our methodological approach integrates qualitative player interviews with robust theoretical framework analysis, providing both rich qualitative data and robust theoretical grounding. Third, our focus on experienced players of a successful game series ensures that our findings reflect sustained engagement patterns rather than initial impressions. Fourth, our systematic identification of correlations between curiosity typologies and design elements provides actionable insights for game developers.

This study employed Reflexive Thematic Analysis (RTA) to explore the design of treasure chests in open-world games through the lens of curiosity, using the Assassin's Creed series as a case study. Through semi-structured interviews with experienced players and subsequent analysis, we identified four major themes: (1) Exploring Multidimensional Motivational Drivers, (2) Mutual Influence Between Players and Treasure Chests, (3) The Role of Treasure Chests in Game Progression, and (4) Emotional Experiences Brought by Treasure Chests.

Our findings reveal that the interaction between different types of curiosity and treasure chest design is complex and multifaceted. The first theme, Exploring Multidimensional Motivational Drivers, encompassed various forms of curiosity including Perceptual Curiosity (PC), Curiosity about Complexity and Ambiguity (CCA), Future Rewards Maximization Curiosity (FRMC), Epistemic Curiosity (EC), and Social Curiosity (SC). This theme highlighted how these different types of curiosity often work in concert to create engaging player experiences.

The second theme, Mutual Influence Between Players and Treasure Chests, primarily involved FRMC and EC. It demonstrated how players adjust their strategies based on their understanding of chest mechanics and reward patterns, showcasing the dynamic interplay between curiosity-driven exploration and gameplay optimization.

The third theme, The Role of Treasure Chests in Game Progression, emphasized how treasure chests influence the overall game experience. This theme particularly highlighted the roles of FRMC and EC in shaping player strategies and engagement over time, as well as how SC contributes to players' connection with the game world and narrative.

The fourth theme, Emotional Experiences Brought by Treasure Chests, explored the affective outcomes of curiosity-driven interactions with chests. This theme touched on multiple curiosity types, showing how they collectively contribute to players' sense of achievement, control, belonging, and occasionally, fatigue.

Our analysis suggests that the challenge for game designers lies in balancing these various forms of curiosity to create a compelling and sustainable treasure chest system. An over-reliance on any single type of curiosity may lead to player fatigue or disengagement, as evidenced by participant responses across all four themes.

Based on our findings, we can now provide specific answers to the research questions posed at the beginning of this study:

RQ1: Player Curiosity and Chest Design

a) **How do different aspects of treasure chest design trigger various types of player curiosity?** Visual and auditory design elements primarily trigger Perceptual Curiosity (PC), with elaborate and culturally coherent chest appearances creating initial attraction. Unknown or probabilistic contents activate Curiosity about Complexity and Ambiguity (CCA), while the systematic pattern of rewards engages Epistemic Curiosity (EC) as players

seek to understand underlying rules. High-value rewards and progression acceleration stimulate Future Rewards Maximization Curiosity (FRMC), driving strategic behaviors.

b) **Which types of curiosity are most prominent in player-chest interactions?** CCA and FRMC emerged as the most prominent curiosity types in player-chest interactions. CCA dominates initial engagement, driving players to discover unknown contents, while FRMC becomes increasingly dominant in later gameplay as players develop strategic approaches to maximize valuable rewards.

c) **How do these different types of curiosity interact with and influence each other?** Our findings demonstrate a dynamic interplay between curiosity types. The PC often serves as an initial trigger that rapidly transforms into CCA upon discovery. As players gain experience, EC drives the understanding of patterns that subsequently enables FRMC-driven strategic optimization. This creates a cyclical system where different curiosity types alternatively or simultaneously influence player behavior throughout the gameplay experience.

RQ2: Player Perception and Experience

a) **What are players' overall views and impressions of treasure chests in games?** Players view treasure chests as multifunctional elements that simultaneously serve as exploration incentives, progression mechanisms, and narrative vehicles. They value chests that provide meaningful rewards proportionate to the effort required to obtain them and expect chest design to maintain coherence with the game world.

b) **How do these perceptions evolve through extended gameplay?** Player perceptions evolve from initial excitement about discovery to more strategic and selective engagement. Early gameplay is characterized by comprehensive exploration driven by CCA, while later gameplay demonstrates more sophisticated decision-making based on expected

value calculations, driven by FRMC. Players develop increasingly complex strategies for maximizing chest benefits as they gain experience.

c) **What factors influence players' sustained engagement with chest mechanics?** Key factors include: the balance between predictability and surprise; alignment between chest difficulty and reward value; integration of chests with broader game systems like quests and character progression; diverse and evolving reward pools; and appropriate chest distribution density to avoid saturation.

RQ3: Design Implications

a) **How can understanding curiosity inform more effective treasure chest design?** Understanding the different types of curiosity enables designers to create chest systems that engage players on multiple psychological levels simultaneously. By recognizing the dynamic prominence of different curiosity types throughout the player journey, designers can craft chest systems that continuously renew interest and engagement.

b) **What specific design principles can be derived from players' curiosity-driven interactions?** Key principles include: maintaining balanced transparency between known and unknown elements; ensuring proportionality between challenge and reward; implementing varied visual and auditory feedback; integrating chests with narrative and progression systems; calibrating chest frequency to avoid fatigue; and providing diverse content that evolves alongside player progression.

c) **How can these principles be applied to enhance player engagement?** These principles can enhance engagement through strategic implementation of chest systems that: evolve with player progression; balance multiple types of curiosity simultaneously; integrate with broader game systems; provide appropriate cognitive challenges; and maintain a rhythm of rewards that avoids both scarcity and oversaturation.

This research contributes to game design knowledge in three significant ways. First, it provides an empirically grounded framework for understanding how treasure chest design elements trigger different types of player curiosity, offering designers specific insights for creating more engaging exploration mechanics. Second, it documents the dynamic evolution of player-chest interactions over time, revealing how initial perceptual attraction transforms into strategic engagement—knowledge that can inform more sustainable long-term reward systems. Third, it identifies specific design parameters, such as reward-difficulty calibration and strategic density management, that directly influence player satisfaction and engagement with chest mechanics.

While our findings are derived specifically from the Assassin's Creed context, the psychological mechanisms of curiosity identified here may have relevance to similar open-world games that employ chest-like exploration incentives. The treasure chest, as one of gaming's most enduring and universal design elements, continues to evolve while maintaining its fundamental role in driving player exploration, progression, and engagement. By understanding the multifaceted curiosity relationships that underpin effective chest design, developers can create more compelling, satisfying, and psychologically rewarding game experiences.

Beyond gaming, these principles can be applied to non-gaming applications such as educational software and gamified systems, as well as user engagement strategies in digital interfaces. These broader applications are possible because the fundamental psychological mechanisms of curiosity that we identify are not unique to any particular game series, but rather represent universal patterns in human engagement with discovery and reward systems. This study advances both theoretical understanding of curiosity in interaction design and practical implementation of reward mechanics in interactive systems.

7. Design Recommendations and Future Directions

Building on our conclusions, we now present specific design recommendations based on our findings, along with directions for future research that can address the limitations of the current study and further expand our understanding of treasure chest design.

7.1 Evidence-Based Design Recommendations

7.1.1. Balanced Transparency System

Our findings in Section 3.2.2 revealed players' desire for balance between predictability and surprise, with participants emphasizing the importance of maintaining some uncertainty while providing sufficient information for strategic decision-making. Based on this finding, we recommend:

- Implement a chest system that provides clear visual differentiation between chest types (addressing PC) while maintaining uncertainty about specific contents (supporting CCA)
- Consider using visual indicators of general reward categories rather than specific items, allowing players to make informed decisions without eliminating surprise
- Ensure consistent relationships between chest appearance, acquisition difficulty, and reward value to maintain player trust and engagement

7.1.2. Reward-Difficulty Calibration

Participants consistently reported frustration when chest rewards did not correspond to acquisition difficulty (Section 3.2.2 and 3.4.2), highlighting the importance of proportional reward systems:

- Design chest placement and protection to correspond with reward value, with more challenging acquisitions yielding higher-value rewards
- Implement consistent visual signaling of chest value to allow players to make informed risk-reward assessments

- Consider dynamically adjusting rewards based on actual player effort expended rather than predetermined difficulty assessments

7.1.3. Progressive Content Evolution

Section 3.3.1 findings showed that players expect chest rewards to evolve alongside their progression, with P7 explicitly stating that "the value of the contents from chests increases as the player grows":

- Design chest content pools that evolve with player level, abilities, and story progression
- Introduce new chest types and appearances at regular intervals throughout the game to maintain PC
- Consider implementing milestone-based special chests that provide significant progression rewards at key game points

7.1.4. Strategic Density Management

The findings in Section 3.4.4 highlighted player fatigue from excessive chest exposure, with participants reporting diminished engagement from overly dense chest distribution:

- Implement variable chest density across different game regions, avoiding uniform distribution
- Consider using chest scarcity in certain areas to increase the perceived value of discovery
- Design chest placement to create meaningful exploration patterns rather than checklist-style completionism
- Monitor the effort-to-reward ratio across game regions to maintain consistent value perception

7.1.5. Audiovisual Feedback Enhancement

Section 3.1.4 findings demonstrated the importance of sensory feedback in chest interactions, with participants highlighting both visual appearance and sound effects as significant engagement factors:

- Design distinctive and satisfying sound effects for chest discovery and opening
- Ensure chest visual design aligns with game world aesthetics and historical/cultural context
- Consider implementing graduated sensory feedback based on chest value or rarity
- Develop consistent but varied audiovisual language to signal chest types and potential contents

7.2 Future Research Directions

Future investigations could address the limitations of our study through several approaches:

7.2.1. Methodological Improvements

- Employ mixed-method approaches, including quantitative analysis of player behavior data alongside qualitative interviews
- Conduct cross-genre comparative analyses between casual and experienced players to provide a more comprehensive understanding of how curiosity types interact with treasure chest design in various gaming contexts
- Implement systematic longitudinal investigations documenting player interaction patterns with treasure chests over time to offer insights into how curiosity and engagement evolve throughout the gaming experience

7.2.2. Expanding Research Focus

- Building on Kao's (2019) work on loot box psychology, investigating how different monetization models interact with the various types of curiosity identified in our research

- Examine the relationship between reward frequency and player disengagement through quantitative studies measuring engagement metrics against chest encounter rates
- Determine specific thresholds for chest frequency that trigger disengagement
- Measure the relationship between chest distribution patterns and player retention
- Investigate how different player types respond to varying reward frequencies
- Examine how the integration of dynamic difficulty adjustment might optimize chest distribution

7.2.3. Promising Design Approaches for Further Study

Dynamic Adaptation Systems While Assassin's Creed has traditionally used hand-crafted chest placement rather than procedural generation, our findings suggest potential benefits from more responsive design approaches:

- Explore the potential for systems that analyze player behavior patterns and adjust chest content and distribution accordingly
- Consider personalized chest content based on playstyle preferences
- Investigate the optimal balance between adaptation and consistency in reward systems

Multi-layered Puzzle Mechanisms Some participants (P2, P9) expressed appreciation for puzzle elements in chest acquisition, suggesting potential value in more complex challenge designs:

- Explore multi-step or distributed puzzle systems for high-value chests
- Consider implementing optional complexity that rewards additional effort without penalizing casual play
- Investigate how puzzle complexity might interact with different curiosity types

Social Integration Elements While direct social elements were not prominently featured in our findings, some participants (P7, P18) mentioned aspects of social immersion and world-building:

- Explore potential for social connection through shared chest discoveries or cooperative chest mechanics
- Consider systems that integrate chest discoveries with narrative and world-building elements
- Investigate how social-comparative elements might enhance chest engagement without creating negative competitive dynamics

Player Customization of Transparency Given the individual variation in preferences for balance between predictability and surprise (Section 3.2.2), player-controlled transparency might offer valuable customization:

- Explore player-adjustable settings for chest information display
- Consider optional "hints" systems that allow players to control their level of foreknowledge
- Investigate how player-controlled transparency might impact long-term engagement with chest systems

Note on Implementation Approaches: Many of these recommendations could be implemented through either traditional hand-crafted design methods or more algorithmic approaches depending on the game's overall design philosophy. While some suggestions might seem to favor procedural generation, they can be equally achieved through thoughtful manual design and content planning. The core principles—responsive rewards, balanced transparency, appropriate pacing, and meaningful progression—remain valid regardless of implementation methodology.

In conclusion, this research reveals the complex psychological mechanisms that underpin effective treasure chest design. By understanding how different curiosity types are triggered, maintained, and balanced through careful chest design, developers can create more engaging, satisfying, and meaningful player experiences. Treasure chests, far from being peripheral elements, represent a critical nexus where game design, player psychology, and engagement strategies converge. As games continue to evolve, the insights from this study offer both practical design guidance and theoretical foundations for creating experiences that resonate with players' fundamental psychological needs for discovery, mastery, and reward.

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Figure Legend

Figure 1. “Assassin's Creed” still screenshot. The image shows a treasure chest placed on a balcony in Rome.

Figure 2. “Assassin's Creed” still screenshot. Mysterious treasure chests can be found through treasure maps.

Figure 3. “Assassin's Creed” still screenshot. A treasure chest placed behind the “enemy”.

Figure 4. “Assassin's Creed” still screenshot. A treasure chest that is considered exquisite.

Figure 5. “Assassin's Creed” still screenshot. Points one and two in the picture are puzzle trigger points with treasure chests hidden behind them.

Figure 6. “Assassin's Creed” still screenshot. Known treasure chest triggers scattered throughout the map.

Figure 7. “Assassin’s Creed” still screenshot. The image shows a treasure chest revealed through a map clue.

Figure 8. “Assassin’s Creed” still screenshot. The image shows a treasure chest found through a papyrus riddle.

Figure 9. “Assassin’s Creed” still screenshot. The image shows a treasure chest hidden in a roadside building without direct map indication.

Figure 10. “Assassin’s Creed” still screenshot. The image shows a wooden treasure chest found inside a residence, visually distinct and interactable.

Figure 11. “Persona 5 Strikers” still screenshot. The image shows points guarded by enemies in a combat arena.

Tables

Table 0. Abbreviations used in this paper

Abbreviation	Full Term
PC	Perceptual Curiosity
CCA	Curiosity about Complexity and Ambiguity
FRMC	Future Rewards Maximization Curiosity
EC	Epistemic Curiosity
SC	Social Curiosity
MC	Manipulatory Curiosity
ARC	Adjustive-Reactive Curiosity
RTA	Reflexive Thematic Analysis

Table 1. Finalized main themes and subthemes

Core Themes	Subthemes
Exploring Multidimensional Motivational Drivers	1. Unknown Contents as Curiosity Triggers 2. Goal-Oriented Exploration 3. Reward Incentives 4. Visual and Auditory Design Elements
Mutual Influence Between Players and Treasure Chests	1. Strategy Optimization 2. Balance of Transparency
The Role of Treasure Chests in Game Progression	1. Reward Rhythm 2. Process Impact

Emotional Experiences Brought by Treasure Chests	1. Sense of Achievement and Satisfaction 2. Sense of Control 3. Sense of Belonging 4. Sense of Fatigue