

Players' Stories and Secrets in Animal Crossing: New Horizons—Exploring Design Factors for Positive Emotions and Social Interactions in a Multiplayer Online Game

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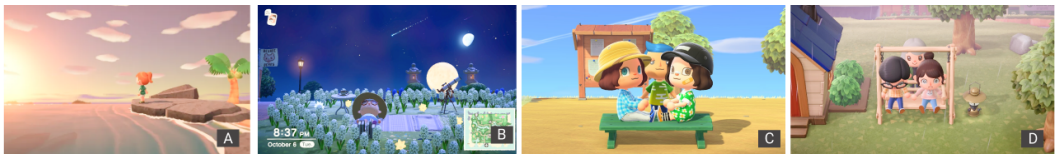


Fig. 1. Participants' Screenshots from Animal Crossing New Horizons. (A) A participant meditating by the sea. (B) A participant waiting for a shooting star. (C) Three friends walking and chatting on the beach the way they did before the pandemic. (D) Three geographically separated family members reunited in the game.

Animal Crossing is an online multiplayer game that supports social communication and collaboration. Its recent version, New Horizons, is immensely popular having sold over 32 million copies worldwide, with many players attracted to the opportunities it provides to remotely socialize during the COVID-19 pandemic. To understand players' increased positive emotions and social interactions, we surveyed 119 of them between May and December 2020 and conducted remote interviews with 25 respondents. We identified the social dynamics among players and with non-player characters (NPCs), and analyzed how positive social interactions were facilitated under player-generated narratives and game-determined narratives. Based on our empirical analyses, we have extended our understanding of how to create positive, safe, and friendly interactions: (1) the design of mood-improving game worlds with flexible game tasks, (2) implementation of game-determined activities with social implications, (3) provision of player rewards to reinforce their social interactions, and (4) creation of opportunities to integrate NPCs' game-determined narratives into player-generated narratives.

CCS Concepts: • **Human-centered computing** → **Empirical studies in collaborative and social computing**.

Additional Key Words and Phrases: Animal Crossing; multiplayer online games; social interactions; social dynamics; COVID-19; emotional well-being

*This author collected some of the survey data from China in a personal capacity, not on behalf of Netease Inc.

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1 INTRODUCTION

Online multiplayer games (MOGs) and virtual worlds offer players opportunities to interact and network with one another for entertainment or professional purposes. Game research suggests that playing video games encourages families and friends to keep in touch, boosts players' positive emotions, and promotes social activities with other players [54, 58]. These positive emotions and social interactions in games contribute to players' happiness and psychological well-being [33].

Since the outbreak of COVID-19, the U.S. Centers for Disease Control and Prevention suggests people wear masks and keep socially distances—a safe distance of at least 6 feet—to slow down the spread of the coronavirus [17]. Recommendations related to social distancing and self-quarantine have led to social isolation and feelings of “pandemic fear” and hopelessness [52]. This led to a corresponding increase in people's probability of developing mental health issues, such as stress, depression, anxiety, and fear [55, 60]. Recently, the World Health Organization partnered with the game industry to launch the #PlayApartTogether campaign to encourage special in-game events and activities that keep players and their families healthy and connected during the pandemic [7].

First released globally in 2001, Animal Crossing is a social simulation video game series developed and published by Nintendo [2]. In the beginning of March 2020, just as COVID-19 developed into a global pandemic, Animal Crossing released its latest version, New Horizons (AC:NH) (Figure 1) [9], on the Switch platform [3]. To the surprise of the game industry, AC:NH was embraced by people looking for ways to socialize during the pandemic and “united” 11 million players in a single month [8, 11]. Moreover, press coverage and player communities have frequently highlighted the calming, safe, and friendly atmosphere AC:NH provided for social play during the pandemic. The positive social atmosphere and players' social presence appear to be the result of AC:NH's complex social dynamics, such as interactions with other players and non-player characters (NPCs) within game-determined or player-generated activities and narratives.

Human-computer interaction (HCI) researchers have been studying players' behaviors and social interactions in emerging and collaborative technologies and how they affect players' emotions or well-being, including online games and virtual worlds [13, 24, 41]. MOGs and virtual worlds allow players to virtually meet in shared spaces and interact with each other. Although a wide range of social interactions in MOGs and virtual worlds improved players' intimacy and emotional well-being [56], not all of them build positive and active interactions—a phenomenon called “Alone Together” [23, 24]. Further, as Depping et al. suggested [20], multiplayer games are so diverse in their mechanics or design patterns that few studies empirically investigated the factors that impact social interactions. How can multiplayer online games best support players' positive emotions and social interactions? What properties are critical to implement so players can highly engage in social interactions?

Therefore, to understand the social phenomena in AC:NH and to inform the design of future games for engaging social interactions, our research questions are: (1) what are the interactions in AC:NH that make players feel closely connected, especially during the pandemic, and (2) what are the design factors in AC:NH that contribute to the game's positive, safe, and friendly social interactions and atmosphere?

To answer these research questions, we conducted an online survey of 119 players and selected 25 respondents for semi-structured remote interviews. We analyzed the social interactions players

experienced and grouped the social dynamics into two categories: game-determined narratives and player-generated narratives. Game-determined narratives are part of the preset game goals, tasks, and mechanics that players follow and complete, whereas player-generated narratives refer to the game goals, rules, or tasks created by the players.

We found that most participants experienced positive emotions while playing AC:NH and were motivated to spend most of their in-game time socializing with both other players and animal NPCs. Our findings also suggested that playing AC:NH affects players' behaviors in three ways: (1) players mirror their real-life behaviors in AC:NH, and (2) players also recreate game objects or perform game behaviors in real life. (3) Further, we discovered that players provided help to support each other, for which their good deeds would be rewarded and reinforced, shifting players' motivation to socialize from extrinsic rewards to intrinsic satisfaction.

Based on our analysis, we revealed that the following design factors informed a socially connected, positive, and friendly game atmosphere and fostered player communities: (1) the creation of an emotion-improving environment, such as natural look and feel, flexible game tasks, and real-time synchronous components; (2) implementation of featured social events with explicit (e.g., festivals) and implicit (e.g., meteor showers) social meanings to facilitate impressive and memorable social moments; (3) provision to both the help providers and receivers of rewards to reinforce their social interactions; and (4) creation of NPCs with friendly and caring personalities and game-determined narratives to support the development of relationships with players and eventually leading to actual friendships. Our primary contributions are twofold: (1) an empirical understanding of players' social interactions and dynamics in AC:NH during the pandemic and (2) extended the knowledge and provided insights for future MOGs, virtual worlds, and the broader HCI community to create positive emotion environments and positive and socially meaningful interactions.

2 RELATED WORK

Researchers have investigated players' social dynamics in various MOGs, but with a primary focus on the ones with massive player populations and social interactions among strangers, like World of Warcraft (WoW) [5, 23, 24], League of Legends (LoL) [37], Second Life (SL) [6, 47, 62], Farmville [16, 29], Pokémon GO [13, 59], and Minecraft [50]. Here, we first review existing social dynamics in MOGs and virtual worlds to understand how players' social interactions in AC:NH vary from prior game environments. We then summarize the literature available in the Animal Crossing game series with a focus on its successful design factors for players' positive social interactions to situate the research background of this study.

2.1 Social Nature and Social Interactions in Multiplayer Online Games and Virtual Worlds

MOGs and virtual worlds can be used to form and maintain social relationships, which ranges from friendships to romantic partnership [30, 38, 38]. These social relationships are formed in the reciprocal in-game interactions and features which can support meaningful conversations without concerning about attributes, such as their appearances, genders, sexuality, or ages [46]. Further, Pace et al. also implied that the mundane and repetitive nature of video games support social interactions because individuals seek more engaging and enjoyable plays through socialization with others.

Moreover, MOGs and virtual worlds provide social presence for friends, families, or strangers to get connected and interact with each other [13, 37]. Players interact with others through chat rooms or windows, and virtual avatars to collaborate and achieve game goals. Literature [23, 24] suggests that players' social interactions are supported by these factors: the gameplay (where social collaborations are a pivotal component to players' success), peer-reinforcing effect (where

players are motivated to help each other and stay motivated) [58] and peer competition [17, 58] in communities, and players' sense of co-presence (or social presence) [34, 44, 52].

In MOGs, like WoW and LoL, players often join in teams, groups, communities, or “guilds” (virtual social networks) to collaborate with each other, complete the game-determined goals and stay motivated [17, 58]. Social collaboration is a required component to follow the game-determined narrative and win these games, but WoW players collaborate not only to complete the required game tasks and win the game, but also to help others and work together [41], which Thorens et al. [58] called “peer reinforcing effect.” For instance, Nardi et al. [41] found that the social interactions in WoW were characterized by a diversity of collaborations from brief informal encounters to highly organized structured groups, such as guilds and raids. Similarly, players in LoL also form temporary teams where they must collaborate with strangers to destroy their opponents [37]. Interestingly, LoL developed two social recognition systems to foster player collaboration [13]: (1) a “Tribunal” system that allowed players to identify and punish deviant behavior and (2) an “Honor” system that allowed players to give positive ratings to others.

Although researchers [19] found that players felt connected through collaboration in groups, such as in WoW or LoL communities, other studies also discovered conflicts and competition among players. Through observing WoW player's long-term behaviors, Ducheneaut et al. [24] indicated that the extent of social activities and interactions had been overestimated by prior literature. According to Ducheneaut et al., WoW requires lots of repetitive activities and competition that gradually narrow the player types to “power gamers” (hardcore gamers who focus on making characters more powerful). Kou et al. [17, 37] also found that competitive game tasks and environments could lead to tensions and conflicts among players who are strangers and expose them to vulnerable situations in LoL. Therefore, competitive and challenging environments with required tasks often create peer-pressures, rather than positive emotions and affective interactions [17, 58]. In contrast, players reported feeling calm and relaxed playing AC:NH during COVID-19 [4]; thus, we explored the game factors that improved players' emotions and affective interactions in this study. Unlike WoW or SL where players join public communities, AC:NH creates a semi-private environment where players require access codes to join their virtual worlds (or an islands). AC:NH only allows small social gatherings (up to 8 players) from its massive player communities. Although there are game-determined narratives and tasks in AC:NH, these tasks are not required to complete and players can freely generate their own narratives and activities, similar to open worlds games.

In open worlds games and environments, such as SL or Minecraft, players often establish their community within the virtual space, and they have the flexibility and freedom to explore the worlds, go anyplace or interact with any players [42]. Virtual worlds like SL and Minecraft do not mandate fixed gameplay or force players to follow game-determined narratives. Instead, players are allowed to generate their own narratives, social activities, and professional events. For instance, in SL, players can socialize with other players in social activities [10], such as educational and medical training [14, 31], virtual academic conferences [25], commercial advertisements [35], and other player-generated or community-specific topics [40]. Ringland et al. [50, 51] also studied a Minecraft server called AutCraft, which is dedicated to players with autism spectrum disorders. She found that this inclusive community facilitated autistic players' communications within the game as well as improved their social skills outside the game. In these open worlds, chat windows or logs, and photo capturing features, have mainly been used by players to strengthen the social interactions and information sharing with other players [42, 43].

Researchers [14, 31, 35, 42, 61, 62] investigated the social events and activities in these open worlds and how players interact with each other. Based on a study with 138 SL players, Messenger et al. [40] found that most of the social scenarios were grouped and themed, and created for business and social applications. Erickson et al. compared organizing conferences in virtual worlds and

in real life and their findings showed that conference attendees enjoyed an all-online academic conference in SL and found social interactions to be similar to those in real-life [25]. However, they found that organizing people and meetings structurally on a large participation scale was challenging, inefficient and took more time than a real conference.

Besides the above mentioned approaches of social interactions (game-tasks-fostered collaboration, conflicts and competition, and player-generated activities), players' sense of presence in the digital worlds, more specifically, their sense of co-presence or social presence, are also identified as one of the critical social dynamics that foster players' interactions in MOGs and virtual worlds [28, 52]. Presence has been defined as the "sense of being there", co-presence as the "sense of being together", and social presence as the "sense of being with another person" [52], which are used interchangeably by researchers. Therefore, allowing players to customize their avatars (outfit and look) and share memories with others increased their sense of social presence in interactions with others [42].

2.2 Animal Crossing in Prior Research and Theoretical Framework

In 2020, during the COVID-19 pandemic, Animal Crossing's player population grew to more than 11 million players, much faster than WoW (2 million active players in March 2020 [5]). Previously, researchers [12, 15, 36, 53] investigated content creation, players' interactivity, and specific game components in several older versions of Animal Crossing. Nintendo released Animal Crossing: Wild World in 2005 and New Leaf in 2012 on the Nintendo DS and 3DS platforms, Pocket Camp mobile in 2017, and New Horizons on the Switch platform in 2020 [9]. These versions share similar gameplay and narratives with slightly different mechanics and newer features.

In a phenomenology study, Behrenshausen [12] analyzed the interfaces, inter-objectivity, and interactions related to touch control in the Wild World version, but did not focus on the social dynamics inside the game as the player community was not as active and large as the AC:NH version. Kim [36] explored players' content creation and the interactivity between the player and game items in the Wild World version. Kim found that the dominant ideologies in AC, such as a hard work ethic and consumerism, were not only supported by creators but also voluntarily emphasized and accepted by players. This dominant ideology permeates the entire series as well the current version of AC. In another study, Scully-Blaker [53] studied the Pocket Camp mobile version and focused on the game currency Leaf Tickets, which can be purchased with real money and used to shorten wait time in the game. The main reason that Scully-Blaker investigated how Pocket Camp gamified the capitalist monetization of time was because AC ran in real-time and most events were time-sensitive. The playtime depends on players' everyday notion of time rather than the contraction of days into minutes that is characteristic of many other games. We also paid close attention to these real-time factors in our study to better understand how they might affect players' behaviors and experiences. Later, Brown et al. [15] studied the New Leaf version with a focus on how game-determined narratives and interactivity contribute to the player-generated horrifying experiences. They also did not investigate the social dynamics among players or with NPCs. In our analysis, we adopted Brown et al.'s framework of game-determined narratives and player-generated narratives to analyze players' social interactions.

In AC:NH, players can establish an alternate life in an island village populated by humorous and friendly animals that are computer-controlled NPCs, and they can also socialize with other player-controlled avatars. This game entails the routines of daily life, including waking up, working (fishing, catching bugs, watering flowers, gardening, etc.), earning game currency, shopping, socializing with other players or animal NPCs in various contexts, and going to bed. Although AC:NH delineates progress for its players in game-determined narratives, such as reaching certain star ratings for the islands or exchanging turnips in the "stalk" market, it also allows players to generate their own narratives for affective interactions with other human players or animal villagers (NPCs),

such as birthday parties, virtual concerts, farmers' markets, customized games, and so on. Since AC:NH only allows players to use text chat or animated expressions to communicate (no audio), in response, players created their own communities in Reddit, Facebook, WeChat, and other social media for organizing social events and activities. We found that more and more people tended to connect with their friends and families, and even strangers via AC:NH during COVID-19.

2.3 Positive Emotions and Well-being

Positive emotions refers to pleasant or desirable situational responses, ranging from interest, contentment, love, joy, and so on [21, 48]. Researchers believed that "positive emotions are evolutionary adaptations to build resources and as appraisals of a situation as desire or rich in resources." [26, 48] With evidence from many controlled studies, positive emotions are proved to be not only the markers of peoples' overall well-being or happiness, but also improve people's future growth and success [21]. As a tool to simulate different environments, video games and virtual worlds demonstrate their ability to elicit players' emotional responses [27]. Given the popularity of AC:NH during the COVID-19 pandemic and players' high levels of social interactions and engagement, in this research, we particular focused on participants' positive emotions elicited by AC:NH and explored its association with social dynamics and game features.

A recent study [32] explored AC:NH players' well-being, motivation, and need satisfaction. Researchers found a small positive relation between game play and affective well-being. However, few studies have explored how the Animal Crossing series functions as a social world and connects players, such as its design features and players' social dynamics. Our research can contribute to the community through an empirical understanding of players' social interactions and dynamics in AC:NH during COVID-19, and extending knowledge and insights for future MOGs and the broader HCI community to create environments that encourage positive emotions and social interactions.

3 METHOD

This study aimed to understand players' social interactions and dynamics in AC:NH with a focus on successful design features. The outcomes are especially beneficial now because of social distancing recommendations and protocols brought on by the COVID-19 pandemic. Our study's participant inclusion criteria were: (1) participants had to be AC:NH players, and (2) players had to be adults. This study was approved by the Simon Fraser University's Research Ethics Board. Participants who completed both the online survey and the remote interview received \$20 dollars CAD in compensation. The researchers were located in Canada.

3.1 Online Survey

We used an online survey to collect participants' demographic information, life experiences during the pandemic, and game experiences. We also asked them to describe their AC:NH game experiences and social interactions in open-ended survey questions, such as their first social activities, daily routines, favorite in-game features and activities, features of the game they did not enjoy, player interactions that did not work out in the game, and their most memorable moments. This survey took approximately 20 minutes to complete. We used convenience and snowball sampling to recruit as many participants as possible, and we also advertised the study on AC:NH's Reddit r/animalcrossing, Facebook, and WeChat groups. From May 2020 to December 2020, we obtained 119 valid survey responses from 132 respondents. The majority of participants lived in the United States, Canada, and China, and a minority were from Japan, Australia, the United Kingdom, and Spain. Seventy-five participants answered the English version survey, and 44 answered the Chinese version. Participants' home countries had different levels of travel restrictions and physical distancing requirements during the pandemic. For instance, the United States, Japan, and the United Kingdom

Table 1. Demographic Distribution of 119 Survey Participants

Categories	Number of Participants
Gender	Female (71.43%), male (26.89%), and non-binary (1.68%).
Age	Ranged from 19 to 61: 19 to 23 (47.9%), 24 to 29 (36.97%), 30 to 39 (10.08%), 40 to 49 (2.52%), and > 50 (1.68%).
Country	United States and Canada (54.62%), China (36.97%), and other countries (8.4%).
Education	High school (6.72%), in college or university (76.47%), and graduate or higher degree (16.81%).
Time spent in AC:NH	Less than 30 hours (3.4%), 30–100 hours (26%), 100–200 hours (41.2%), and > 200 hours (29.4%).

had closed their borders to specific countries, and Canada, China, and Australia closed their borders to nonresidents [18]. All participants' countries required residents to maintain different levels of social distancing [1]. Participants spent an average of 25.5 hours playing video games a week (SD = 34.1). In addition to AC:NH, they played a wide range of video games across different platforms (computers, mobile devices, and consoles). The most frequently mentioned games were Zelda, Pokémon, League of Legends, FIFA, the Mario Brothers series, Overwatch, Call of Duty, Half-Life, Grand Theft Auto V, Diablo, and Minecraft. On average, they spent 15.6 hours a week (SD = 14.2, from 3 to 60 hours) and 117.1 hours in total (SD = 149.3, from 30 to 610 hours) in AC:NH. Table 1 shows participants' demographic breakdown. Survey questions can be found in Appendix A.

3.2 Remote Interviews

After the online surveys, we conducted 60-minute remote interviews with 25 respondents (age 21 to 61; female = 14). We looked at participants' survey responses and selected players with various levels of social experiences in AC:NH. Out of the 25 interviewees, we included 19 players who frequently socialized with others (> 3 times/week), five who regularly communicated with others (1–3 times/week), and one who seldom interacted with others (< 4 times/month). The amount of interview participants from these three social frequencies were proportionally selected to all survey respondents. Within each social experience category, participants were randomly selected. To obtain an in-depth understanding about their social interactions and dynamics, we asked semi-structured questions about life experiences and emotions, social interactions with other people inside and outside video games, specific social activities inside AC:NH, and their overall experiences with the game. The interviews were conducted online via video conferencing software during June to December 2020, and all interviews were voice-recorded with participants' permission. We included the semi-structured questions used in the interview in Appendix A.

3.3 Data Analysis

We conducted a descriptive analysis of the data collected from the online survey. For instance, we calculated the mean and standard deviation (SD) values of the quantitative questions and percentiles from distribution questions. We analyzed the open questions from the online survey and the data from the remote interviews using inductive thematic coding. First, the audio recordings were transcribed [57]. Then, two researchers used an inductive coding approach to identify concepts and categories independently. Both adhered to the following coding process: open coding to identify all concepts, axial coding to establish categories, and selective coding to decide on themes and

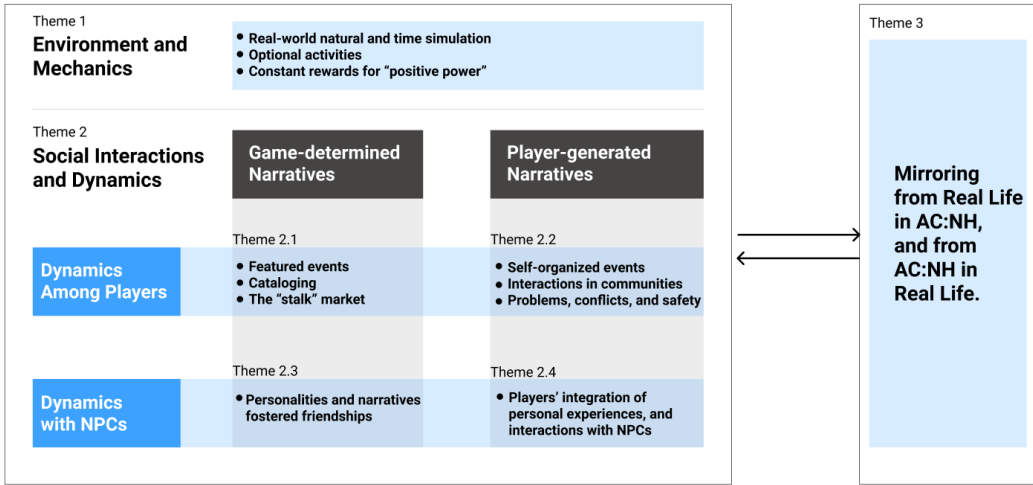


Fig. 2. Diagram of Themes and Subthemes

meaning construction. Two of the authors discussed the coding results and refinement of themes was also done with the research team through discussions. A written narrative was provided for each theme with important quotes from participants that validated the themes. During the coding process, we used the assessment of inter-coder reliability [39, 45] approach to validate our results. We put in the names of all codes and themes from two raters (researchers), and used "1" or "0" to mark either the raters "agree" or "disagree" with one particular code in SPSS. We found that the two coders reached substantial agreement, Cohen's Kappa (κ) = .63, $p < .01$.

We mapped and grouped three themes that emerged from three aspects: (1) Environment and Mechanics, (2) Social Dynamics, and (3) Mirroring Behaviors from AC:NH in Real Life and from Real Life in AC:NH (Figure 2). The Social Dynamics theme contained four subthemes divided into two categories: subjects with whom players interacted (other players or NPCs) and sources from which narratives were derived (game-generated or player-generated).

4 FINDINGS

4.1 Descriptive Findings of Quantitative Data

4.1.1 Life Experience during the Pandemic. In the survey, we asked participants to share their life experiences during the pandemic, particularly if they had reduced in-person interactions and if they had experienced or were experiencing any emotional changes. The results suggested that most participants (95.2%) practiced strict social distancing and experienced different levels of negative emotions (Table 2). Their negative emotions could be attributed to four main pandemic-related reasons: (1) concerns about the entire situation or future, (2) disconnection with families, (3) troubles working or studying from home, and (4) frustration from not meeting people and not knowing how to communicate or what to do with other people.

4.1.2 Game Experience in AC:NH during the Pandemic. The survey showed that around half of participants started playing the game because they wanted to engage with their acquaintances who were AC:NH players, and they wanted to join their real-life social network remotely. AC:NH promoted social and collaborative play among players and their friends, families, or even strangers. All but two participants reported strengthened connections with people they knew in real life as

Table 2. Life Experience Survey Responses

Survey Items	Responses
Social-distancing situation	<p>"I stay at home almost every day" (46.7%).</p> <p>"I go out a few times, just for things like grocery shopping" (46.7%).</p> <p>"I go out sometimes, but not as much as before the pandemic" (5.3%).</p> <p>"I go out as much as before the pandemic or even more" (1.3%).</p>
Negative emotions/moods due to COVID-19	<p>"I experienced severe negative feelings that affect my life due to COVID-19" (21.3%).</p> <p>"I experienced low to intermediate levels of negative feelings that somewhat affect my life due to COVID-19" (56%).</p> <p>"I did not experience any negative feelings due to COVID-19" (22.7%).</p>
Number of participants mentioning different negative emotions	<p>Depression (29), anxiety (26), loneliness (26), isolation (21), loss of motivation (19), worry (19), boredom (17), frustration (13), inability to control life (10), homesickness (7), restlessness (4), loss of confidence (4), and grief (2).</p>

a result of playing AC:NH. Further, half of participants' said their most memorable moments in AC:NH were the social experiences they had with other human players or NPCs (Table 3). More specifically, the survey results suggested that most participants (92%) have played AC:NH with their family members or friends at least once, with half of them consistently interacting with their family members or friends a few times per week. Very few participants (4%) never played with other players, no matter if they were acquaintances or strangers, and very few (4%) only interacted with strangers. Lots of participants (88%) interacted with strangers a few times to exchange rare items and DIY recipes, trade "stalks", and hold parties at a friend's island.

4.2 Qualitative Results

Here, we report on the three themes that emerged from the qualitative results: Environment and Mechanics, Social Interactions and Dynamics, and Mirroring Behaviors from AC:NH in Real Life and from Real Life in AC:NH. We merged the qualitative findings from the surveys and interviews together to provide more details.

4.2.1 Theme 1: Environment and Mechanics. In general, approximately half of the interview participants acknowledged that they had experienced negative emotions since the beginning of the pandemic, a period during which playing AC:NH improved their emotions. Overall, participants reported the real-time simulated environment, flexible game tasks, and AC:NH's semi-private player network made them feel calm, safe, and less stressed. Others noted that the game provided constant rewards whenever they committed time to it, and they felt a sense of achievement and satisfaction. Participants said that whatever they had been doing in the game was more productive than doing nothing or panicking when they needed to study or work from home.

The Real-Time Simulated Natural Environment Calms Players. Participants from the interviews reported that the natural and peaceful visual environment, the audio feedback, and the real-time simulated features contributed to AC:NH's calming effect. Although they played other games that manipulated time, weather, or seasons, very few games had seamlessly developed real-time

Table 3. Game Experience Survey Responses

Survey Items	Responses
People who participants had played this game with (multiple choice)	Friends from real life (86.6%) and strangers (57.1%). Family members (25.2%) and no one (1.7%).
Made new friends from the game or strengthened current connections?	Made new friends (25.3%). Strengthened connections with current social network, such as friends and family (72%).
Initial motivation to play AC:NH	“Because I have friends or family members who are playing this game” (42.9%). “Because the game is popular and I wanted to try” (33.6%). “Because I have been playing AC series or I am a fan of Nintendo games” (21%). “Other reasons” (2.5%).
Categories of most memorable with NPCs (26.1%).	Social experience (56.3%): with other players (30.2%) and moments in AC:NH Reaching certain achievements (26.9%). Labor (e.g., fishing, diving, or gardening; 10.9%). Aesthetics (chill environment, music, art style; 5%). Other: “Could not think of one because one moment isn’t better than the next” (0.8%).

features akin to AC:NH’s. To support the virtual world, AC:NH uses an ecological trope as a realistic environment to reinforce the coherence of the virtual worlds and increase players’ immersion. Further, around one-third (N=25) of interviewees reported that AC:NH provided them with chances to virtually “enjoy the weather” (P89) the same way it was in real life when they chose to stay at home. For instance, P71 said, “*I like the view of the island. The light is so natural, and the season and time change the same as [in] real-time. Because of the pandemic, I had to cancel my vacation. But playing AC gave me the illusion that I’m on vacation since it has beautiful graphics, low pressure, and a customizable world.*”

Flexible and Varied Game Tasks. Although AC:NH has many activities players need to complete if they want to progress, such as the beginner’s guide, paying off a house loan, and collecting items, the game does not set any time limit or obligatory tasks that players must complete to keep playing. From the surveys and interviews, participants reported that playing in AC:NH was relaxing and that they did not feel any pressure, which has been one of the critical factors contributing to its popularity during the pandemic. For instance, P49 said, “*I can play it at my own pace instead of feeling like I have to rush to ‘win’ it because it isn’t a game that you ‘win.’ I don’t want to play competitive games like World of Warcraft (WoW) because I think they’re too stressful during the pandemic.*” Additionally, depending on participants’ interests, a wide range of activities enabled infinite ways of playing, e.g., “*It has a high level of freedom in what you want to do in this game depending on interest,*” said P14. “*It is long term (can’t be ‘beaten’), wholesome (calming and peaceful), and [an] opportunity for creativity.*”

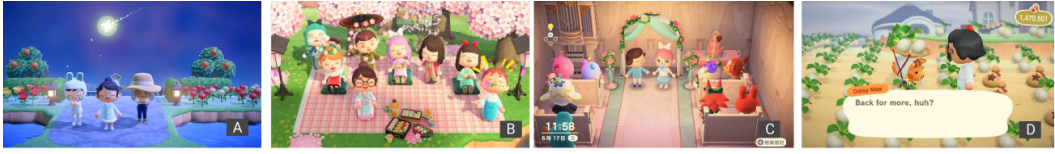


Fig. 3. Game-Determined Narratives. (A) One participant invited two of her friends to the shooting star event, and the image shows the moment they made wishes as the meteor passed by. (B) One participant invited seven players to her island during cherry blossom season. The participant organized a virtual party because they wanted to organize a physical one to correspond with the cherry blossom season in real life. (C) One participant and her friend went to the church during the wedding season. (D) One participant visited another player's island to trade turnips for a higher price.

Positive Feelings from Constant Rewards. AC:NH gives its players positive reinforcement by rewarding their behaviors and effort, making them feel satisfied with their efforts in the game. More than three-quarter ($N=25$) of the participants from the interviews mentioned that AC:NH motivated them with positive emotions; for instance, one of them used the term “positive powers” to refer to the feelings he received. Participants used “calm,” “friendly,” “rewarding,” “relaxing,” “quiet,” “stress-reducing,” “easy and simple,” “free,” “kindness,” “play at one’s pace,” and “motivated” to describe their positive feelings while playing the game. They suggested that the positive feelings may come from explicit rewards (such as reeling fish, shaking fruit, or catching bugs), implicit rewards (such as building a house, an achievement they could not attain in real life), or receiving gifts by talking to the NPC animal villagers. The constant rewards gave them a sense of accomplishment without pressuring them to do anything.

4.2.2 Theme 2: Social Dynamics. AC:NH differs from other MOGs and virtual worlds in two aspects: (1) it supports small social groups in a semi-private environment that enables player-generated activities, and (2) it generates rich game-determined narratives for the NPCs to facilitate players’ social presence and engagement. AC:NH is semiprivate in the sense that it requires access codes to visit other players’ virtual spaces and limits gatherings to eight players (probably because of technical difficulties). Interestingly, from the interviews, participants reported that these two features created a different social atmosphere than other MOGs, such as World of Warcraft and Second Life. Therefore, participants’ social interactions were categorized into four groups under two dimensions: Subjects with Whom Players Interacted (other players or NPCs) and Sources from Which narratives were derived (player-generated or game-determined). These four categories of social interactions constitute the four subthemes of players’ social dynamics above (Figure 2): with other players in game-determined narratives, with other players in player-generated narratives, with NPCs in game-determined narratives, and with NPCs in player-generated narratives.

Theme 2.1: Social Dynamics with Other Players in Game-determined Narratives. In AC:NH, several game-determined activities have been designed for players to communicate or collaborate with one another, including Featured Events, Cataloging, and the Stalk Market. Different types of social activities and contexts enable players to interact with varying degrees of player flexibility. For instance, synchronous multiplayer interactions occur when one player visits another’s island to exchange or collect items (Cataloging) and when attending game-determined Featured Events, such as a shooting star (Figure 3A), cherry blossom festival (Figure 3B), or wedding event (Figure 3C). Additionally, the Stalk Market (Figure 3D) is worth mentioning because it broadens players’ social interactions with acquaintances and strangers for trading.

AC:NH has game-determined featured events with explicit or implicit social implications that provide opportunities for players to get together. From our survey results, around half participants' most memorable moments happened during one of those featured social events, such as observing a shooting star or attending festivals or seasonal events. The most-mentioned event (almost a-quarter of the participants) was the shooting star and making a wish when it appeared. Generally, when participants identified the clue that told them the meteor shower was coming, they invited their friends or posted the event on their social media and AC:NH groups to invite strangers. For instance, P66 said, *"I like to watch meteor showers with my friends. All avatars are doing the same thing—make a wish, and it looks really nice. My friends could also benefit from the event for star fragments."* Participants explained that the visual experience was not the reason they enjoyed the event; rather, they were excited to share a special and rare moment with other players.

AC:NH includes other game-determined seasonal events that create opportunities for players to socialize as they would in real life. For instance, Figure 2B shows a cherry blossom party in which participants and their friends gathered to simulate what they would do in real life in April, when the cherry blossom festival occurs in their town. The social nature of these featured events motivated participants to engage in the storylines, share with other players, and provide impressive social moments.

Additionally, collecting items is one of AC:NH's game mechanics that engages players in long-term missions; it is also one of the participants' favorite features. Players can exchange anything they can acquire in the game, and the game intentionally scattered resources among players. To benefit from this, participants collaborated with other players and visited other islands in order to expand their inventories and collect more items, including furniture, do-it-yourself (DIY) recipes, special bugs, or fish. From the surveys, P54 said she made a list of her collections in a Google Doc to share with her friends so they could visit each other when they see something new on the list. She said, *"We actually have a google doc to share all DIY recipes, furniture, rugs, wallpaper, and other stuff. She knows what I don't have, and so do I."*

Finally, the turnip Stalk Market (Figure 3D) is a special event that simulates the stock market in real life. Players use the game currency, which is called "Bells," to trade turnips. Every player's island has a different price for turnips that fluctuates when the market opens at noon on Sunday. As participants noted in their interviews, players usually join social groups on Reddit, Facebook, or WeChat to communicate with strangers and get access codes so they can travel to foreign islands to sell turnips at a higher price and earn Bells. P57 said, *"My friend started a Facebook group chat about AC:NH, and we just trade things or turnips. Sometimes, we play together for turnips. We know each other by nicknames, but there are no other interactions other than this."* Participants said they searched for access codes in online groups and then selected an island. In return, they tipped the island owners with gifts, watered their flowers, or gave them goods. Almost all interview participants said they had traded with strangers. When answering a follow-up question—did you have other social interactions with strangers besides trading turnips?—all participants said that they only visited other players' islands for turnips and did not have further interactions. Therefore, it can be said that the Stalk Market hardly developed players' relationships, nor did it broaden their topics of communication.

Theme 2.2: Social Dynamics with Other Players in Player-Generated Narratives. In addition to game-determined game features and events, players also used AC:NH's environments to create their narratives or events. In both surveys and interviews, participants reported that although they were not physically together due to social distancing, they felt closely connected with and cared for by others in these player-generated events. Audio or video phone calls are not comparable with the social presence that AC:NH offers in such events. Participants also suggested that playing



Fig. 4. Player-Generated Narratives. (A) One participant celebrated his birthday with other players. (B) All players dressed up as their idols to attend a virtual concert. The avatar dressed differently was the event organizer. (C) A player reformed her islands for a maze game and invited others to play. (D) One player built a haunted house for others to explore.

together in AC:NH gave them opportunities to realize this fact during a time when they could not physically meet with others and when most real-life social events had been canceled. In the interview, P94 said, “[*Playing this game*] makes me believe people who are not with me in the same physical location are still willing to connect with me.” He also talked about celebrating his birthday party in AC:NH, which was his most memorable moment: “*There was no birthday party in real life, and I was really depressed. But my friends came to my island and held a virtual party for me! They brought things to decorate a small party place and prepared gifts for me. It was really encouraging. If we have something like a Zoom meeting, it’s not that fun.*” Interestingly, birthday parties (Figure 4A) seemed to be the most popular player-generated event, as nine participants mentioned them in their interviews. They noted that birthday parties were one of the primary reasons they met in small groups of people in real life. Therefore, they transferred their in-person birthday parties to AC:NH’s decorated space. Their process of celebrating birthdays in AC:NH simulated what would happen in real life; either the person celebrating their birthday sent out invitations, decorated a place, and friends brought gifts, or friends secretly planned a party.

From surveys and interviews, other player-generated social activities included virtual concerts (Figure 4B), tea parties, graduation celebrations, tours, short games (Figure 4C), haunted houses (Figure 4D), farmers’ markets, and hide and seek games. For instance, P02’s friend from Canada planned to go to a concert held by their idols in South Korea in March 2021, but it was canceled because of COVID-19. P02’s friend was very upset. Interestingly, she decided to organize one herself and then put significant effort into building a concert hall in AC:NH complete with instruments. P02 was invited to the virtual concert and said, “*The day we went to the virtual concert, we played as a band, including the guitar, bass, and drums together. We all dressed up [like] our idol group... and took lots of pictures together*” (Figure 4B). Other players received a sense of achievement and satisfaction by crafting and building environments for social activities. For example, players reformed their islands as mazes for treasure hunting or playing mini-games, such as Mario Party.

AC:NH facilitates positive behaviors with explicit and implicit rewards that reinforce social interactions and foster a friendly atmosphere in players’ communities. For example, interview participants reported that the turnip market was ideal for social collaborate because they could get a higher price (reward) when trading with others. Meanwhile, participants who did good deeds were also rewarded through gifts or tips from traders. In another example from the interviews, participants’ flowers grew much faster when watered by others. Participants who visited other players to water their flowers also got chances to collect more game items or recipes.

The gameplay reinforced social interactions by (1) rewarding help receivers rather than the help providers (e.g., with items they are collecting, or turnips they’d like to exchange), so that (2) the help receivers are motivated to gift the help providers or share critical game information with them (e.g., water flowers, gift items or game money). Such a feedback loop encouraged participants to help other players have fun. Therefore, performing social interactions furthered participants’ progress

and benefited all parties. As P62 suggested (from the survey) in a turnip-trading case, “*Strangers [came] and [left] tips. They even took turns and did not come at the same time so nobody [would] need to wait for the loading screen. The strangers were polite and well organized. [There] is kind of an unspoken culture in the AC community. I am always happy and motivated to host giveaways and give back to this community.*”

Despite the pleasure participants derived from playing the game, they reported technical problems in the surveys and interviews that they hoped AC:NH’s developers would improve. First, synchronous gameplay in games like AC:NH is usually accompanied by live audio calls via communication software, as nearly half of participants noted. However, AC:NH only has textual communication, which is slow and inconvenient compared to audio chat. Participants’ feedback indicated AC:NH was so limited in communication tools that they sought supplemental software. Around half of the participants reported similar feedback. For example, P112 said, “*We would chat [on] one side on the phone; [on] the other side, we played together.*” Using supplemental software for chatting created extra work, and participants said it was frustrating to operate several devices at once. Players also responded that seeing the avatars in the virtual environment was not enough to feel connected. Although AC:NH allowed them to replicate visuals from their social activities, according to more than half of the interview participants, oral conversations were also important in family gatherings and parties with friends because, as P112 noted, they had more to discuss than just the game. On such occasions, participants felt the visual representations of their avatars did not support their social demands. Interestingly, in contrast, participants did not report having phone calls or video chats when trading turnips or exchanging goods with strangers because there was “*no need to talk and we just follow[ed] the social norms to exchange or trade*” (P02). Second, more than half of the participants reported technical problem where one player had a network issue during a meeting, AC:NH would drop them all without saving their progress.

Although most participants gave very positive feedback about their social interactions with strangers in AC:NH, one interview participant reported a minor conflict that made him feel frustrated and discouraged. The conflict happened when P18 visited a stranger’s island to sell turnips. Instead of welcoming P18, the island owner intentionally blocked his store and house to protect his resources or virtual belongings. Although this conflict did not involve insults or harm, P18 reported feeling “*emotionally... hurt and treated as a [thief].*”

Regardless of the technical problems and potential conflicts in AC:NH, two-thirds participants reported in the surveys and interviews that this game is a “*physically and mentally safe place to meet with... friends during [the pandemic]*” (P14) because they were connected remotely and therefore social distancing. Moreover, participants simulated environments and social behaviors in the virtual world similar to those in real life. They felt that staying together in the game was “*safe and just [like] what happen[ed] regularly before the pandemic*” (P14). P89’s experience also saw her and her family communicate in AC:NH and create a safe environment to meet: “*My sister is in Japan right now, and she can’t come back to Canada because of COVID-19. Therefore, my mom and I, we play with her regularly, and I feel [like I’m] being reunited with my family... because AC:NH creates a safe environment for us to meet. I worried about her health a lot when the pandemic started. But later, seeing all of us reunited together [made] me happy. My sister is still very far away, but if we talk and play together, I feel we are there together.*”

Theme 2.3: Social Dynamics with NPCs in Game-determined Narratives. AC:NH has a total of 391 animal villagers with individual personalities, narratives, and storylines. Part of the flexible game tasks in AC:NH involved interacting with these villagers by talking with them (selecting replies from an answer pool) or giving them gifts. In addition to socializing with human players,

participants also interacted with different animal NPCs on their islands, and most reported feeling connected to their villagers.

From the interviews, participants said they spent almost the same amount of time communicating with the villagers as with human players. Surprisingly, more than half of the interview participants felt a similar social connection with the NPCs as with human players, and a few even reported “being loved” by the NPCs more than by other players. Those reported “feeling loved” by the animal NPCs more than other players primarily did so because of three reasons: (1) the NPCs are always welcoming, encouraging, and friendly; (2) NPCs have memories of important social activities with players and they respond to the players’ social requests in an intelligent and funny way; and (3) players don’t have social pressures or anxieties of messing up relationships with NPCs. Further, they treated their relationship with the NPCs as friendships. Around one-third of the interview participants knew the names and personalities of their animal villagers as well as their background stories. For instance, P26 treated NPCs the same way as human players and said, *“I love talking to the villagers and working on those friendships. For instance, I make sure Punchy [an NPC] never leaves the island. I also always say ‘What’s up?’ to my boy Eugene [an NPC] in his language.”* Similarly, P89 said, *“I always like observing what the villagers do to each other and enjoy ‘eavesdropping’ [on] their conversations. Once, one villager said, ‘You look like my mom,’ and the other villager replied ‘Laozi [‘I am your dad’ in Chinese slang], not your mother.’ It’s a lot of fun.”* In contrast, other participants valued the time they spent playing with real people more than with NPCs. P07 said, *“Although I spend more time interacting with villagers than with other players, I know they don’t have complex relationships with me and they aren’t real.”*

There were also examples in which participants’ social connections were strengthened because of the villagers. In AC:NH, players can give villagers away or accept new villagers from other players. From the interviews, P94 told a story about a villager of hers: *“One of my villagers, Sprinkle, moved to my friend’s island before. Once, I went to visit my friend. She talked to me and still remembered me! She said happy birthday to me, and she told me she would come back to my island for a concert.”* P94 added that she almost burst into tears during this conversation. She felt guilty that she had not sent her villager any special gifts or treated her well before the villager moved away. Although players were clear that the NPCs had game-determined narratives, their social interactions still brought social presence and connections to participants. In P94’s case, the NPC’s narrative made her feel guilty because she could not do anything in return for the “caring” NPC who expressed friendship to her.

However, interview participants also thought that if they talked to the NPCs too frequently, they would soon run out of conversations. The repeated game-determined narratives revealed that villagers were programmed. This is one of AC:NH’s design limitations, as all conversations are game-determined without an AI component creating endless and meaningful dialogue.

Theme 2.4: Social Dynamics with NPCs in Player-Generated Narratives. In addition to P94’s social experience with NPCs, a third of the participants from our interviews mentioned told touching stories about their villagers, especially when the NPCs’ game-determined narratives could be integrated into participants’ player-generated narratives that originated from real life. P26’s said that *“the day my cat passed away, I met a mouse villager in AC:NH who just moved in, and he [had] the same name as my cat! The first thing he told me was that [I] was destined to meet... you.”* I can’t explain how I felt at that moment.” In another case, P98 received an album as a gift from her villager, and it was her favorite singer in real life. She was excited about the gift, and afterward, she tried to communicate more frequently with that NPC to make it stay longer on her island. P98 said, *“I love her, and I treat her as my digital friend.”* These remarks revealed that AC:NH creates opportunities

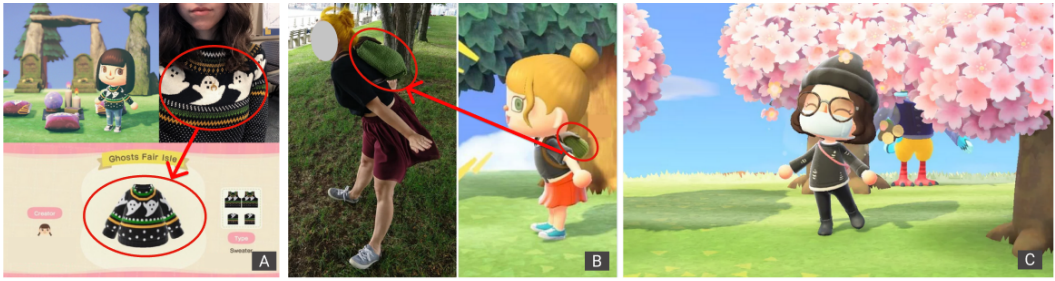


Fig. 5. Mirroring Behaviors. (A) One participant recreated her favorite ghost sweater in AC:NH using the DIY feature and had her avatar wear this sweater. (B) One participant handcrafted the same knotted bag that her AC:NH avatar had in the game. (C) This participant wore a mask while participating in a virtual event in AC:NH.

for players to embody their real-life stories and self-created narratives in the game world through social interactions with NPCs' game-determined narratives.

Theme 3: Mirroring Behaviors from AC:NH in Real Life and from Real Life in AC:NH. The results of the surveys and interviews both suggest that playing AC:NH affects players' behaviors in two ways: (1) they mirror their real-life behaviors in AC:NH, and (2) they recreate game objects or perform game behaviors in real life. AC:NH provides players with virtual places to hold social events, props to simulate real life, and rich game-determined narratives. Therefore, participants moved their social interactions from real life to AC:NH because of pandemic-related social distancing measures, and these activities included the birthday parties mentioned in Subsection 4.2.2 and the friend and family reunion shown in Figure 1C and Figure 1D. Participants created their narratives and activities under game-determined narratives during social interactions with both human players and NPCs, sometimes combining player-generated narratives and game-determined narratives. Moreover, participants tried to embody their real-life identities in their virtual avatar. For instance, Figure 5A demonstrated that one participant made her avatar a DIY sweater in AC:NH because it was her favorite sweater in real life, and Figure 5C shows participants putting masks on their avatars much as they did in real life to combat COVID-19.

Further, AC:NH's features inspired participants to craft game items and mirror their game behaviors in real life. For instance, Figure 5B shows a participant's handcrafted backpack, the same one her character wore in AC:NH; she wanted one to match the game outfit she wears in real life. In another case, P02 reported that she had been an indoor person and never enjoyed gardening or knew any plant names. After gardening in AC:NH and collecting plants, she became more aware of natural beauty and even started gardening in real life. "Since I've been playing in AC:NH for a while," she said, "planting and watering flowers, it [has] raised my interest in natural beauty, and I [I've] started to like the flowers in real life. Now I'm more aware of plants and flowers in real life, and I even know their names. I'm very happy about this change."

5 DISCUSSIONS

5.1 Summary

This study aimed to understand players' experiences in AC:NH with a focus on their social interactions during the COVID-19 pandemic and the relevant design features of the game. Survey results revealed that 42.9% participants started playing AC:NH for social purposes, and they spent most of their game time socializing with other players and NPCs. The interview findings demonstrated

that AC:NH's game world fosters positive feelings in its players and creates a stress-reducing environment. Further, findings suggest that AC:NH has been successful in promoting players' social interactions with other players and NPCs in two contexts: the game-determined activities and player-generated activities. Reinforced social interactions and the game's reward system facilitate a friendly atmosphere in player communities, shifting players' motivation to socialize from extrinsic rewards to intrinsic satisfaction from doing good deeds.

5.2 Design Insights

5.2.1 Create an Emotion-Improving Environment, with a Natural Look and Feel, Flexible Game Tasks, and Real-Time Synchronous Component. Compared to other MOGs, such as World of Warcraft or League of Legends, AC:NH does not have mandatory tasks or competitive battles [53]. Instead, as revealed in Theme 1: Environment and Mechanics, AC:NH, it creates a friendly and positive aesthetic with (1) a natural look and feel, (2) flexible game tasks, and (3) constant rewards. The way AC:NH syncs with real-time clocks and makes users pay closer attention to different visuals and sounds (e.g., footsteps on different terrains, unique sounds for each insect, and a wide range of background music that fits well with the time of day) contributes to the overall natural feel of the experiences. The semiprivate social network, limited players' attendances at social events, and positive and less-pressured gameplay differentiate AC:NH's social experiences from those of other MOGs. Participants found value in these features and the calming and stress-reducing game atmosphere they create, especially during the pandemic. Thus, we think it would be valuable to consider these three factors in future MOG design.

5.2.2 Implement Featured Social Events with Explicit or Implicit Social Meanings to Facilitate Impressive and Memorable Moments. In Theme 2: Social Dynamics, our findings suggest that player-generated narratives and the game-determined narratives are both critical factors in promoting social interactions when the events imply social communication or collaboration. In Theme 2.1, we found that featured events with explicit (e.g., festivals) and implicit (e.g., meteor showers) social meanings facilitate impressive and memorable social moments. In contrast, Zhou et al.'s findings from Second Life revealed that, in the context of the general public, female players focus on shopping and exploring, while male players use the virtual world as a tool to make money [62]. However, our findings suggest that AC:NH players put more effort into socializing and that their connections with other players who are friends or family are strengthened. Although Second Life is also an open-world MOG, it lacks game-determined narratives to trigger players' impressive and special memories like AC:NH does. Therefore, we recommend that future designers implement game-determined narratives and activities, such as rare moments (e.g., meteor showers), special events (e.g., the Stalk Market), and virtual festivals (e.g., cherry blossom festivals), to enrich the social contexts.

5.2.3 Using Rewards to Reinforce Social Interactions. Positive energy and similar concepts were mentioned multiple times in the interviews, as reported in Theme 1 and Theme 2.2. Almost every effort that players put into AC:NH is met with rewards that motivate them to play. The positive reinforcements exist in players' social interactions with other players and NPCs. The game rewards players who receive help, and they go on to provide positive rewards for players who provide help. This feedback loop reinforces a friendly game atmosphere and community environment. Therefore, we recommend providing the positive reinforcement of social interactions to create similar experiences in future MOGs.

5.2.4 Enable NPCs to Have Friendly and Caring Personalities and Behaviors to Support the Development of Relationships. Finally, we recommend that designers integrate NPCs' game-determined

narratives in players' social experiences. In Theme 2.3, we discussed how AC: NH covered a wide range of animal NPCs with diversified personalities and why players interacted with the NPCs. Participants from interviews and surveys reported that NPCs with friendly and caring personalities and game-determined narratives supported the development of relationships between them and eventually led to actual friendships. These friendships were facilitated through frequent social interactions, including a large amount of conversation, storytelling, and positive rewards associated with interactions (e.g., villagers will give gifts if they receive them from players). Although most virtual worlds or MOGs feature NPCs, their functionalities are limited to providing guidance, instructions, or relating simple storylines. Few studies have shown how MOGs foster friendship between players and NPCs. Therefore, we recommend future social games consider enabling NPCs to have friendly and caring personalities and behaviors that support the development of relationships between players and NPCs.

5.3 The Play of AC:NH during the COVID-19 Pandemic

This study was conducted before vaccines were available to the public during the COVID-19 pandemic. As our self-reported survey results suggested (Table 3), 95% of our participants self-quarantined at home, kept socially distanced, and rarely went out. The majority of our participants had experienced negative emotions due to COVID-19, with 21.3% feeling severe effects and 56% feeling low to intermediate levels of impact. Further, findings from both surveys and interviews indicated that participants utilized the social features and virtual spaces of AC:NH to substitute for social events in real life because of the restrictions. As discussed in subsection 4, AC:NH created physically and mentally safe virtual places to meet with people similar to those in real life, and simulated calming and friendly environments in the virtual world. Therefore, some particular real-life social events were facilitated in AC:NH during the pandemic as mentioned in subsection 4.2, such as birthday parties, virtual concerts, in-person gatherings, and graduation celebrations. Although other social interactions, such as exchanging items, trading turnip "stalks", and visiting other players' islands, are part of the gameplay for regular players and not unique because of the pandemic, players have been more active and engaged in AC:NH when they could not meet others in person.

5.4 Limitations

This study may be limited by the participants' sampling approach, as players recruited from game communities were most likely people who had positive feelings and devoted higher engagement and playtime than others in AC:NH. Players who felt differently might have quit the game after encountering problems or negative social experiences, so this study may have not captured their gaming experience. Therefore, the findings of this paper might not be applicable to less engaged players. Also, we primarily focused on the positive aspects of playing AC:NH, but did not fully explore in-game or real-life social tensions or conflicts. Further, our study results were all from one specific game, AC:NH. Although the findings might not be generalizable to all video games, we believe that other MOGs might benefit from findings of this paper and learn about strategies to build positive social interactions and environments. Moreover, we included participants who came from a wide range of backgrounds and cultures. There may have been differences in culture and COVID-19 policies depending on where they came from or what specific physical distancing requirements were in place in their region. A journal or diary that logs participants' daily experiences might have revealed more in-depth findings compared to the online survey and remote 60-minute interviews we conducted. Finally, we would like to mention that because of the exploratory nature of our study, the survey and interview questions were specifically developed for this research to explore players' experience and social interactions, and thus were not validated. Future studies could adopt

validated scales to measure positive emotions, affect, or well-being, such as the validated scale of positive and negative experiences [49] and the player experience and need satisfaction scale [22].

6 CONCLUSION

In this research, we conducted an online survey and remote interviews with AC:NH players to investigate their social dynamics during a period of the COVID-19 pandemic. Our findings suggest that AC:NH provides players with a rich social collaboration modality and enables synchronous communications with other players. Although players occasionally interact with strangers, socializing with family members or friends strengthens their relationships. Further, players also enjoy social interactions with animal NPCs and develop genuine friendships with them. Overall, our results suggest that AC:NH improves players' emotions during the pandemic and facilitates their social interactions with other players and NPCs. This game also facilitates a positive and friendly atmosphere among players' communities. Finally, we extended design knowledge and insights for positive, safe, and friendly interactions: (1) create an emotion-improving environment, such as a natural look and feel, flexible game tasks, and real-time synchronous components; (2) implement featured social events with explicit (e.g., festivals) and implicit (e.g., meteor showers) social meanings to facilitate impressive and memorable social moments; (3) provide both the help providers and receivers with rewards to reinforce their social interactions; and (4) enable NPCs to have friendly and caring personalities with game-determined narratives to support the development of relationships between players and NPCs.

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A APPENDIX. SURVEY AND INTERVIEW QUESTIONS

A.1 Survey Questions

- (1) Your Name
 - (2) Your age
 - (3) Your gender
 - (4) Which city do you live in?
 - (5) What is your most current job?
 - (6) If you are comfortable sharing, in the past few weeks, have you been staying at home because of the COVID-19 pandemic?
 - (7) If you are comfortable sharing, have you experienced any negative emotions recently? If so, what is it?
 - (8) If you are comfortable sharing, if your answer is yes to question 7, do you think that your emotional problem is because of the COVID-19 pandemic?
 - (9) Do you play video games?
 - (10) How many hours have you spent playing video games per week in the past few weeks?
 - (11) What games are you currently playing in the past few weeks?
 - (12) If you play Animal Crossing, how many hours do you spend on playing Animal Crossing per week (if applicable)?
 - (13) If you play Animal Crossing, how many hours in total, do you spend on playing Animal Crossing (approximately)?
 - (14) When did you first start playing this game?
- How many hours per week have you spent on this game so far (approximately)?
- (15) Who do you play it with, alone, with your family and friends, or strangers?

- (16) Do you make new friends because of playing the game?
- (17) How important is it that your friends are playing this game, so you decide to play the game?
- (18) Do you enjoy playing the game? Why? Try to give at least three reasons.
- (19) What do you Not like about this game? Why? Try to give reasons.
- (20) List the top 10 Things/Activities you like to do, or you normally do in Animal Crossing.
- (21) Can you talk about the best (most impressive) moment you remembered or you felt playing Animal Crossing?
- (22) Can you provide us with at least one screenshot of you and your friends playing Animal Crossing? Note: (a) Please first blur out any personal identification information in your picture, such as account name, ID, etc. (b) Please also show your avatar clearly (front) in the screenshots and upload it here.

A.2 Interview Guide

- (1) What have you done for entertainment since you have had to quarantine at home?
- (2) Do you play games? (If yes, why?)
- (3) If you are comfortable sharing, since the pandemic, have you had any feelings of depression, pressure or stress? If yes, do you associate those feelings with or because of the pandemic?
- (4) If you are comfortable sharing, what is your biggest concern right now? Why?
- (5) What, if anything, do you usually do to relieve your stress or anxiety levels? (If you do something to relieve stress or anxiety. Why?
- (6) Do you communicate with anyone or not (if you are staying at home)? Family, friends, etc. Why? why not?
- (7) Does playing games help you to feel socially connected? Which games? Why do you think so?
- (8) Does playing games help you reduce negative emotions, like stress or anxiety? If so, why?
- (9) Why did you start playing this game (AN:CH)?
- (10) When do you usually play the game (time of the day)? Why?
- (11) Do you play the game with your friends together (physically or remotely)? Do you play the game with strangers, or people who you do not know? If so, do you feel connected with your friends in the game? How? Why?
- (12) Do you prefer to interact with virtual animal NPCs/villagers, or human players in Animal Crossing? Why?
- (13) How does this game affect you (in every aspect you can think of, emotionally, behaviorally, etc.)?
- (14) What does a typical gameplay session look like for you? Tell me about your last one.
- (15) Tell me about your first virtual party or any activities with other players.
- (16) Tell me about one virtual meeting with other players that made you happy or impressed.
- (17) Tell me one gameplay session that did not work out well if applicable.
- (18) Can you talk about one of the most memorable moments or impressive activities that you experienced in this game?

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