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Pixels and people: Exploring the dynamics of engagement and disengagement in Minecraft's multiplayer realm

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ABSTRACT

Engagement is often viewed as the holy grail of digital experiences, particularly video games, while disengagement is seen as a consequence of poor design. This study attempts to flip the script, exploring disengagement as a natural part of the user journey rather than a failure of game design. Focusing on the popular open-world game Minecraft, the research investigates dynamics triggering engagement and disengagement in the multiplayer mode through the lenses of established frameworks like the Process Model of Engagement as well as the Mechanics, Dynamics, and Aesthetics model. Semi-structured focus-group interviews conducted with 15 participants analyzed using Mayring's content analysis revealed social connections, novelty, progression, goal-driven gameplay, and adrenaline-fueled combat as key drivers that keep players hooked. Yet, the very act of achieving goals, absence of friends, overplay, setbacks, skill gaps, negative interactions, and the demands of the real world can trigger a powerful urge to disengage. Far from a design flaw, this research expands the body of literature suggesting that disengagement is a vital component of user autonomy. By redefining success beyond mere engagement metrics, the study paves the way for responsible gaming practices that empower players to make informed choices about their level of involvement. It beckons us to embrace a holistic vision of genuinely sustainable, ethical, and meaningful digital experiences that respect user autonomy and cultivate healthy engagement patterns.

1. Introduction

Successful computer games have capacity to hook players, keep them glued to the game, and make them want to keep playing. It is not sufficient to encourage a player to pick up the game; if the engagement is not sustained, the player will not continue to play. On the other hand, disengagement is just as important as engagement. Disengagement refers to when the user withdraws from interacting with a system, whether temporarily or permanently (O'Brien et al., 2022). In a play session, engagement and disengagement are a cycle. Engagement refers to when the player gets immersed and entertained by the game. Disengagement is also natural since people need breaks during the game, whether going about their daily lives or satisfying a physical need (such as getting water or food). After this disengagement, the game needs to have the ability to re-engage the players to pick up the game once again. Researching engagement and disengagement in games is crucial for understanding player behaviour (Van Rooij et al., 2021), improving game design (Xie et al., 2015) and promoting player wellbeing (Van Rooij et al., 2021; D. Alexandrovsky et al., 2024). Understanding why players disengage can also help mitigate conflicts over gaming time, potentially leading to a more enjoyable and sustainable gaming experience for all. Although players' behaviours play an essential role for both the game and the player base, studies that account for disengagement remain the exception.

1.1. Background

Since the introduction of computer games in the 1970s, the

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landscape of leisure activities has been significantly transformed due to the influence of digital gaming (Boyle et al., 2012). This has opened a new horizon for the entertainment market. In 2022, the worldwide market for video games was approximated to be valued at USD 217.06 billion, with projections indicating a yearly growth rate of 13.4 % in 2030 (Video Game Market Size, Share and Growth Report 2030). Thanks to technological advancements in multiplayer gaming, networked gaming, and particularly mobile gaming, video games have expanded their audience (Engelstätter and Ward, 2022). Video games serve as a form of entertainment and can facilitate learning, skill development, and changes in attitudes and behaviours (Boyle et al., 2011). Engaging gameplay attracts players (Schoenau-Fog, 2011) and heightened engagement serves as the lifeblood that sustains player interest and fuels immersive experiences (O'Brien and Toms, 2008). As a result, engagement in video games has gained more and more attention over the last years. Immersion (Jennett et al., 2008), flow (Chen, 2007), "fun" (Koster, 2013), enjoyment (Mayes and Cotton, 2001), and presence (McMahan, 2003) are just a few of the concepts that can be linked to the multidimensional concept of engagement in games (Filsecker and Kerres, 2014).

Within a game, designers may try to increase engagement with the game by presenting players with (the illusion of) choice (Bowey et al., 2019), having them customize their own avatar (Friehs et al., 2022) or set up games specifically set they facilitate sustained, but brief, interactions (Alexandrovsky et al., 2019, 2021). Thus, engagement may not necessarily mean one, long, continuous game-session but engagement also refers to 'snacking' a game, which may be most beneficial for serious learning games and such a setup has been proven to be popular with language learning apps (e.g., Duolingo) (Alexandrovsky et al., 2021). Game dynamics such as, for example, blocking players from the game completely to combat overplay and missions to be completed have proven to be effective to facilitate initial and sustained engagement.

While engagement has been extensively researched in academia, disengagement remains surprisingly under-explored. This knowledge gap is concerning since disengagement is just as crucial as engagement in overall user experience, especially in the context of gaming. Disengagement is when the player's interest starts to fade, leading to a stop of interaction with the technology or game (O'Brien and Toms, 2008). If players fail to disengage from the game, in other words, if players don't lose interest and continuously play the game for long periods, it could lead to unhealthy gaming habits or addiction as well as the neglection of more basic needs (e.g., sufficient water intake) (Milani et al., 2018). The prevailing discourse within the realm of games research has often linked disengagement with deficient game design, which fails to foster sustained player involvement (D. Alexandrovsky et al., 2024). Instances where players disengage from a game, are frequently viewed through a critical lens that attaches a negative connotation to the phenomenon. Player disengagement is commonly framed in terms like 'attrition,' which casts it as an undesirable outcome. Most research on player disengagement adopts a restrictive perspective, seeing it as players quitting the game because of some external factor (D. Alexandrovsky et al., 2024; Alsheail et al., 2023). Nevertheless, O'Brien et al. (2022) argue that we should not only look at disengagement negatively.

Sometimes disengagement is just temporary - players may disengage for some time because they are satisfied with their previous gameplay sessions. It can actually represent players exercising their own autonomy in how they engage. This alternative lens highlights how nuanced disengagement can be. We need a more holistic understanding of what causes it, how it plays out, and what it means for players and developers.

Disengagement is not merely the antithesis of engagement; it is a complex and multifaceted process that can significantly impact the overall user experience and long-term engagement with a game or digital platform (O'Brien et al., 2022). By ignoring or simplifying disengagement, critical factors are overlooked by researchers and game designers, such as overplay, unhealthy gaming habits and prolonged disengagement from the game, which could ultimately lead to the unsustainability of the gaming experience (Lee and LaRose, 2007). Therefore, it is crucial that disengagement is researched through a more positive lens to understand its intricate nature and recognise its potential to inform the design and content of games to be more engaging and balanced, leading to a sustainable gaming experience. By shedding light on this under-researched aspect, researchers and designers can gain valuable insights into creating immersive and fulfilling gaming environments that foster healthy engagement patterns and respect users' autonomy and preferences.

When understanding the factors that drive engagement and disengagement in games, the sandbox genre offers an interesting case study. Sandbox games are generally designed to provide the players with a high degree of freedom to explore and interact with the game content in an open-ended manner. This freedom can be a powerful driver of engagement, touching into the player's innate curiosity and desire for discovery. However, if players become too immersed in the game environment's never-ending exploration, it could lead to unhealthy long hours of play. On the other hand, this characteristic could also trigger disengagement if not balanced carefully. Players could struggle to stay interested in the game without explicit tasks or achievements. The right balance between engagement and disengagement factors is critical for the game's sustainability. One example of a popular and influential sandbox game is Minecraft, a game created by Mojang Studios.

1.2. Related works

Balancing engagement and disengagement to ensure healthy interactions between players and games is a difficult task since one has to know what makes players engaged, how this engagement transitions to disengagement and what makes the players want to start playing again, restarting the whole cycle. A study by Schoenau-Fog (2011) found that there were four main components to engagement: objectives, activities, accomplishments and effects. These results significantly contribute to our understanding of how engagement is created. However, the components that make up disengagement covered in the framework. Especially how disengagement would look from perspective of a player's interactions with the game is not well understood. Hence, investigating how each stage in the engagement cycle emerges through a player's experience would provide valuable information to design sustainable and high-quality gaming experiences. Frequently, related literature discusses disengagement from a perspective of problematic play, considering games as inherently addictive (Bean et al., 2017; Kuss, 2013) that require regulation of the playtime (Kiraly, 2021). On the other hand, disengagement is often conceptualized as a consequence of bad game design or that does not match the players' needs. For instance, Frommel, Klarkowski and Mandryk (2021) conducted an online survey, where they asked players to report on their experiences with failure and success in video games. Their findings highlight that, especially in performance-oriented games, experiences of failure occurred when players were unable to reach their goals, or when the challenges did not match their abilities which was mostly associated with negative emotions, such as anger, frustration, and discouragement. On the other hand, succeeding at a challenge players failed before was reported as highly rewarding. Here, the authors distinguish between *temporary failures*, where the player experience a momentary setback, they often aim to overcome and *perpetual failures* that disengages players from the game entirely due to frustrating player experiences and lack of progress. These results also align with previous research on breakdowns and breakthroughs by Iacovides et al. (2015) who found that players disengage when the breakdowns are too long or yield substantial consequences to the gameplay. Further, they found that overcoming big challenges (i.e., breakdowns) foster a sense of achievement (Iacovides et al. 2015). Adjacently, Drey et al. (2021) conducted a literature review on the experience of "being stuck" in videogames which results in negative emotions such as mental overload when players cannot reach their intended goals. Further, Drey et al. (2021) conceptualize being

stuck as a continuum with three zones of (i) comfortable stuck zone, where the player accepts the challenge; (ii) a moderate stuck zone where countermeasures should be applied before players feel they cannot reach their goals; and (iii) unacceptable stuck zone where players feel frustrated and disengage. Hence, concerning the negative consequences of failure in games, based on findings from interviews with game developers, Foch and Kirman (2022) conclude that failure in games is an outdated design paradigm point out that "the best way to account for failure in their games, was to discard the mechanic of failure entirely". This notion of failure is in alignment with recent shift towards game experiences that are less focused on performance, such as just playing for relaxation (Tyack and Mekler 2021) or player seeking out other diverse experiences, such as emotional challenges (Bopp, Opwis and Mekler, 2018). However, as these examples illustrate, the contemporary notion of engagement and disengagement in videogames is mostly driven by the conception of performance in play.

To support disengagement in games, research and industry have encountered several methods which mostly build upon time restrictions (Hiniker et al. 2016), nudges to finish a session (Okeke et al. 2018), or setting individual goals for usage time (Ko et al. 2015). However, such time-based approaches do not account for the player experiences at the last moments of play (D. Alexandrovsky et al., 2024) and may facilitate frustration with potentially long-term effects on the players' well-being (Syrek et al. 2017). Furthermore, these methods are not applicable in the context of multiplayer games, as the playtime is embedded in the context of social commitment (Freeman and Wohn, 2017). Opposingly, D. Alexandrovsky et al. 2024 suggest that disengagement should be considered as part of the game design and as an essential component that contributes to the overall quality of the player experience. Hence, the authors suggest that game design should strive for *positive disengagement* experiences, which are conceptualized as the player ending the gameplay voluntary with satisfactory player experience and the players' general willingness to re-engage at some other point in time. In this work, we adapt this notion of positive disengagement as a lens for high-quality player experiences in the context of long-term engagement in multiplayer games.

Previous work on disengagement (Alexandrovsky et al., 2024; Iacovides et al. 2011, 2015; Schoenau-Fog 2011), works tend to focus on micro-level disengagement during a single-play-session and foremost on single-player games. Furthermore, disengagement has been predominantly conceptualized as a consequence of performance failure or 'getting stuck' (Drey et al., 2021; Koch and Kirman 2021). However, the macro-level perspective as well as a social component are missing from these studies. Engagement and disengagement across sessions and in multiplayer games cannot be solely explained by, for example, failure to perform an in-game task.

We explore the players' engagement and disengagement through the lens of player interactions utilizing two theories commonly employed in game user research, but rarely discussed in conciliate: The Process model of Engagement (O'Brien and Toms, 2008) and the Mechanics-Dynamics-Aesthetics (MDA) framework (Hunicke et al., 2004). The Process model of Engagement conceptualizes interaction with technology as a cyclical temporal process with different stages of engagement (Section 2.2.1). The MDA framework supports examination of relationships between game mechanics, their ramification during game play (dynamics) and their effect on player experience (aesthetics) systematically (Section 2.2.2). We focus on the player experience within and across session as well as the social and performative components.

1.2.1. Process model of engagement

The Process Model of Engagement (O'Brien and Toms, 2008) describes users' stages when engaging with technology and digital media as a cyclical temporal process – the Engagement Cycle. It outlines four key stages in engagement: Initial engagement, Sustained engagement, Disengagement and *Re*-engagement. It proposes that users initially experience a point of engagement where their attention and interest are captured. If specific attributes like aesthetics, novelty, and usability are present, users can transition to sustained engagement, actively maintaining involvement over time. After the Engagement phase, users disengage, i.e., stop engaging or interacting with the system. Disengagement can happen because the user does no longer need engaging with the technology (e.g., finished a task) or due to lost engagement, such as when the user lost interest, feels bored, or their attention shifts away from the technology or experience. The final stage of the engagement cycle, when users return back to the technology, this is denoted as *Re*-engagement. Significantly, the model acknowledges that after disengagement, re-engagement is possible if factors re-attract the user's interest.

The central premise of the model suggests that engagement is not a static state but instead fluctuates dynamically as users fluidly transition between stages of sustained involvement, disengagement, and potential re-engagement. This fluidity is influenced by the presence and degree of certain attributes. By examining these distinct stages and influencing attributes, the model provides a framework for analysing and understanding the factors that lead users to become engaged with technologies and digital experiences, maintain that engagement over time, disengage, or ultimately re-engage.

The Process Model of Engagement facilitates the structured analysis of engagement with digital media. Applying this model enables tracking how a user's engagement progresses temporally - from the initial spark of attraction to deep, sustained immersion and potentially to disengagement. This longitudinal perspective facilitates a more nuanced comprehension of the factors underpinning long-term engagement with games and other interactive experiences, moving beyond solely examining the immediate experiential state.

1.2.2. MDA framework

The MDA framework, proposed by Hunicke, LeBlanc, and Zubek (2004), has become an influential analytical tool in the field of game design and game studies. This framework deconstructs games into three essential components: Mechanics, Dynamics, and Aesthetics. (1) Mechanics refer to the particular rules, components, and data representations that govern the game's behaviour. These include game elements such as game rules, player actions, and algorithms (Hunicke et al., 2004). For example, in Minecraft, mechanics encompass the crafting system, resource gathering, and block placement/destruction rules. (2) Dynamics describe the acting behaviour of the mechanics in tandem with player inputs and interactions (Hunicke et al., 2004). They emerge from the interplay between the rules and player actions. Examples include the strategies players employ, the patterns that arise during gameplay, and the narrative experiences that unfold (Sicart, 2008). (3) Aesthetics refers to the emotional responses or reactions evoked in the player during the game (Hunicke et al., 2004). These include experiences such as sensation, fantasy, narrative, challenge, fellowship, discovery, expression, and submission. Aesthetics arise from the dynamics created by the mechanics and player interactions. Notably, the MDA framework suggests a feedback loop, where aesthetics influence and shape the dynamics, which in turn shape and inform the development of mechanics (Hunicke et al., 2004; Sicart, 2008). This iterative process is crucial in game design, as it allows for the refinement and adjustment of mechanics to achieve desired aesthetic experiences.

The MDA framework offers a valuable analytical lens for this research by systematically examining how the dynamics of Minecraft influence player behaviour, emotions, and enjoyment—core factors impacting engagement and disengagement. As an established model in game studies, the MDA framework connects game mechanics to player dynamics and resulting aesthetic experiences, aligning well with the research objective. Complemented by the Process Model of Engagement, applying the MDA framework facilitates a comprehensive analysis grounded in game design principles, ultimately informing strategies for fostering engaging gaming experiences.

1.3. Present study

Given the critical importance of comprehending the nuances of both engagement and disengagement in gaming experiences, this study turns its attention to the immensely popular and influential open-world sandbox game Minecraft. The game was chosen for its unique blend of creativity, exploration, and player autonomy (Cipollone et al., 2014). Minecraft is an ideal game environment to explore the factors and dynamics that trigger engagement and disengagement. With its open-ended gameplay and vast gameplay dynamics, Minecraft provides players with freedom to craft their own experiences (Nguyen, 2016). The game offers players opportunities for self-expression, goal setting and exploration by constructing structures and exploring different biomes such as caves or jungles (Keller, 2024). The vast array of gameplay elements and the ability to shape one's own gaming experience make Minecraft a desirable subject for investigating the drivers of engagement and disengagement.

While Minecraft offers a rich, open-ended experience in both single-player and multiplayer modes, this study focusses on the multiplayer aspects of the game. The decision to concentrate on the multiplayer facet is driven by recognising that social interactions and shared experiences are pivotal in shaping engagement dynamics (Lu and Churchill, 2014) and it extends previous work on disengagement in single-player games (D. Alexandrovsky et al., 2024). The multiplayer dimension of Minecraft introduces a unique set of dynamics that extend beyond the confines of a single-player experience. Collaboration, competition, and the ability to interact with other players in real-time add layers of complexity and richness to the gameplay experience (Winn and Fisher, 2004). On the other hand, multiplayer is also significant for disengagement due to the potential for negative social interactions. Issues such as conflicts and peer pressure can lead to frustration (Satija, 2016), stress (Agoston and Rudolph, 2016), and a diminished gaming experience (Donthu et al., 2023), ultimately causing player attrition. These social elements have the potential to profoundly influence players' motivations, goals, and overall sense of engagement or disengagement (Bostan, 2009).

1.3.1. Research aim and research question

Through an in-depth exploration of engagement and disengagement dynamics in Minecraft, this study aims to contribute to the broader understanding of game dynamics and player engagement and disengagement, ultimately paving the way for the creation of more immersive, balanced, and sustainable gaming environments that respect user autonomy while nurturing enduring engagement. Therefore, the study's research question is: Which game dynamics and mechanics trigger engagement and disengagement in multiplayer Minecraft?

2. Methods

With the aim of finding which dynamics trigger engagement and disengagement in Minecraft, we conducted a qualitative interview study with focus groups. For our analysis, we implemented an inductive approach: data collection is used to develop general theories or hypotheses through the identification of patterns and themes. The specific methods used to answer the research question will be described in this section.

This study was conducted with the approval of the Ethics Committee of Behavioural, Management and Social Studies at the University of Twente (approval code: #240,177).

2.1. Sampling

A non-probability sampling method, purposive sampling, was employed to select individuals for participation in this study. Purposive sampling is a strategy designed to intentionally include only cases that meet predefined criteria, ensuring the final sample is composed of participants relevant to the research objectives (Campbell et al., 2020). In this study, participants were recruited through word of mouth and Instagram, leveraging these platforms to reach a community of individuals with relevant characteristics. The inclusion criteria required participants to be over 16 years of age and have prior experience playing multiplayer Minecraft, as these factors were critical for providing meaningful insights into engagement in this specific context. By using this approach, the study ensured that the sample consisted of individuals with the necessary experience and perspective to address the research question effectively. Participation in the study was voluntary, and no compensation was provided to the participants A recruitment message was posted outlining the purpose of the study, selection criteria, and instructions for expressing interest in participating.

2.2. Participants

All participants (N = 15) were older than 16 years and had experience playing Minecraft multiplayer mode. A homogeneous sample of this size is sufficient to reach data saturation (Mayring, 2015). Most participants were male (86.7 %, N = 13), and only a minority were female (13.3 %, N = 2). The participants had a mean age of 21.9 years (SD = 1.88, range = 20–26 years). The majority of the participants were from Europe (12 people), two people came from Asia, and one person was from North America. Participants were assigned to groups to conduct focus-group interviews with. Participants were assigned to small groups of 2–3 people based on existing social connections between the players, leveraging pre-established relationships to facilitate natural group dynamics during gameplay.

The sample size was guided by the principle of thematic saturation, meaning interviews were carried out until no new themes or insights were emerging from the data. Prior research on sample sizes for focus groups informed this approach. According to Gandy (2024) on average, datasets reached 90 % saturation between 5 and 6 focus groups. Hence, the study was conducted six focus-group interviews containing 2–3 participants each. In each group all participants knew each other and play together on a regular basis. We observed that thematic saturation was achieved around the fifth and sixth groups. This alignment with established benchmarks ensures sufficient depth while maintaining feasibility.

2.3. Research design

The research seeks to explore which dynamics play a part in engagement and disengagement; therefore, an exploratory research design was applied. An exploratory research design seeks clues or evidence to uncover events or ongoing occurrences. Researchers utilise various sources to gain understanding and clarity, pursuing insights and explanations along the way (Elman et al., 2020). In the present study, focus-group interviews and follow-up questionnaires were used with the aim of gathering rich qualitative data.

The decision to use focus-group interviews rather than individual interviews was based on three key considerations: First, group interviews better mirrored the social and collaborative nature of multiplayer Minecraft gaming, where players often interact and engage in shared experiences. Second, this approach allowed us to observe natural interactions between players who regularly game together, providing richer insights into how social connections influence engagement and disengagement. Third, group interviews leveraged participant interactions to stimulate more in-depth discussions, as players could build on each other's experiences and ideas.

2.4. Data collection

Data was collected via semi-structured focus-group interviews and surveys. Group interviews were the dominant technique, providing insight into which game dynamics were related to engagement and disengagement and how the participants would improve engagement

and disengagement. The interviews were conducted via Discord, a platform chosen based on participants' preferences and existing usage patterns, as all participants indicated they regularly used Discord for communication while gaming with friends. This ensured participants were already comfortable with the communication platform, eliminating the need for additional training. The surveys were sent after the interviews were conducted to provide participants with a means to share information, they might feel uncomfortable talking about in front of others and information they want to add to the interview.

All participants were told that the research concerned two parts: the group interview and a survey concerning which dynamics in Minecraft trigger engagement and disengagement, which would take around forty-five minutes. Before participating in the interviews, participants were given an informed consent stating the purpose of the study, the procedures involved, and their rights as participants. They were informed that participation is voluntary, and they could withdraw from the study at any time without consequence. The group interviews were conducted using Discord. After the group interview, the participants were asked to complete a survey via Qualtrics. Participants were assigned pseudonyms during data analysis to protect their privacy.

2.4.1. Focus group interviews

Semi-structured interviews were chosen as the primary data collection method since they combine predefined questions with the flexibility to explore topics in more depth as they arise during the conversation (Adams, 2015). This approach allows for a balance between consistency across interviews and the ability to adapt to the interviewee's responses, allowing the researcher to explore what dynamic the players perceive with each engagement stage.

With the research question in mind, the interview questions were developed to find out which player dynamics occurred in each stage of engagement according to the Process model of Engagement (O'Brien and Toms, 2008). To get to know the participants and set the flow of the group interview, a question about what a general play session in Minecraft looked like was developed. After, questions about engagement were developed. These questions were divided into four main points according to the Process model of Engagement (O'Brien and Toms, 2008): Initial engagement, Sustained engagement, Disengagement and *Re*-engagement. To receive the whole story of the player's experiences, only open-ended questions were used to ask about the player's experience in each stage. Furthermore, to understand what could facilitate Sustained engagement and Disengagement, a question about what the players think could support each stage was generated. To understand how multiplayer affects engagement and disengagement, a question regarding how the participants feel about playing with others influences their engagement and disengagement was developed.

The interview questions (See Supplemental Material) were designed to address different aspects of player engagement with Minecraft, informed by theoretical frameworks such as the Process Model of Engagement and the MDA Framework. These questions were grouped into three main sections: general information about a typical Minecraft play session, the different stages of engagement and the effect of multiplayer on engagement. The first section gathered general information, focusing on participants' typical Minecraft sessions and their general gameplay habits (e.g., Can you describe a typical Minecraft session?). This served as a foundation for understanding their responses to the more detailed questions in subsequent sections. The second section delved into the Process Model of Engagement, examining the stages of engagement, including initial engagement, sustained engagement, disengagement, and re-engagement. Questions in this section sought to uncover what game content attracted players, what sustained their engagement, what led to disengagement, and how they re-engaged with the game. The MDA Framework was used to analyse the specific game elements that influenced these stages. For instance, participants were asked what game content sustained their engagement and what elements caused them to disengage. The final section investigated the effect of multiplayer gameplay on engagement and disengagement. Participants were asked about how playing with others influenced their gaming experience (e.g., How does playing in multiplayer affect your engagement?).

The protocols aimed to maintain a consistent line of inquiry, but due to the dynamic nature of the questions, each conversation was expected to be unique. Consequently, specific conversational questions were asked in each interview to meet the inquiry's needs while enhancing the conversational quality of the interview (Yin, 2009). Prior to the interviews, the interviewer provided participants with a structured explanation of engagement, outlining the four stages of engagement to ensure a baseline understanding of the concept.

2.4.2. Survey

The survey contained nine questions, consisting of demographic questions and questions relating to the content of the interview (See Supplemental Material 2). The participants were asked if they wanted to add any information to the engagement stages or had anything to add in general to the research (e.g., Do you have anything to add to the interview regarding game engagement?). A helpline for peer pressure and video game addiction was provided at the end of the survey. The study design incorporated a follow-up survey immediately after the group interviews. While the response rate to these follow-up surveys was 100 %, no additional opinions or perspectives were contributed through this method. The follow-up surveys did not contain a transcript of their original interview.

2.5. Data analysis

The data collected from the interviews were analysed using Mayring's (2015) qualitative content analysis approach. Mayring's Qualitative Content Analysis is a systematic and rule-governed method for interpreting textual data by developing and applying categories through iterative and context-sensitive processes (Mayring, 2015). This approach allows the study to explore and identify the different categories of dynamics involved in the four stages of engagement.

This study employed a hybrid approach to content analysis, combining conventional and directed methods as outlined by Hsieh and Shannon (2005). The conventional content analysis approach facilitated inductive code development, particularly useful given the limited existing research on engagement in multiplayer sandbox games like Minecraft. This allowed codes to emerge naturally from the data, capturing participants' unique perspectives and complex experiences without being constrained by pre-existing theoretical frameworks. Concurrently, elements of directed content analysis were applied, using O'Brien's process model and the MDA framework as deductive organizing tools to structure findings into stages of engagement. While these theoretical frameworks guided the overall organization, they did not predetermine the specific codes within each stage, preserving the inductive nature of the initial analysis.

The analysis process was iterative and collaborative. The first author conducted open coding of interview transcripts, allowing codes to emerge directly from participants' words and experiences (inductive conventional approach). These codes were then organized within the broader engagement stages defined by O'Brien's model (deductive directed approach). Two rounds of code review and refinement were undertaken by the two authors, followed by cross-validation with external researchers to ensure reliability. A third author joined to collaboratively adjust the codes, and a fourth author contributed to final refinements during the writing process. The analysis focused exclusively on interview data, as follow-up surveys did not yield additional insights. This hybrid approach balanced the inductive discovery of new insights specific to the Minecraft context with the deductive application of theoretical structure, mitigating potential bias while maintaining analytical rigor through multiple validation and refinement stages.

3. Results

The engagement experiences described by participants consisted of simultaneous, multi-layered interactions between the individual, other players and their environment within the game of Minecraft. In seeking to understand the meaning of these interactions, we came to view participants' engagement experiences through the metaphor of a journey. Like the evolving stages of a journey, engagement with Minecraft involved distinct phases that profoundly affected our participants: most reported experiencing varied, dynamic, and deeply immersive engagement reactions that were influenced by multiple factors.

In the analysis, results were classified into triggers, potential support, and suppression to provide a comprehensive understanding of engagement in Minecraft. Triggers refer to the actual experiences, events, or factors reported by players that influenced their engagement, either positively or negatively, during gameplay. Potential forms of support encompass player-generated suggestions for improvements or additions that could enhance engagement in the future. Suppression, in contrast, captures the experiences and strategies that players reported as preventing them from quitting the game, even when they felt disengaged. This three-part framework allowed the exploration of both the immediate and long-term dynamics of player engagement, including what drives continued participation and what players envision as beneficial for sustaining or enhancing their experience.

To foreshadow the results, the data shows that there are several factors that influence initial engagement, sustain engagement, lead to disengagement, and facilitate re-engagement. Within the engagement cycle internal, external and motivational/emotional factors impact engagement over time. For a complete, conceptual overview of the results refer to Fig. 1.

3.1. Initial engagement (IE)

The first stage of the journey starts with Initial Engagement.[1] IE can occur from the moment the players start getting drawn into the game, whether it be content or a friend's invitation sparking their interest, to the first few minutes to hours of the game. This stage is characterised by the player's first interactions with the game. This stage's duration depends on how quickly the player can grasp the basic mechanics and get used to the game's concept. Finding which dynamics trigger Initial Engagement (IE) allows us to explore what initially attracts players to the game.

3.1.1. IE triggers

Six factors were identified as factors that triggered Initial Engagement, as seen in Table 1. The codes are arranged from the greatest number of people quoting the code and most mentioned to the least number of people mentioning the code and least mentioned. A further description of the codes with example quotes is provided in the following subsections.

3.1.1.1. Social influences. The journey often begins with a spark ignited by social influences. "Social Influences" serve as an external engagement trigger, primarily through peer pressure and invitations, which fall under Dynamics. Aesthetically, players feel interested in joining the game, often motivated by the social experience. Participant 1 vividly described, "For playing on the Minecraft server, it is just a friend or myself just saying like, "Hey, I am kind of down to play Minecraft, do you want to start playing", and we play". Another noted:

> "Since it is multiplayer, when I decided and planned to meet with some friends at this point, and we were going to play at that time, they were always playing, and I was not really that into it. I am not playing because I want to, but at that point, I'm playing because that's the scheduled time. Obviously, I still love Minecraft, so there's still a good time. (P7)

Mechanically, multiplayer mechanics support this engagement trigger by enabling interaction between friends and encouraging cooperative and competitive play. Social influences demonstrate how interpersonal relationships can facilitate a player's initial entry into the game environment."

3.1.1.2. Combat. The dynamics of combat are facilitated through player-versus-player (PvP) mechanics that promote the initial engagement stage. A participant shared, "I'm engaged because I like doing PvP, so the PvP is player-versus-player. So, I like fighting other people. So, combat that engages me" (P4). This element highlights how the competitive and survival aspects of Minecraft draw players into the game, providing an adrenaline-pumping experience right from the start.

3.1.1.3. Freedom. The game's open-ended nature and the variety of activities it offers were compelling reasons for initial engagement. One participant noted:

> "It doesn't force you to do anything you don't want to, and you can basically do whatever you want. You go farming, you go mining. It also has a variety of mobs of friendly animals, and it gives you the freedom to do whatever you want. (P13)"

> "Freedom," as a code, is primarily an aesthetic represented by the concepts of freedom and fun (P14). This aesthetic emerges from the dynamic of exploring the game's open-ended gameplay and avoiding mandatory activities. The underlying mechanics that support this dynamic include features that allow unrestricted movement, player choice, and creative exploration. Together, these elements create an environment where players feel liberated to chart their paths, fostering a sense of autonomy and joy within the gaming experience.

3.1.1.4. Social media inspiration. Inspiration from social media, particularly YouTube content played a significant role. "Social Media Inspiration" reflects the aesthetic of interest, as players are inspired by videos or posts from platforms like YouTube. The dynamic involves external media influencing players' decisions to join or try new aspects of the game. Supporting mechanics like building systems and recording tools make it possible for players to replicate or share content they have seen, bridging real-world inspiration with in-game creativity. One participant explained, "For me, it is when I see something from a YouTube video [and] I'm like 'I want to do that in Minecraft'. I see something and be like, 'Yeah, I want to build that." (P2). The exposure to creative and engaging Minecraft content on YouTube spurred players to explore and recreate what they had seen, emphasising the impact of external media on initial engagement.

3.1.1.5. Novelty. For others, the allure of new content and experiences was irresistible. One participant noted, "Usually, I get engaged by new updates coming out because they've added a bunch of new stuff that I want to explore" (P3). The code "Novelty" serves as an aesthetic marked by interest (P1) and curiosity (P3). This aesthetic is elicited through the dynamic of exploring new game elements, which keeps the player's experience fresh and stimulating. The mechanics enabling this dynamic involve the introduction of novel in-game features or content, such as

[1] While O'Brien uses the term "point of engagement," we opted for "initial engagement" to better reflect the process-based nature of how players begin engaging with multiplayer Minecraft. Rather than engagement occurring at a single point in time, our findings suggest it often develops through a gradual process. For example, social media influence on engagement may accumulate over time through multiple exposures to gaming content before a player decides to participate. The term "initial engagement" better captures this developmental aspect of early engagement compared to the more temporally specific "point of engagement."

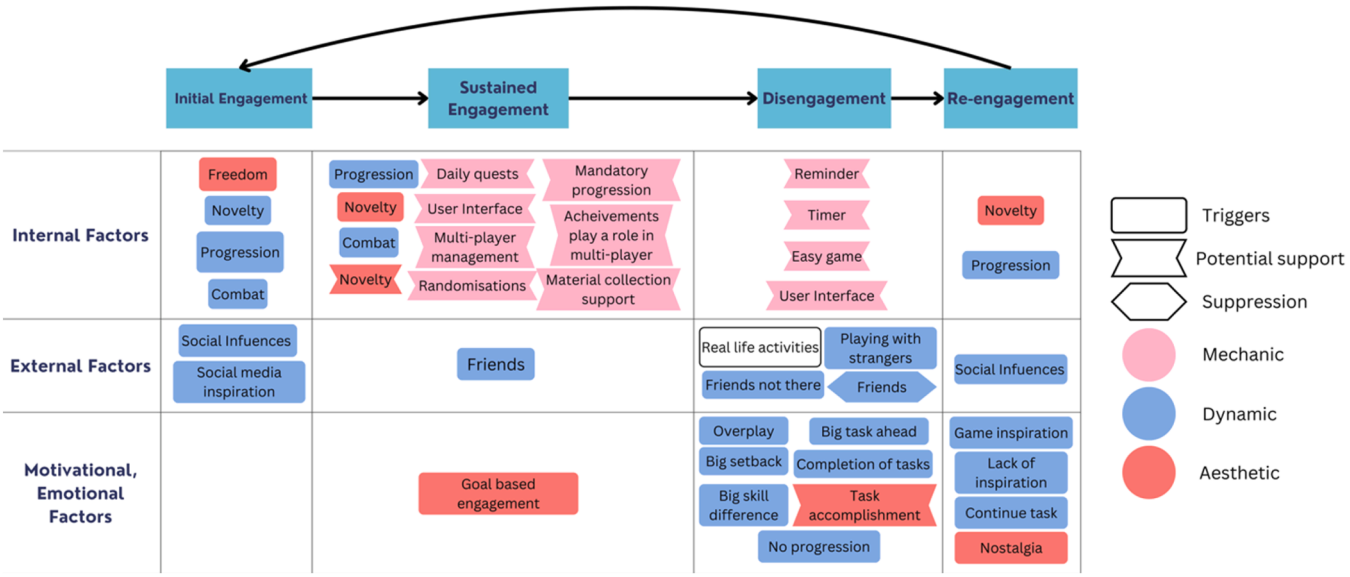

Fig. 1. Factors that trigger and potentially support engagement in Minecraft.

Table 1
Factors that trigger Initial Engagement (IE).

Code	MDA	Description	Person count	Mention count
Social Influences	Dynamic	Invitations from friends or peer pressure to play Minecraft	10	14
Combat	Dynamic	Player vs. Player (PvP) Fighting game mobs	4	10
Freedom	Aesthetic	The game's open-ended nature and not mandatory activities.	4	8
Social Media Inspiration	Dynamic	Inspiration from social media such as videos on YouTube	3	3
Novelty	Aesthetic	New in-game elements	2	2
Progression	Dynamic	Improvement, achievement and desire to reach advanced stages of the game	2	2

new levels, characters, or tools, that maintain the player's engagement. By constantly surprising players with new elements, game designers can sustain curiosity and ensure the game remains compelling over extended periods.

3.1.1.6. Progression. The prospect of making progress and obtaining better gear triggers initial engagement for some. One participant mentioned, "What engages me is making progress, like getting better gear"(P4)."Progression" operates as a dynamic within the MDA framework, emphasizing improvement, advancement, and achievement within the game. This dynamic is supported by mechanics such as gear upgrades, skill enhancements, and level advancements, which provide players with a clear sense of development over time. The aesthetic resulting from this dynamic is a feeling of achievement (P7), as players are rewarded for their efforts and milestones, reinforcing their motivation to continue playing.

3.2. Sustained engagement (SE)

The second stage of the Engagement Cycle is Sustained Engagement (SE). This phase in Minecraft can last from weeks to months or even years for dedicated players. SE is characterised by the deepening of the player's understanding of the game (e.g., exploring the environment, game mechanics, and large projects). This stage is marked by regular play sessions, often lasting several hours at a time. Uncovering which dynamics trigger SE and what could support this stage ensures the game can yield captivating content to keep players interested in the game.

In examining the dynamics of Sustained Engagement in gaming, this section is organised into two pivotal categories: *triggers* and *potential support*. Triggers encompass the specific elements and dynamics that inherently motivate players to remain actively engaged with the game over an extended period. Conversely, potential support refers to the strategic features and mechanisms that game developers can employ to foster continued engagement during gameplay. By delving into these triggers and support mechanisms, we can develop a nuanced understanding of the factors that underpin long-term player engagement, offering valuable insights into effective game design and player retention strategies.

3.2.1. Sustained engagement triggers

Five factors were identified as Sustained Engagement triggers, as presented in Table 2. The codes are ranked in descending order based on two criteria: the number of individuals citing each code and the frequency of mentions. Those with the highest number of people quoting

Table 2
Factors that trigger Sustained Engagement (SE).

Code-group	Code	MDA	Description	Person count	Mention count
Triggers	Friends	Dynamic	Talking and playing with friends in the game	12	12
	Progression	Dynamic	Improvement, achievement and desire to reach advanced stages of the game	9	13
	Goal based Engagement	Dynamic	Personal projects and goals in the game	7	11
	Novelty	Aesthetic	New in-game elements	4	4
	Combat	Dynamic	Fighting other players (PvP) and mobs	3	4

them and the most frequent mentions appear first, while those with the fewest citations and mentions are listed last. Further details and examples of the codes are discussed in the following subsectons.

3.2.1.7. Friends. As players settle into the game, sustained engagement often hinges on continuous social interaction. Playing with friends is a key factor in sustaining engagement. The aesthetic experience of calmness (P1), camaraderie (P7), and fun (P9) arises from interacting with others, providing emotional satisfaction and social fulfilment. This dynamic is supported by players talking and playing with friends in the game, creating opportunities for shared experiences and collaboration that maintain engagement. A participant shared how playing with friends helps them become more engaged:

> "Playing with friends definitely helps me become engaged for my part, which helps me get into the game. There's this camaraderie going on in the beginning. Everyone's working towards a common goal. And I think the multiplayer aspect is really good at that. So, I think, for me, it usually adds more than it takes away. I feel like the social aspect, being able to talk to my friends and leading up a task, can really help. I probably find some parts of the game more fun, [which] P8 thinks are boring and the other way around. Then I get to do more of the things that I think are fun while someone else takes care of what I think is boring, but they think that's fun. And we all get to do more of the fun stuff while getting rid of the boring stuff." (P7)

At the mechanic level, multiplayer mechanics enable these interactions, offering systems that allow friends to connect, communicate, and work toward common goals. By fostering both emotional and social connections, playing with friends helps to sustain players' interest and involvement in the game over time.

3.2.1.8. Progression. Continual progression within the game remained a significant factor. One participant shared how getting better at the game triggered their engagement:

> "It's really rewarding to watch yourself get better, whether that's in hours, days, weeks, months, whatever it is. Same thing for survival, to be honest. You start out not knowing how to do anything. And then, eventually, you get to the point where you can just run things down into what would have taken you months or weeks before in a matter of hours. I think it's getting better at the game and seeing and knowing that you're getting better at the game is what I really enjoyed about it when I was really engaged. (P11)"

The code "Progression" operates as a dynamic within the MDA framework, emphasizing improvement, achievement, and growth throughout the game. This dynamic is supported by mechanics such as equipment upgrades, interactions with game mobs and bosses, and the use of a quest book to track progress. These mechanics create opportunities for players to advance steadily within the game, fostering an aesthetic of thrilling experiences (P8) and fun (P7). The rewarding feedback loop generated by these elements keeps players engaged over extended periods, emphasizing the importance of progression in sustaining engagement.

3.2.1.9. Goal-based engagement. Personal projects and goals also played a significant role in sustaining engagement, as mentioned. A participant detailed, "I just give myself like huge projects to make on the world. And yeah, that kind of keeps me engaged" (P3). "Goal-Based Engagement" is a dynamic centred on completing personal projects and achieving in-game goals. The mechanics enabling this dynamic include in-game achievements and building mechanics, which offer players a framework to pursue meaningful objectives. This process results in an aesthetic of goal-oriented engagement (P14), where players feel immersed and engaged for prolonged periods. By giving players, the freedom to set and achieve personal goals, the game fosters a sense of purpose and satisfaction, making it a key factor in maintaining sustained player involvement.

3.2.1.10. Novelty (SE trigger). Experiencing new content and updates also remained vital for sustaining interest. "I think the biggest factor for me is having new experiences. I don't like doing the same thing a second time" (P6). The code "Novelty" functions as a dynamic involving the exploration of new in-game elements. The mechanics supporting this dynamic include the regular introduction of innovative features, levels, or content that refresh the gameplay experience. This dynamic generates an aesthetic characterized by novelty and entertaining elements (P6), which capture players' attention and sustain their curiosity. By consistently providing fresh content, the game maintains players' engagement by preventing monotony and encouraging continuous exploration.

3.2.1.11. Combat. The desire to overcome combat challenges, both PvP and against mobs, kept many players motivated. "The Ender dragon and the wither are the only things that would keep me engaged to try and beat them" (P2). Another participant shared, "Fighting the Ender Dragon or working until there and then just do things like building very big buildings or towers. Each of us can be allowed in castles, or we can have PvP turned on, have our tournament, or do something like that" (P13). "Combat" represents a dynamic focused on fighting other players (PvP) or engaging with game mobs, including powerful entities such as the Ender Dragon. The mechanics underlying this dynamic include structured combat systems, NPCs, and PvP interactions. These mechanics create an environment of challenge and competition, resulting in an aesthetic described as driven (P2), chaotic (P14), and good (P14). This blend of intense action and strategic gameplay sustains engagement by providing players with moments of adrenaline and fulfilment, reinforcing combat's role as a critical factor in prolonged player interest.

3.2.2. Sustained engagement potential support

Eight factors were found to potentially support Sustained Engagement, as listed in Table 3. The codes are listed in order of popularity and frequency. They start with those cited by the most people and mentioned most often and end with those referenced by the fewest individuals and discussed least frequently. The following section will explain the codes and the representative quotes.

3.2.2.12. Novelty (SE potential support). The code "Novelty" represents an aesthetic characterized by a sense of newness, increased engagement (P2), and challenge (P15). This aesthetic is created through the dynamic of exploring new in-game elements that differ from existing content. As one participant stated, adding "a bunch of new biomes like with a bunch of stuff to explore" keeps the game engaging. The mechanics supporting this dynamic include introducing new environments, tasks, and game modes. By offering innovative and varied experiences, the game sustains players' interest and prevents disengagement, ensuring that the aesthetic of novelty remains a key driver of sustained engagement.

3.2.2.13. Daily quests. "Daily Quests" is a mechanic that provides recurring objectives to maintain consistent player interaction. This mechanic generates the dynamic of players routinely engaging with the game, creating a rhythm of participation, as one participant mentioned, having "something to do every day" keeps the game engaging and gives players continuous goals to work towards. The aesthetic resulting from this interaction is one of entertainment (P2), as players derive satisfaction from accomplishing short-term goals. By integrating this mechanic into the gameplay loop, the game promotes long-term engagement and habit formation.

3.2.2.14. Material collection support. The "Material Collection Support" mechanic offers systems such as checklists and item counts that facilitate crafting or building within the game. This mechanic underpins the

Table 3
Factors that potentially support Sustained Engagement (SE).

Code-group	Code	MDA	Definition	Person count	Mention count
Potential Support	Novelty	Aesthetic	New in-game elements	8	8
	Daily quests	Mechanic	Daily tasks	3	3
	Material Collection Support	Mechanic	A system providing players with checklists and item counts necessary for crafting or building in the game	2	2
	Randomisations	Mechanic	Random events, varying quest lines, or different item drops	2	2
	Multiplayer Management	Mechanic	Organising tournaments and improving anti-cheat systems	2	2
	User Interface	Mechanic	Simplifying the user interface	2	2
	Achievements play a role in multiplayer	Mechanic	Visible rewards or status symbols that show up for other players	2	2
	Mandatory Progression	Mechanic	Mandatory progression in the game. Mandatory quests to unlock new content or advance through the game	1	1

dynamic of players actively tracking and collecting necessary resources. The resulting aesthetic is one of excitement (P5) and helpfulness (P2), as players feel both supported and rewarded for their efforts, enhancing their overall gameplay experience. One participant highlighted the usefulness of having "material checklists, and with like numbers, like how many items you have to collect." Such support can reduce the cognitive load on players, making the gameplay experience smoother and more enjoyable, which in turn sustains their engagement.

3.2.2.15. Randomisations. "Randomisations" is a mechanic that introduces variability through random events, quests, and item drops. This mechanic creates the dynamic of players encountering unexpected and diverse gameplay scenarios. The aesthetic generated by this interaction is one of fun (P6) and difference (P6), as the unpredictability ensures ongoing curiosity and engagement, preventing monotony. A participant noted the appeal of having "randomisations and also more ways to do things" as a way to keep the game interesting.

3.2.2.16. Multiplayer management. The "Multiplayer Management" mechanic enables collaborative and competitive interactions through events, and anti-cheat systems. This mechanic supports the dynamic of social engagement, where players connect with others in shared gaming experiences. The aesthetic emerging from this dynamic is one of increased enjoyment and engagement (P10), as social interaction adds depth and richness to the game, fostering a sense of community.

3.2.2.17. User interface. "User Interface" functions as a mechanic designed to simplify and improve players' interactions with the game. This mechanic supports the dynamic of ease of use and accessibility, ensuring players can focus on gameplay without unnecessary complications. When poorly implemented, the aesthetic becomes one of annoyance (P8) or dissatisfaction (P7), highlighting the importance of well-designed interfaces in enhancing the gaming experience.

3.2.2.18. Achievements play a role in multiplayer. "Achievements" serve as a mechanic that makes players' accomplishments visible to others in multiplayer contexts, using symbols, stats, or other forms of recognition. This mechanic creates the dynamic of validation and acknowledgment, as players feel rewarded for their successes. A participant mentioned that achievements in multiplayer scenarios can motivate them to engage more deeply with the game, as these accolades often represent both personal and collaborative success. The resulting aesthetic is one of visibility (P10), where players enjoy recognition within the game's community, motivating continued participation and striving for further achievements.

3.2.2.19. Mandatory progression. "Mandatory Progression" is a mechanic that requires players to complete specific quests or tasks to unlock new content or advance through the game. This mechanic drives the dynamic of structured advancement, guiding players through a linear progression path. A participant expressed that mandatory progression would motivate continued play: "If they added something mandatory for progression, then I would play it." This approach ensures that players remain focused on achieving specific milestones, thereby maintaining their long-term interest in the game.

3.3. Disengagement

The third stage of the Engagement Cycle is Disengagement (DE). In our interviews, Disengagement was framed as the third part of the journey. Disengagement in Minecraft can occur at various points in the player's time with the game. Although it can vary among players, this stage is typically after several months of regular play. This phase is characterised by the player exhausting the game elements, completing a major project or the need for a break. A player could reduce their play time until coming to a stop. On the other hand, this stage might not fully occur if the player continues to find inspiration. Exploring the dynamics that trigger, and support disengagement can help us identify what makes players disinterested in the game and what could support disengagement when the player has been playing for a long period of time.

This section delves into the factors contributing to disengagement in gaming, dividing our analysis into three critical categories: triggers, potential support, and suppression. Triggers are the specific elements and events that lead players to lose interest and disengage from the game. Potential support refers to the strategies and features that game developers can implement to facilitate a healthy exit from the game. These mechanisms are designed to encourage healthier gameplay habits by helping players disengage in a structured and mindful manner. Suppression encompasses the factors that suppress disengagement, keeping players hooked even when they might otherwise want to stop. By exploring these triggers, support mechanisms, and suppression factors, we gain a comprehensive understanding of the dynamics driving player disengagement and the ways to promote balanced and sustainable gaming practices.

3.3.1. Disengagement triggers

Ten factors were found to trigger Disengagement, as seen in Table 4. The arrangement of codes follows a hierarchical pattern, beginning with the most widely quoted and frequently referenced and concluding with those least cited and discussed. The codes are explained in detail with example quotes in the following subsections.

3.3.1.20. Overplay. The code "Overplay" refers to a dynamic where extended periods of repetitive gameplay led to player dissatisfaction. This dynamic is driven by mechanics such as prolonged dying sequences or repetitive inventory loss, which can create an overwhelming sense of redundancy. "It's when I've been playing so long that I just kind of get sick of it" (P7), expressed one participant, capturing the essence of overplay. The aesthetic resulting from this interaction is negative, often described as feeling sick (P7), repetitive (P9), or stale (P10). These

Table 4
Factors that trigger Disengagement (DE).

Code-group	Code	MDA	Description	Person count	Mention count
Triggers	Overplay	Dynamic	Extended play periods or repetitive gameplay	10	15
	Big Setback	Dynamic	Significant losses or failures within the game that undo progress or achievements	10	11
	Real-life Activities	N/A	Responsibilities and activities outside of the game that demand the player's time and attention	8	9
	Friends not there	Dynamic	The absence of friends, lack of social interaction	7	10
	No Progression	Dynamic	The player's efforts are not leading to significant advancements or achievements within the game, or there is simply no more gameplay to progress	7	9
	Big Skill Difference	Dynamic	Disparity in skill levels between players	5	6
	Completion of tasks	Dynamic	Accomplishment of significant tasks	4	4
	Big Task Ahead	Dynamic	Facing large, tedious tasks or the anticipation of extensive or monotonous tasks	4	7
	Playing with Strangers	Dynamic	Playing in multiplayer with unfamiliar people	3	4
	Lack of Inspiration	Dynamic	The absence of ideas or activities to do	3	3

emotions significantly contribute to disengagement by exhausting the player's interest and sense of novelty.

3.3.1.21. Big setback. "Big Setback" arises as a dynamic when players experience significant losses or failures in the game that undo their progress or achievements. This dynamic is tied to mechanics like dying or losing inventory, which amplify the sense of wasted effort. "Dying and losing all my stuff really makes it really easy to leave the game for me. Because it's just really discouraging to like kind of start all over with my inventory." (P3) The aesthetic associated with this is boredom (P4) and discouragement (P3), as players feel disheartened and lose motivation to continue.

3.3.1.22. Real-life activities. Real-life obligations encompass responsibilities and activities outside of the game that demand the player's time and attention. These can include work, school, family commitments, and other personal activities. As players prioritise these real-life duties, their engagement with the game naturally decreases. "The most popular reason would probably be like it's already too late. It's already 3–4am in the morning, we go to school at six, seven, we better stop" (P13). Other commitments, like needing sleep to disrupt engagement.

3.3.1.23. Friends not there. "Friends not there" is a notable disengagement trigger that highlights the social aspect of gaming. Aesthetically, players may feel bored (P5) or lose interest (P8) when their friends are absent, diminishing the enjoyment they derive from the game. Dynamically, the lack of social interaction and companionship can make the game feel isolating. "We just stop playing, or everyone just stops playing, and no one gets on the server, then I just stop as well." (P5), shared one participant, highlighting the social aspect of disengagement. Mechanically, this code is reinforced through multiplayer mechanics, which rely heavily on the presence of others to maintain engagement. When players expect to interact or collaborate with friends but find themselves playing alone, the game may lose its appeal, prompting disengagement.

3.3.1.24. No progression. The code "No Progression" represents a dynamic where players' efforts fail to lead to significant advancements or achievements. This dynamic stems from mechanics such as a simple quest book which can be completed easily or automation mechanics that limit opportunities for meaningful growth. The aesthetic resulting from this is feelings of uselessness (P4), staleness (P8), or a sense that the game is too easy (P9). Such lack of progression makes the game unappealing and leads to disengagement. A participant shared, "There's nothing new to explore if you've done basically everything you want to do and built everything you want. There's not much left to do except for doing things to your own liking or preference, and those things can run out as well. And when everything runs out, then it gets boring." (P13).

3.3.1.25. Big skill difference. "Big Skill Difference" is a dynamic reflecting disparity in skill levels between players, which creates an unbalanced gameplay experience. This dynamic is fuelled by mechanics that fail to accommodate players of varying abilities, often resulting in frustration. The aesthetic that emerges is one of discouragement (P10) and demotivation (P11), as less skilled players feel overwhelmed and unable to compete, leading to their withdrawal from the game. This can be clearly seen when a participant shares, "So as the average skill level has gone up, I've kind of stayed where I am. So, you join a game. Everybody is better than they used to be, and you feel kind of washed. I don't know if you know that word, but it's just kind of demotivating getting in the game" (P11).

3.3.1.26. Completion of tasks. "Completion of Tasks" functions as a dynamic where players finish significant projects or achieve major milestones within the game. "Usually, I get disengaged if I finish like a project. So, if I was working on something, and I finished it, and I don't really want to do something else, I stop playing it" (P2). This often leads to a temporary drop in interest as the immediate goals or objectives that motivate their engagement are no longer present. The aesthetic derived from this interaction is boredom (P13). As players don't have new challenges or projects to undertake, players may feel a lack of purpose, resulting in disengagement

3.3.1.27. Big task ahead. "Big Task Ahead" represents a dynamic where players face large, tedious tasks or anticipate extensive, monotonous gameplay. This dynamic is driven by mechanics such as material collection or travelling a long distance, which can feel burdensome. One participant stated, "I usually get disengaged when I have to collect too many materials. It's very boring just going around and getting, I don't know, wood or mining. It's just very annoying. I have to do everything manually." (P12) The aesthetic associated with this dynamic is tedium (P5), lack of interest (P6), and hindrance (P6), creating a sense of dread that reduces players' willingness to engage further.

3.3.1.28. Playing with strangers. "Playing with Strangers" serves as a disengagement trigger, primarily due to its impact on player motivation and emotional state. The disengagement and demotivation are clearly explained by a participant: "You're playing with unknowns, randoms,

that could be more demotivating when people are ruining your builds and stealing from you and all that. That's kind of like a big throw-off where it's not fun anymore because you're kind of progressing but never progressing because everything is getting destroyed." (P8). Aesthetically, interacting with unfamiliar people in multiplayer environments can be demotivating (P8), draining, and even "kill the drive" to play (P11), as reported by participants. Dynamically, the experience of playing with strangers in a multiplayer setting can feel impersonal or unfulfilling, especially when players seek camaraderie or coordinated team play. Mechanically, this issue is rooted in *multiplayer mechanics*, where the game pairs players with others who may not share the same goals, communication style, or level of engagement. This disconnection between player expectations and reality can diminish enjoyment, leading to frustration and eventual disengagement.

3.3.1.29. Lack of inspiration. "Lack of Inspiration" is a disengagement dynamic that arises when the game fails to spark creativity, excitement, or a sense of purpose for the player. Unlike the previous dynamics, this one is more abstract, stemming from the absence of fresh ideas, engaging mechanics, or meaningful goals within the game environment. "I basically only copy other people, and I struggle to think of new projects. It just gets boring. I don't know what to do. And then I just quit" (P4). The resulting aesthetic is characterized by boredom (P4) and a sense of struggle (P4), as players are left without clear motivation or direction to continue.

3.3.2. Disengagement potential support

Five factors were identified to potentially support Disengagement, as listed in Table 5. Codes are sorted from most prevalent to least prevalent, with prevalence determined by both the number of unique individuals referencing each code and the total number of times each code is mentioned. The following section will explain the codes and their representative quotes.

3.3.2.30. Reminder. The "Reminder" mechanic functions by notifying players about how long they have been playing, often through in-game pop-ups or notifications. Participants indicated a preference for such reminders as they encouraged taking breaks. One participant noted, "Something in the game to show how long you've been playing. There are a lot of people who play Minecraft for a lot of hours. It could definitely help them and show them how much they have already played and how much they need to get off." (P10). This mechanic shapes the dynamic of self-awareness, where players become conscious of their time investment in the game. The aesthetic outcome is perceived as helpful (P15), as it allows players to monitor their gameplay habits and make informed decisions about when to take breaks or step away, promoting a healthier gaming experience.

3.3.2.31. Timer. The "Timer" mechanic allows players to set countdowns or playtime limits within the game. This mechanic supports a dynamic of time management, where players can structure their gaming sessions around specific goals or constraints. One participant stated, "You press that leave in ten minutes button, and then it starts the timer, and you can see it up in the corner. It counts down. And then, when there's one minute left, it notifies you, "You have one minute" (P7). Another participant mentioned, "If you could add maybe a timer or like, kind of like an alarm in the game" (P8). The resulting aesthetic depends on player intent; while it may foster a sense of control and organization, it could also feel restrictive for players seeking uninterrupted immersion.

3.3.2.32. Easy game. The "Easy Game" mechanic lowers the challenge level by simplifying gameplay, reducing the difficulty of tasks or encounters within the game. This mechanic can create a dynamic of disengagement, as evidenced by the interviewees. One participant commented, "What would help me stop playing earlier is if it was just too easy. They just make the game easier." (P4). Another noted, "For me, offer nothing new. Don't hinder; make everything extremely easy." (P6). If the gameplay becomes overly simplistic, offering little stimulation or novelty, players may perceive the experience as dull and lose interest.

3.3.2.33. Task accomplishment. The "Task Accomplishment" mechanics involve assigning players specific objectives to complete, creating dynamics of goal completion that provide a sense of accomplishment. These mechanics can also support disengagement by offering players clear stopping points within the game. Players often choose to log off after completing their tasks, as one participant observed: "Once I'm done doing the main quests or like daily quests, I just hop off" (P5). This suggests that well-structured tasks, particularly those with defined endpoints, can facilitate a natural conclusion to gameplay, helping players disengage without feeling compelled to continue indefinitely. While this mechanic enhances player satisfaction through the aesthetic of achievement, it simultaneously provides an effective mechanism for limiting prolonged play.

3.3.2.34. User interface. The "User Interface" mechanic, when overly complicated or unintuitive, can create barriers that make disengagement challenging for players. A convoluted interface may require multiple steps to perform simple actions, such as exiting the game, thereby fostering frustration. One participant highlighted this issue, stating, "You cannot instantly exit to desktop; you first have to exit to the main menu and then quit the game. So, I would just add a button that makes you quit in some way" (P2).(Table 6).

3.3.3. Disengagement suppression

3.3.3.35. Friends. "Friends" acts as a powerful factor in suppressing disengagement, keeping players engaged in the game longer than they might otherwise intend. Participant 12 mentioned, "But it's also hard to disengage when you're with friends. Because it's just some people want to go out, some people don't, but you're with your friends, so you don't want to log off ". Aesthetically, the presence of friends makes quitting

Table 6
Factors that suppress Disengagement (DE).

Code-group	Code	MDA	Description	Person count	Mention count
Suppression	Friends	Dynamic	Talking and playing with friends in the game	7	7

Table 5
Factors that potentially support Disengagement (DE).

Code-group	Code	MDA	Description	Person count	Mention count
Potential Support	Reminder	Mechanic	In-game reminders about how long the player has been playing	4	4
	Timer	Mechanic	In-game timer	4	4
	Easy Game	Mechanic	Making the game easier, offering little stimulation	2	2
	Task Accomplishment	Aesthetic	A task for the players to complete or giving them a sense of accomplishment	2	2
	User Interface	Mechanic	Simplifying the user interface	1	1

hard, as social bonds and shared enjoyment provide a compelling reason to stay. Dynamically, talking and playing with friends within the game creates a positive, interactive environment that fosters camaraderie and shared experiences, making players less likely to leave. Mechanically, this is enabled by multiplayer mechanics, which facilitate group play, communication, and collaboration. The social connection provided by friends transforms the gaming experience, motivating players to stay engaged even when other triggers for disengagement might arise.

3.4. Re-engagement (RE)

The last stage of engagement in the Process of Engagement model is Re-engagement (RE). RE often happens periodically and can occur weeks, months or even years after disengagement. This phase is characterised by the return of the player. Identifying the triggers and time taken to re-engage can help games retain players, creating a larger player base and design a sustainable engagement cycle.

This part of the analysis is divided into two primary categories: triggers and the time required to re-engage. Triggers refer to the various dynamics that prompt a player to return to the game. Each trigger code represents a specific motivator that reignites a player's interest and compels them to re-engage with the game. Time to *Re*-engage encompasses the duration it takes for players to resume gameplay after disengagement. Understanding the time frame for re-engagement helps in designing strategies to maintain consistent player interest and activity.

3.4.1. RE triggers

Six factors that triggered re-engagement were identified, as listed in Table 7. The list of codes is organised in descending order of importance, where importance is measured by how many different people mention each code and how often each code appears overall. Further details and representative quotes will be explored in the next section.

3.4.1.36. Novelty. Novelty remains a significant trigger, driven by new features, updates, or changes in the game. "Novelty" serves as an aesthetic that fosters re-engagement through its capacity to intrigue and captivate players. The associated dynamic involves players logging back into the game to explore new content or updates, driven by curiosity and the promise of fresh experiences. Participant 7 mentioned, "Or if they release new features like they launch something new and interesting, and that's kind of a good excuse to go and test it out." This dynamic is enabled by the mechanic of introducing new in-game elements, which continually refresh the game environment and keep it engaging. By appealing to players' innate desire for discovery and innovation, encouraging re-engagement.

Table 7
Factors that trigger *Re*-engagement (RE).

Code-group	Code	MDA	Description	Person count	Mention count
Triggers	Novelty	Aesthetic	New in-game elements	10	10
	Social Influences	Dynamic	Invitations from friends or peer pressure to play Minecraft	8	10
	Game Inspiration	Dynamic	Fresh ideas and new creative endeavours, such as projects	7	7
	Nostalgia	Aesthetic	Returning to the game evoked fond memories, rekindling players' passion	4	6
	Progression	Dynamic	Improvement, achievement and desire to reach advanced stages of the game	4	6
	Continue task	Dynamic	The desire to continue unfinished tasks	2	2

3.4.1.37. Social influences. Friends are another powerful motivator for re-engagement, driven by social interactions, invitations, and peer pressure. Aesthetically, players experience anticipation (P7) and feelings of happiness (P10) when reconnecting with friends or responding to invitations. Dynamically, re-engagement occurs through invitations from friends or peer pressure, as social circles often drive players back into the game to maintain relationships or join group activities. Participant 10 highlighted this by saying, "If a friend tells me to come online, I'll be more than happy to join."

Mechanically, this is supported by multiplayer mechanics, which enable collaborative play and social interactions. The social aspect of Minecraft fosters a sense of connection and shared enjoyment, motivating players to re-enter the game world to engage with friends.

3.4.1.38. Game inspiration. Getting inspiration for a new project prompts re-engagement. "Game Inspiration" combines the aesthetic of fun, motivation, and curiosity with the dynamic of engaging in new, creative endeavours such as projects or self-directed goals within the game. This dynamic is supported by mechanics that provide opportunities for creativity, such as expansive building systems or personalized challenges. For instance, Participant 3 mentioned, "If a new project comes to mind, I'm usually quick to hop on again," illustrating how a new creative idea can reignite engagement. Game inspiration motivates players to re-engage by offering fresh ideas and avenues for exploration, keeping the gameplay experience meaningful and stimulating.

3.4.1.39. Nostalgia. A sense of nostalgia encourages re-engaging with Minecraft. "Nostalgia" is an aesthetic that taps into players' emotional connections with the game, invoking fond memories of past experiences. The dynamic here involves players returning to the game to relive activities they have enjoyed previously, such as specific gameplay mechanics or familiar settings. Nostalgia often requires little mechanical innovation, as its power lies in rekindling emotional ties rather than introducing new features. By drawing on sentimentality, this trigger creates a powerful motivator for re-engagement. Participant 8 stated, "So it's kind of like visiting a part of your childhood kind of feel when I visit Minecraft now."

3.4.1.40. Progression. The desire for progression prompts re-engagement. Progression offers the aesthetic of motivation and challenge, as players are driven by the desire to achieve improvement and reach advanced stages of the game. The dynamic associated with progression involves a continuous cycle of striving for betterment, which is facilitated by mechanics such as reaching a new milestone, unlocking new abilities, or acquiring advanced gear. Players motivated by progression seek the satisfaction of achieving these goals and advancing in the game. Participant 7 illustrated this by saying, "I guess it's the progression. It's kind of when I start to get that spark back, and I want to play again. Then it feels like I want to get to that late game stage where we have everything, and everything is super easy."

3.4.1.41. Continue task. The desire to continue tasks can also motivate players to return to the game. "Continue Task" leverages the aesthetic of motivation, compelling players to re-engage by providing unfinished tasks or objectives. The dynamic involves players returning to the game to complete these tasks, which may include ongoing projects, or incomplete missions. This dynamic is driven by mechanics that ensure tasks are left incomplete when a player exits the game, creating a sense of obligation or anticipation to finish what was started. By creating a

structure of continuity, this trigger effectively fosters re-engagement. Participant 4 expressed, "But day to day, it's just I want to continue where I left off," showing how ongoing projects can maintain a player's connection to the game.

While seemingly similar, 'progression' and 'continue task' represent distinct types of engagement. Progression refers to advancement through game-defined mechanics and objectives (such as defeating the Ender Dragon in Minecraft), while 'continue task' relates to personal goals and self-directed activities set by the players themselves (such as building a house or creating a farm). This distinction captures the difference between game-structured achievements and player-created objectives, which emerged as separate motivating factors in our analysis.

3.4.2. Time to re-engage

As seen in Table 8, time to re-engage can be divided into three main categories: days, weeks and months. The time taken off is determined by how the player disengaged with the game or what the player did in the last session. Participant 4 shared, "If I'm on a consistent streak, I'll play every day, but there could be months in between if I forget about the game or get bored." Another participant explained, "When I'm working on the projects, I can be on every day for, like, two weeks straight, maybe? Yeah, it depends on how big the project is. But if I stop after a few projects, it will usually take me until there's a new update to get into it. Again. So maybe months, it goes from days to months really" (P3).

3.5. Overarching code themes

The systematic categorization of engagement codes across different stages—initial engagement, sustained engagement, disengagement, and re-engagement—provides a structured temporal understanding of player experiences in Minecraft. While these stages represent a chronological progression of interaction, they are not strictly linear but rather interconnected and dynamic. Each stage reveals distinct patterns of player behaviour, motivation, and emotional response. To comprehend these complex engagement patterns more deeply, the paper analysed the codes through three overarching thematic lenses: internal factors related to game mechanics and gameplay, external factors encompassing social and environmental influences, and motivational and emotional factors driving player experiences. These themes offer a nuanced framework for understanding the multifaceted nature of player engagement beyond the temporal stages of interaction.

3.5.1. Internal factors (Game mechanics and gameplay)

The Internal Factors theme represents the core mechanical and structural elements within Minecraft that directly influence player engagement. This theme captures the game's intrinsic design elements that shape player experience from within the game itself.

As shown in Table 9, the internal factors represented within Minecraft encompass various game mechanics and structural elements that directly shape the player's experience. For instance, the "Progression" factor encapsulates the systems that allow players to advance, develop their skills, and expand their capabilities over time. Within the context of Minecraft, this progression manifests through the ability to upgrade tools, armour, and other equipment, as well as unlock new crafting recipes as the player gains experience. These incremental advancements imbue a sense of achievement and encourage the player to continue engaging with the game in order to further enhance their efficacy and unlock new content.

Table 8
Time to Re-engage (RE).

Code-group	Code	Description	Person count	Mention count
Time to re-engage	Months	Months to re-engage	10	10
	Week	Weeks to re-engage	3	3
	Days	Days to re-engage	5	6

Table 9
Codes of engagement according to themes.

Internal Factors	External Factors	Motivational and Emotional Factors
Freedom	Social Influences	Game Inspiration
Combat	Friends	Nostalgia
Novelty	Social Media Inspiration	Continue Task
Progression	Playing with Strangers	Task Accomplishment
Material Collection Support	Friends Not There	Lack of Inspiration
Daily Quests	Real-life Activities	Big Task Ahead
Randomisations		Overplay
Mandatory Progression		Big Setback
Achievements in multiplayer		No Progression
Reminder		Big Skill Difference
Timer		Goal-based Engagement
Multiplayer Management		Completion of tasks
User Interface		
Easy game		

3.5.2. External factors (Social and environmental influences)

The External Factors theme explores how elements outside the game's direct mechanics impact player engagement. This theme recognizes that player motivation is not solely determined by in-game experiences but is deeply influenced by social contexts and real-world circumstances.

Within the context of Minecraft, examples of external factors could include social influences, real-life activities, and environmental conditions (Table 9). For example, a player's real-life responsibilities, schedules, and life events may impact their available time and mental state for engaging with Minecraft. Factors like work, school, or family obligations could potentially disrupt or enhance a player's capacity to maintain involvement with the game.

3.5.3. Motivational and emotional factors

The Motivational and Emotional Factors theme delves into the psychological and personal drivers that sustain or diminish player interest. This theme goes beyond mechanical interactions to explore the internal landscape of player experience.

For players with a long history of engagement with the game, the feelings of nostalgia and a desire to revisit familiar experiences may further reinforce their continued involvement. Conversely, a player may experience a sense of stagnation or lack of novel stimuli, leading to a decline in their motivation and a subsequent disengagement from the game.

4. Discussion

4.1. Summary

This interview study aimed to explore the game elements that trigger engagement and disengagement in Minecraft. We analysed the results from the theoretical perspective of the Engagement Cycle (O'Brien and Toms, 2008) along with Hunicke et al.'s (2004) MDA framework and arranged the responses in correspondence to the different stages. The results provide valuable insights into the factors that trigger and potentially support initial engagement, sustain engagement, lead to disengagement, and facilitate re-engagement in the context multiplayer gameplay by the means of the popular sandbox game Minecraft. The findings of this study are summarized in Fig. 1 which shows how the different elements appear within the Engagement Cycle categorized into Internal, External and Motivational/Emotional factors.

4.2. Theoretical implications

Our study identified that not all responses fall into game specific elements and can be attributed to the MDA components. Hence, we categorized game-specific elements as Internal factors which include the mechanics, dynamics and aesthetics according to MDA, External factors that describe facilitators outside the game, and finally, Emotional/ Motivational factors that are related to the players themselves. With this categorization, our work extends the notion of engagement beyond instances of interaction and contextualizes the gameplay within the players' daily life. We structure the discussion of our findings and their implications along these three themes.

The findings, when considered alongside existing theories and frameworks, present several significant theoretical implications for understanding player engagement in Minecraft and potentially other similar games. In contrast to competing frameworks that conceptualized disengagement as negative experiences that are rooted in bad game design or facilitated by negative affect (e.g., OA3 Framework by Schoenau-Fog 2011), our work provides a more nuanced perspective on long-term play all stages of the Engagement Cycle as a natural part of interaction. With this, the recognition of disengagement as a potentially valuable component of the user journey, rather than a mere failure of design, picks upon Alexandrovsky et al.'s (2024) notion of positive disengagement and aligns with the process model's cyclical nature, acknowledging that engagement is not a continuous state but a recurring process. This alignment extends its applicability to multiplayer, sandbox-style gaming environments, providing a robust framework for understanding the complex dynamics of player engagement in such games.

4.2.1. Internal factors

Internal factors describe triggers of the engagement stages within the game and are categorized as Mechanics, Dynamics and Aesthetics. The key triggers for Initial Engagement span various dynamics and aesthetics, including Novelty, Combat, Progression, and Freedom. Interestingly, our results did not show any specific game mechanics that draw players in to engage with the game. In Initial Engagement, Novelty sparks curiosity and drives initial exploration of the game world.

For Sustaining Engagement, all components of MDA are present. Here, we identified mechanics facilitate the dynamics of Progression and Combat through the game and specific goals that the game provides. Additionally, we found that Randomization mechanics facilitate Sustained Engagement. Our findings on Randomisation mechanics are co-aligning with Iacovides et al.'s (2015) results how unpredictability can create meaning and compelling game experiences. However, contrary to our results, Iacovides et al. also found that unpredictability can be frustrating and mitigate the players' agency. This tension highlights that randomness in games requires careful design and a transparent communication of the potential outcomes and meaning within the game to the players. These game elements predominantly promote the aesthetic of Novelty as the primary factor for Sustained Engagement. During Sustained Engagement phase, Novelty keeps the experience fresh through new discoveries, challenges, or player-created content.

The analysis identified Reminder, Timer, Easy Game, and User Interface as the main contributors of the players' disengagement. Here, reminders and timers work as Blocking mechanics (Alexandrovsky et al. 2019). The Easy Game mechanics, complement related work on players' expectations for the game (Iacovides et al. 2015) and the general notion of game design which suggest that the game's difficulty should match the players' abilities (Hunicke, 2005), performance feedback, hits and supporting tools (Drey et al., 2021). This further aligns with previous findings that experiences of success are mostly satisfactory and enjoyable when players have overcome a challenge they struggled with or learned something new (Frommel, Klarkowski, and Mandryk, 2021).

Finally, *Re*-engagement is prompted by the dynamic of Progression and the aesthetic of Novelty. In *Re*-engagement, Novelty is often yielded through game updates, new mods, or unexplored aspects of the game, rekindling the interest and drawing players back to the game.

Notably, Novelty is prominently present in the engaging stages, but not for disengagement. The findings reinforce the importance of Novelty but also provide a more nuanced understanding of how it operates at different stages of engagement. Importantly, our research offers new insights into the Disengagement stage. The Process Model of Engagement (O'Brien and Toms, 2008) primarily describes Disengagement in terms of 'perceived time', 'challenge' or positive and negative effects. However, the study's findings suggest that Disengagement is actively driven by other specific elements, notably the perceived lack of Novelty or the Completion of major task.

4.2.2. External factors

The pervasive influence of social contacts across all stages of engagement highlights a significant social dimension that the original Process Model of Engagement (O'Brien and Toms, 2008) does not explicitly emphasise. While the model focuses primarily on individual interactions with systems, this research underscores the crucial role of social connections throughout the engagement cycle in Minecraft. This suggests that engagement in multiplayer games like Minecraft is not solely about individual experience but also about shared experiences and social interactions. Social Influences contribute to Initial Engagement by providing encouragement and guidance, sustain engagement through collaborative projects and shared adventures, mitigate disengagement by maintaining social bonds, and often catalyse re-engagement through invitations. The findings on the importance of social interaction such as playing together with friends in engagement are in line with a study by Chen et al. (2006). The research stated the degree of player engagement is primarily influenced by social interaction, and for those who are highly engaged, social elements play a crucial role in shaping their gaming experience (Chen et al., 2006). However, the current study underlines that social factors could have both positive and negative influences. Not all invitations from social contacts (i.e., friends) leave a positive feeling; sometimes, the invites could produce peer pressure, making the player feel forced to start playing because the rest of the friend group is. Furthermore, this peer pressure makes it more difficult to leave the game while the whole friend group is still engaged. Social influence is a double-edged sword, and studies about engagement need to take into consideration that Social Influences can have both positive and negative effects on the player (Miller et al., 2019). Here it is worthwhile to learn from broader findings about the impact of social media on decision-making (Grover et al., 2022). Pressure from peers for example can significantly impact the use of social media, even to the detriment of the user (Xu et al., 2023). All in all, findings about social influence on engagement imply that engagement theories should consider not just individual-system interactions but also the social context in which these interactions occur. A more socially aware model of engagement could provide a richer understanding of how players interact with games and other interactive systems.

Other external factors that influence playtime are real-life events and social media inspirations. Real-life events draw players them away from the game and lead them to re-focus on something non-game-related (see also Alexandrovsky et al., 2024). This may be as mundane as a short-term disengagement due to a bathroom break, but as dramatic as a hardware failure or family-related responsibilities the players need to take care of. Furthermore, (re-)engagement can be driven by out-of-game experiences are such as inspiration from social media; see another person do something can be inspirational and motivate people to try to achieve a similar feat in the game.

4.2.3. Emotional and motivational factors

Emotional and motivation factors are tied to the individual's experiences. They may relate to something or someone in-game or out-of-game. For example, a big-task-ahead or a big setback that was

experienced may trigger the disengagement from a game session (similar to the concept of getting stuck; Drey et al., 2021) and prohibit re-engagement over a longer period of time. The motivation to complete a task or fulfil a certain goal may sustain engagement but also trigger re-engagement; a phenomenon not unlike to the Zeigarnik Effect first described in 1927. Although players in our study typically described this as a positive to think about the game even while not playing, it may actually be detrimental to real-life in extreme circumstances. While it is certainly fine to think about and daydream about one's hobby, in extreme cases unfinished tasks may impair sleeping and increase rumination (Syrek et al., 2017). However, once a specifical task has been completed, the motivational pull of unfinished business no longer exists and a finished task acts as a disengagement trigger (see also Alexandrovsky et al., 2021 for similar findings on missions and reoccurring gameplay).

A substantial proportion of triggers of disengagement was related to performance-related frustration such as Big setback, Big skill difference, and No progression. This finding reflect the results by Frommel, Klarkowski, and Mandryk (2021) on failure and success experiences in performance-oriented games, which show experiences of failure are mostly present when players were not able to reach their goals, when challenge and difficulty did not match their abilities, or when they did not believe they could succeed at a certain task and can lead to perpetual disengagement.

Disengagement suppression on the other hand, hinders players from leaving the game. Here it is important to disentangle the players interaction with the game and the experience of engagement. While the elements of sustained engagement facilitate the players' willingness to play voluntary and with joy, disengagement suppressing elements keep players in because they *must* not because the *want to*. Such disengagement suppression occurs, for example, when player are exhausted but continue playing or, play due to social obligations. This distinction substantiates the initial findings of Alexandrovsky et al. (2024) on gameplay while bored without enjoyment.

4.2.4. (Dis)engagement across time

The findings from this study build upon the existing models of user engagement proposed by O'Brien et al. (2022). While their earlier work (O'Brien, 2008) focused on shorter, narrowly-defined episodes (e.g., more discrete episodes of web searching), the current study examines engagement within the context of Minecraft, an open-ended sandbox game where player experiences can unfold over much longer timescales - from 'weeks to months to even years,' as noted by some participants. This distinction is important, as the triggers and support mechanisms influencing engagement in a freeform, exploratory game environment may differ from those observed in more structured, goal-oriented digital activities. The social influences and out-of-game experiences that shape Minecraft engagement, such as the inspiration drawn from social media, point to the need to consider a more holistic, cyclical view of the engagement process, as advocated in the evolving models proposed by O'Brien et al. (2022). The open-ended, sandbox nature of Minecraft is a key factor that likely shapes the engagement experiences in unique ways compared to other game genres. In more linear, narrative-driven games, triggers for engagement may be more closely tied to progressing through the story or achieving predefined objectives. Conversely, the triggers and support needs identified in this Minecraft study, such as the importance of personal goals, social connections, and autonomy, may be more closely aligned with engagement in other sandbox or simulation-style games that prioritize player agency and emergent gameplay.

The present results can be effectively contextualised within the MDA. The identified engagement triggers align with various components of the MDA model. Mechanics are represented through Minecraft's open-world structure, combat system, resource gathering, and multiplayer functionality. Dynamics emerge from the interaction between these mechanics and player behaviour, manifesting as progression systems, novelty and exploration, social interactions, goal-based engagement, and randomisations. The Aesthetics component is reflected in the emotional responses evoked by the game, such as the sense of freedom, challenge, discovery, and fellowship. Notably, the study's findings on disengagement factors also correspond to the MDA framework (Hunicke et al., 2004), with issues in user interface relating to mechanics, problematic progression and skill differences representing dynamics, and overplay suggesting a failure in maintaining desired aesthetics. However, the research also highlights potential areas for expanding the MDA framework. The influence of external factors such as Social Media Inspiration suggests a need to consider broader ecosystems in game analysis. Here it would be fitting to connect to the research on theory crafting, where players search for optimal strategies with which to play a game (Reimer, 2021). The lives that people lead outside of playing their games inevitably impacts inspiration within the games they play. Furthermore, the cyclical nature of engagement, disengagement, and re-engagement processes implies that the traditional linear conception of MDA might benefit from refinement to accurately capture the complexity of player experiences. Additionally, the recognition of disengagement as a potentially positive aspect of gameplay challenges conventional applications of the MDA framework that primarily focus on sustaining engagement.

These insights contribute to a more nuanced understanding of player experiences in modern, socially connected games like Minecraft and suggest avenues for potential expansions of the MDA framework.

4.3. Practical implications

The findings of this study yield several practical implications for both Minecraft specifically and video games in general.

4.3.1. Engagement

For Minecraft, the results suggest several avenues for enhancing player engagement while also encouraging positive disengagement. Firstly, given the importance of social interactions in driving engagement, developers should focus on enhancing in-game social features, facilitating easier connections with friends, and improving collaborative tools. Implementing a more structured progression system (e.g. Daily quests) while maintaining the game's sandbox nature could provide a sense of advancement for players seeking more directed gameplay. This aligns with findings from the Snacking framework's (Alexandrovsky et al., 2019, 2021). The Snacking framework is a framework consisting of five game mechanics (rewards, novelty, completion, waiting and blocking) that contribute to sustained engagement in casual games (Alexandrovsky et al., 2019, 2021). They argue that some games are most enjoyable for players when they are snacking (playing a game regularly and frequent for a sort time). The findings on the structured progression system match the concept of 'Mission Completion' – mission-based mechanics that give the player a sense of accomplishment. Further, this aligns with Iacovides et al.'s (2015) results on the importance of players to understand the function and structures in order to yield satisfying experiences of progression. Secondly, regular introduction of new content, biomes, or gameplay mechanics could maintain the element of novelty that drives engagement. Novelty has been proven to be an important dynamic and game mechanic in both the Process model of Engagement (O'Brien and Toms, 2008) and the Snacking framework (Alexandrovsky et al., 2019, 2021), therefore adding new in-game elements would combat boredom (Berlyne, 1970) and lengthen the period of engagement for players. Thirdly, refining the combat system to ensure it remains challenging yet accessible could further support engagement, as combat was identified as a key trigger. Fourthly, implementing in-game tools for setting and tracking personal or group goals could support goal-based engagement (Law and Jacob, 2013).

4.3.2. Disengagement

In addition, several recommendations can be made regarding

positive disengagement - disengagement from tasks to build energy capacity that provides more opportunities for meaningful engagement (Constantino, 2016). Providing natural stopping points, in line with the Snacking framework (Alexandrovsky et al., 2019, 2021) could help to facilitate disengagement. For example, 'Blocking' and 'Waiting' mechanics can mitigate overplay and promote healthier engagement patterns because it stops the play from engaging with the game in a specific way. However, it must be noted that these mechanics should not be circumventable by other means such as microtransactions (pay-to-play). Blocking mechanics prevent the player from accessing the required elements needed for gameplay (Alexandrovsky et al., 2019, 2021). Explicit blocking can prevent overplay, or lack of interest in a game; even if many players complain about this limiter, the objective behind blocking through regeneration mechanics is to limit the duration of a gameplay session (Joel, 2015). Waiting mechanics are features in games that take time to complete, including resources that must be collected gradually or produced via instructions (Alexandrovsky et al., 2019, 2021). Waiting can help combat overplay and excessive gameplay and has even been found to be utilised to promote delayed gratification in order to keep gamers mentally engaged (Carducci, 2009). Finally, to promote positive disengagement (i.e., disengagement that is perceived as positive by the player and stepping away from the game with a smile), reminders or timers set by either the game system or the players themselves could facilitate smoother transitions between engagement and disengagement, preventing abrupt interruptions or frustrations. The game can remind the player how long they've been playing to raise awareness, and if the player doesn't want to be reminded, they can set a timer or countdown to help them disengage. Another mechanic that may be perceived as a natural stopping point are completed missions.

For video games in general, the implications of this study suggest a need for more intentional design around engagement and disengagement cycles. Implementing the Snacking framework more broadly could involve introducing natural stopping points or "cool-down" periods in gameplay to prevent overplay and time-gated content or daily quests that provide reasons for players to take breaks and return later (Alexandrovsky et al., 2019, 2021). These strategies promote a more balanced engagement cycle. To encourage positive disengagement, games could incorporate reflection prompts after extended play sessions or after several missions have been completed, offer suggestions for offline activities related to the game's themes, and provide end-of-session summaries highlighting accomplishments. These features can help players feel satisfied with their progress and comfortable taking breaks. *Re*-engagement techniques could include personalised notifications about new content aligned with individual interests and features that facilitate reconnection with in-game friends upon return. Addressing the "big skill difference" disengagement factor through sophisticated matchmaking systems in multiplayer games could enhance player retention (Horton et al., 2016). Adjacently, following Foch and Kirman (2022), frustration through insufficient balancing failure in the game could be discarded entirely and replaced with a progression system where players do not need to reach a certain state, but rather where different outcomes of the players' actions exist side by side equally. Furthermore, prioritising intuitive UI design, implementing flexible progression systems that accommodate various play styles and time commitments, and fostering positive community building could all contribute to a more engaging and balanced gaming experience. As Minecraft is an open-ended sandbox game, player agency is prioritized compared to more linear narrative-driven. Hence, the development of prompts after extended play sessions, personalised notification, intuitive UI design and flexible progression systems still need to appeal to the agency the player experiences while playing the game (see also Alexandrovsky et al. 2024). Player agency can be used as a tool to enhance a player's connection to the game (Cole, 2018) and is not solely reflected in-game choices by the players. Blocking and waiting mechanisms seem to go against agency yet are vital to keep games attractive (Alexandrovsky et al., 2019). Disengagement could be done with softer and harder suggestions. If blocking and waiting mechanisms are suggestions to disengage and people follow such suggestions, then re-engagement should be made easy. If quitting the game is difficult, the suggestions will likely not be followed and effective disengagement is hindered. That being said, Blocking and Waiting are both not supporting player agency per se and should be reconsidered because they are often implemented to sell tools to circumvent those disengagement dynamics to the player (e.g., buy 50 coins for 5 USD to continue to play!). At the same time, transparent game structures support players agency and allow players to leave at their own volition (Alexandrovsky et al. 2024). With this, Blocking and Waiting mechanics are not per se good or bad for positive disengagement but rather require consideration on how they should be implemented. This seems especially crucial to consider because play-time legislations are spreading across the globe with China and South Korea restricting gameplay time already.

The findings of this study provide insights into player engagement within Minecraft's sandbox environment, where the open-ended and exploratory nature of gameplay creates unique patterns of engagement and disengagement. Unlike linear or narrative-driven games where progression is typically defined by preset objectives, Minecraft's sandbox design allows players to create their own goals and meaning. This fundamental difference likely influences how engagement manifests and evolves over time. In sandbox games like Minecraft, triggers for engagement often emerge from players' creative impulses and social interactions rather than predefined game structures. For instance, while traditional games might trigger engagement through story developments or level progression, we found that Minecraft players were often motivated by self-directed projects and collaborative building activities. This suggests that engagement triggers in sandbox games may be more internally driven and socially constructed compared to more structured game formats. The support mechanisms identified in this study may also differ from those relevant to non-sandbox games. Where traditional games might support engagement through clear objectives and reward systems, Minecraft's engagement is often sustained through the freedom to explore, create, and interact without predetermined endpoints. This raises interesting questions about how engagement supports might need to be adapted across different game genres.

By incorporating these recommendations, which are grounded in the study's findings and the principles of the Snacking framework by Alexandrovsky et al. (2019; 2021), game developers can create experiences that not only attract and retain players but also promote healthy gaming habits and positive disengagement. This approach aims to enhance the overall player experience while acknowledging the importance of both engagement and intentional disengagement in the gaming lifecycle, potentially leading to more sustainable and enjoyable gaming practices.

While the findings suggest several ways to support healthy player engagement, implementing these recommendations within the current digital gaming landscape presents significant challenges. The dominant "engagement equals revenue" business model in platform capitalism often prioritizes maximizing player time and spending over player wellbeing (see also Howe, 2017). This creates an inherent tension between research-based recommendations for supporting healthy engagement patterns and the financial incentives driving game development decisions. The case of Final Fantasy XIV Online provides an interesting counter-example to traditional engagement-maximizing approaches. Unlike many MMOs that employ various mechanics to maintain constant player engagement, FFXIV's developers have explicitly acknowledged that periods of disengagement are natural and healthy. This approach is embedded directly into FFXIV's game design through several key mechanics: weekly caps on endgame rewards that can be caught up on later rather than daily requirements, a "rested experience" bonus system that accumulates while offline to reward breaks, and catch-up systems in each patch that help returning players rejoin their friends without extensive grinding. The game also notably lacks common retention mechanics like daily login rewards or limited-time

exclusive content, instead making most content permanently accessible. However, such player-centric approaches remain relatively rare in an industry where engagement metrics are closely tied to monetization strategies.

The implementation of research-based recommendations often faces resistance without regulatory frameworks to enforce them. While regulations could theoretically mandate certain player protection features, the global nature of gaming markets and the rapid pace of technological change make effective regulation challenging to establish and enforce. This leaves many decisions about engagement mechanics to be driven by market forces rather than player wellbeing considerations. This context raises important questions about how researchers can effectively influence industry practices. Future work might explore alternative business models that better align commercial interests with healthy engagement patterns or investigate how player communities might advocate for more balanced approaches to engagement design (Howe, 2017).

4.4. Limitations

While this study provides valuable insights into engagement dynamics in Minecraft, several limitations that may impact the interpretation and generalizability of the findings must be acknowledged.

A limitation of this study is the small number of participants and the homogeneity of the participant group. Although the study focuses specifically on participants who play Minecraft's multiplayer mode, and leveraged the already existing social circles the limited sample size raises concerns about the representativeness of the findings. It should be noted that such sample sizes are common for in-depth analysis and the point of saturation is reached much quicker in homogeneous samples (Mayring, 2015). Nevertheless, the small participant pool may not adequately capture the diverse experiences and perspectives of the broader Minecraft player base (especially when considering that Minecraft can be played also as a single-player), potentially missing important nuances or variations in engagement patterns. This limitation restricts our ability to generalise the results beyond the specific group studied, as the experiences of this sample may not reflect those of the wider Minecraft community or players of other sandbox games. Participants were assigned to small groups of 2–3 people based on existing social connections between the players, leveraging pre-established relationships to facilitate natural group dynamics during gameplay. is worth noting that the results could be influenced by pre-existing group norms and dynamics among friends, potentially affecting individual responses and group interactions during the study.

Furthermore, the absence of objective measures or corroborating data sources poses another limitation. The study relies primarily on self-reported experiences, which, while valuable, are subject to various biases and limitations. Participants' recall of their gaming experiences may be incomplete or influenced by recency effects, where more recent experiences are given more weight, or social desirability bias, where participants may report what they believe the researchers want to hear. Additionally, participants may struggle to articulate complex emotional or cognitive processes accurately, potentially leading to over-simplification or misrepresentation of their engagement experiences. The lack of objective data, such as actual gameplay metrics (e.g., play session duration, frequency of social interactions, or in-game achievements), means that the study cannot triangulate the self-reported data with more objective measures. This triangulation could have provided a more comprehensive and accurate picture of engagement dynamics.

These limitations underscore the need for future research incorporating larger, more diverse samples and employing mixed-method approaches combining self-reports with objective data. Such efforts would help validate and extend this study's findings, providing a more comprehensive understanding of engagement and disengagement processes in digital gaming environments.

4.5. Future work

Based on the findings and their implications, several recommendations can be made for future research and game design endeavours. First, exploring the applicability of the identified factors and dynamics in other game genres and contexts, both single-player and multiplayer, would broaden the understanding of engagement dynamics across various gaming experiences and inform the development of tailored strategies for different game types. Second, investigating the effectiveness of implementing "snacking" dynamics, such as blocking or waiting mechanics, in mitigating overplay and promoting sustainable engagement patterns would be beneficial; empirical studies could validate the impact of these dynamics on player experiences and inform best practices for their implementation. Finally, collaborating with game developers and designers to translate the research findings into practical guidelines and design frameworks could foster a more effective integration of engagement-enhancing strategies into the game development process, ultimately leading to more immersive and captivating gaming experiences. By addressing these recommendations, researchers and game designers can refine our understanding of engagement dynamics, validate and extend existing theoretical frameworks, and develop more engaging, immersive, and sustainable gaming experiences tailored to diverse player preferences and contexts.

4.6. Conclusion

This study sought to investigate the factors that trigger engagement and disengagement in Minecraft multiplayer mode. The findings reveal a complex interplay of social and game-related factors that shape the engagement experience. While social interactions, particularly with friends, emerged as a pervasive driver of initial engagement, sustained engagement, and re-engagement, other factors such as novelty, progression, goal-oriented gameplay, and combat challenges also played significant roles. Conversely, disengagement was triggered by task completion, lack of social support, overplay, setbacks, inability to progress, skill gaps, negative interactions, and real-life commitments.

This study has made significant strides in understanding the intricate interplay of factors that shape engagement and disengagement dynamics in Minecraft multiplayer. By embracing disengagement as an integral part of the user experience rather than dismissing it as a failure or undesirable outcome, researchers and designers can unlock new frontiers in creating engaging, ethical, and sustainable gaming experiences. The findings and recommendations from this research have the potential to reshape the gaming industry, promoting player wellbeing, autonomy, and a deeper appreciation for the nuances of human-computer interactions. As digital experiences continue to evolve, this holistic approach to understanding engagement and disengagement dynamics will become increasingly vital in fostering meaningful, balanced, and self-regulated user experiences that resonate with diverse communities and contribute to overall wellbeing.

CRediT authorship contribution statement

Vi Anh Doan: Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Dmitry Alexandrovsky:** Writing – review & editing, Visualization, Validation, Supervision. **Iris van Sintemaartensdijk:** Writing – review & editing, Validation, Supervision, Project administration. **Kathrin Gerling:** Writing – review & editing, Validation. **Maximilian A. Friehs:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ijhcs.2025.103465.

Data availability

Anonymized transcripts of the interviews can be accessed on https://osf.io/m9wr4.

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