Human-Nature Relationships through Video Games: An Exploration of Players' Sense-Making

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Abstract

Technology profoundly mediates how people feel, think and engage with nature. Here, video games are projected to become one of the most important mediums to facilitate digital human-nature interaction. In this paper, we explore how 16 players make sense of nature-in-games. Drawing from their own lived experiences, we 1) interviewed them, and 2) invited them to show us games that exemplify their conceptualisation of nature-in-games. We thematically analyse these "show-and-tell" conversations to construct three inductive themes: We arrive at an understanding that nature-in-games experiences are pluralistic, contested happenings. Participants positioned digital nature 1) as a relational other to respect, 2) as a space to reflect on humankind's current practices towards nature and 3) as a tool to escape from the lack of nature in their everyday lives. Based on our insights, we sketch out design inspirations for people wishing to augment, challenge and expand nature-in-games.

CCS Concepts

• **Human-centered computing** → **Empirical studies in HCI**.

Keywords

nature, ecology, climate change, sustainability, video games, player experiences, ecological distress, digital ecologies

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1 Introduction

The relationship between nature and people is fundamental to the human existence: It is not only the basis for the very survival of our species, but a precious bond that supports "human flourishing" [59, 76]. Despite people's belonging to and interdependence with the natural world [37, 44], we face tremendous ecological distress on a planetary scale: Pollution, human-made climate change, and a loss of biodiversity are already causing harm and death, and it will get unimaginably worse over time [24, 56, 93].

People do not make sense of nature in isolation: Personal beliefs, cultural trends, societal attitudes, political trends, and technological experiences shape the connection between people and nature [49, 99]. The latter has fundamentally changed how we might feel about nature: GPS services influence how people move across the natural world [4, 95], sensors and forecasts shape people's relationship with the weather and disasters [9, 38], and applications teach people about their local environments (e.g., by identifying plants, animals, and beyond [70, 94]). Beyond engagements located in the *actual* world, technology is facilitating encounters with digital representations of nature. Within this context, video games are gaining prominence: They are interactive artefacts with a long-standing history of portraying nature [20, 21]. We can understand them as affective mediums with a wide reach into people's lives [6]: Bogost posits that video games can be understood as mediators that represent *and* help construct social, cultural and political values and practices [15]. Video games offer a "possibility space" constrained by their gameplay and rules [14]: As facilitators of make-believe, they can provide a space for meaning-making for people [8] to explore their identity [34], to process difficult times [48], or to reflect on the wider world as a whole [62]—including their connection with nature. Video games can be understood as "environmental texts" (as posited by Chang [20]) that go beyond just showcasing "pixelated nature", as Navarro-Remesal explains: Playing (with) nature can allow us to critically reflect on our relationship with nature [66].

Therefore, video games are in a leading position to shift both current and future consciousness, regarding nature: As a popular entertainment product that is backed by a global, multi-billion-dollar industry, video games' cultural impact is massive [67, 84]. We can understand video games as a driving force for "digital ecologies" [92]: By being leveraged as a blueprint for what virtual and digital archival, preservation, education and conversation efforts could look like [31].

With this potential power comes responsibility, and the need to figure out what nature-in-games currently is, what it could be, and to what ends it *should* be—which scholarship has begun to explore: Examples here include Wallin, who explores the portrayal of and relationality with animal companions in games [96], Shaw et al.,

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who investigate video game environments as virtual spatialities [82] or Truong et al., who explore the significance of vegetation for players in *World of Warcraft* [90].

This paper seeks to add to this pluralistic conversation through an empirical study, by turning to players of video games: What is nature-in-games for them? Here, we were keen to investigate the relationship between nature, video games and people in concrete terms, by drawing from players' lived experiences. Concretely, as a research question (RQ) we ask: *How do players make sense of nature-in-games?*

To answer this RQ, we engaged 16 people through 1) interviews, and 2) "show and tell" sessions, where we invited players to show us video games with prominent nature portrayals in them. We produce a situated-phenomenological snapshot of knowledge *(see 3.3.1)*, that sheds some light on human-nature(-in-games) relationships.

We begin by contextualising this research in existing scholarship touching on both nature and games. Then, we elaborate on our study setup, methodology, and process of thematic analysis before heading into our findings. For context, we outline a deductive overview of participants' conceptualisations, habits, and ideas about games, and nature. Then, we present three inductive themes, constructed out of our encounters with participants. Based on our gained insights, we sketch out design inspirations for nature-in-games. We conclude the paper by describing the limitations of our study.

2 Related Literature

2.1 Making Sense of the Human-Nature Relationship

Speaking directly to you, the reader, what do you think of when you read the term "nature"? We can speculate that each reader will likely draw up their own, very personal images–informed by their own "subjective nature experiences" [46].

In this section, we will sketch a broad overview of human-nature relationship configurations.

One approach might lean toward the perceived ubiquity of the natural world: Nature is seen as the physical world that surrounds us (e.g., land, water), and all life found within it: Flora, fauna, and everything in between and beyond (e.g., mushrooms [91]) [27]. This understanding positions nature as fundamental to the human experience: Without it, people would not be able to survive, as it provides the space, resources and means for humans to exist [27], and by proxy, "flourish" [59, 76]. While this framing of nature is supportive and beneficial to humankind, it can run the risk of presenting nature as a seemingly passive, subservient actor: Human superiority over nature is presumed in this setup, and nature is positioned as separate from people [27].

Another configuration could recognise that people are undoubtedly part of the natural world: Nature becomes a socially constructed entity that exists within a network of human and non-human relationships [27, 81]. Some conceptualisations even go so far as to declare that there is not any distinction between nature and human (action), e.g., "natureculture" [39, 55] or "naturesociety" [33, 58]. Building on this understanding, scholars, artists, and activists propose a "more-than-human" paradigm shift that recognises different life-forms' agency, ways of lives, and perspectives as meaningful: They seek to actively decentre the human being as the presumed most important actor [13, 19, 26]. Within this context, we can recognise that nature is not a neutral concept. As a term with presumed authority, it is used to inflict harm upon others. It can be used to further systematic oppression like sexism, racism or homophobia (among many other forms of violence): Nature can be leveraged to stigmatise people and non-humans, and to justify their discrimination and brutalisation [5, 30]. Here, the negotiated interconnectedness between people and nature can be described as a "human-nature-society web" [74].

We come to understand nature as a concept full of tensions: Regardless of where one's stance on nature may fall, our understanding of nature undoubtedly informs how we might encounter the natural world (e.g., how we might treat other species, like wolves [50]).

2.2 Nature in, with and through Video Games

Portrayals of nature in games are a ubiquitous feature: For example, using nature as an aesthetic framing for game environments, showcasing it as an entity to fight, companion to save, or approaching it as an overarching theme (e.g., games wrestling with climate change) [20, 21].

The overlap of nature and games is also being explored from a "serious" lens, by utilising games as a modality for persuasion and education, e.g., for sustainability and climate change [2, 98], for conservation and preservation efforts [80], for virtual tourism [12], for health and well-being [77, 86], or for teaching biology [83].

However, as cultural artefacts, video games are always at risk to perpetuate harmful, marginalising messages—including how they treat and portray nature-in-games [72, 73]: Chang puts forward that most games are reductionistic in their portrayal of nature: 1) By presenting it as a mere backdrop, 2) by "relying on stereotyped landscapes" [20, p. 58] or 3) by showcasing nature as a mere resource for the player to exploit and extract [20].

Farming as a topic in games is a prominent example for flattening nature. Here, video games can overly romanticise the realities of living, working and being with nature by portraying it in idealised, nostalgic ways [21]. However, this "pastoral" treatment of agriculture is removed from the actual labour, (human-animal) relations and (bio-)politics found in farming [68].

Presenting nature as a *less-than other* positions the player as an unchallenged overlord, that is given a game world to shape as they please [85]—often framed as "improving" it [28]. These player-centred power fantasies run the risk of uncritically pushing imperialist, (neo-)colonial and settler colonial narratives: They portray (native) nature as needing to be subjugated, dominated, and tamed—without reflecting on the violence needed for these processes, or the historical, social context of such actions [2, 28].

Researchers, designers, and developers have already begun to articulate alternatives for what nature-in-games could be, and to explore different "possibility spaces" [15]: For example, leading the player more towards "tending and befriending" (after Taylor [88]) instead of being a dominant, destructive force in-game [78]; designing from marginalised, Subaltern perspectives (e.g., Indigenous sovereignty [53]), exploring modalities of resisting and reframing (e.g., enacting vegan ethics in-game [97]), or exploring how the

lines between player, nature, and games could be blurred and deconstructed [43].

Bringing all of the aforementioned facets together, we can understand video games as a part of new media that reconfigure how people conduct their relationship with "Nature 2.0", as described by Büscher [18].

By default, nature-in-games sets the stage for a pluralistic, interdisciplinary and very personal engagement for each player. Through this study, we seek to capture how players might configure and operationalise the concept, and to add to our understanding of video games' influence on humankind's relationship with nature.

3 Methodology

3.1 Study Setup

This study engaged 16 people to learn about their perceptions, feelings, and opinions of nature in video games. This study was conducted in Finland: It did not require a formal approval through an ethics committee due to being considered "low risk". However, we strictly adhered to national and international research guidelines and best practices (as overseen by TENK [1]): Participation in this study was voluntary and based on informed consent: It consisted of two remote video calls (around 90 minutes in total) with VS between September and November 2022.

In the first call, VS met each participant to conduct a semi-structured interview with the participant about their relationship with games, nature, and nature-in-games *(see Appendix A)*. Afterwards, VS and each person discussed which game(s) they could bring to the next call. The modality of this "show and tell" was left open and only constrained by time (circa 30 minutes): Participants could share their screen, record footage beforehand, take screenshots, or talk over existing content (e.g., YouTube videos). This setup was informed by "talk out loud" user studies, which are used to understand how somebody is using an interface, and to learn about their usage strategies and practices [45, 60]. We asked each person to meet VS again within a time frame of two weeks: 1) To increase the likelihood of them participating in the second call, and 2) to provide the participants with some time for reflection and preparation.

In the second call, participants were invited to talk openly about their game(s), using their medium or modality of choice. An overview of them can be found below *(see 3.4)*. After half an hour, VS asked each participant to wrap up, and to move to a shared MURAL whiteboard to deepen the conversation. We prepared five themed sections with 2-3 guiding questions each:

(1) **Nature Experience with the Game:** "How does being in this environment feel like?", "How do you make sense of nature in this game?" and "What's your role as a player in the game world? Do you feel like you belong to the game environment, as part of it?".
(2) **Look & Feel:** "How does nature in this game look like?", "What about colours, sounds, textures?", "What emotions or thoughts does it evoke?" and "How are you as a player represented in the game?".
(3) **Mechanics & Interactivity:** "How do you interact with nature in this game?", "Can you shape the environment?" and "Can the environment shape the player?".
(4) **Compare & Contrast with Real-Life Nature:** This section did not have specific questions, but VS invited each participant to discuss how their real-life and in-game nature experiences related to each other.
(5) **Open Space:** The last section was left open for any last comments, or personal insights on nature in games from each participant.

These MURAL sections, and their introductory questions, were informed by three factors:

(1) Concepts that describe different aspects of each game (e.g., mechanics, aesthetics, game loop [3, 61])
(2) Inquiries into the player experience [1] (e.g., perceived agency, embodiment and immersion)
(3) Environmental psychology (e.g., nature connectedness [75])

This order was chosen to guide the participants through the conversation, to move from more descriptive comments (e.g., outlining the colours of nature in a game) towards expressing their own opinions, feelings, and experiences (e.g., comparing their nature experiences in-game and in real-life). VS took notes of the participants' thoughts throughout as digital sticky notes in each person's MURAL, and used them for further discussion with each participant for further prompting: Participants talked through 1-2 games in more detail.

3.2 Recruitment

Participants were recruited through the VS's personal and professional networks, particularly through social media (e.g., X/Twitter). We published a recruitment website that listed all relevant study and contact information (e.g., project information sheet, privacy notice).

We left the participant profile broad on purpose to invite a pluralistic group of people. Concretely, we asked to speak remotely with people ...

(1) ... who are adults.
(2) ... who engage with video games (e.g., playing, developing, studying them).
(3) ... who have thoughts, feelings, or opinions about nature-in-games.

We were keen to talk to people who already have accrued lived experience with nature-in-games, in a way that allowed them to formulate a stance on it. We were interested in people's specific, situated and expert views, instead of trying to create a generalisable model of what nature-in-games might be for the many *(see 3.3.1)*.

After leaving us their contact details, potential participants were sent a project information sheet, a privacy notice, and a consent form. As remuneration for taking part in this research, participants could pick games from the Humble Bundle video game store front up to the value of 15 Euros (or the equivalent in a currency of their choice).

In total, 35 people registered their interest: We tried to follow up with all of them. However, people dropped out due scheduling conflicts, a lack of interest, not showing up to calls, or not responding

[1] URL: https://tenk.fi/en/advice-and-materials/guidelines-ethical-review-human-sciences. Accessed 26th February 2025.

to follow-up emails. The remaining number of participants is 16, which were all included in this study. We did not exclude anybody to ensure that we would encounter a plurality of personal opinions, game preferences and nature relationships.

3.3 Data Collection and Analysis

All 16 calls were automatically transcribed through Microsoft Word's transcription function, and then manually corrected. Interactions with MURAL whiteboards were manually included in the transcription, as annotations to keep the calls' contexts accurate (e.g., if participants referred to a written answer).

The resulting texts were analysed through Braun and Clarke's self-reflective six-phase thematic analysis [16, 17, 89]. Our smallest meaningful unit was defined as a single word. VS familiarised themselves with the data through re-reading and reflecting on the interviews (Step 1). Then, they went through the texts to develop a first set of codes (Step 2). All transcripts shared the same, iteratively refined set of codes (Step 3), to ensure consistency in our analysis across calls. Through this cyclical process, VS began to shape codes and data points into theme sketches (Step 4). Through collective work in the author team, the sketches were finalised into coherent, congruent themes (Step 5), which we report on in this paper (Step 6). Throughout Step 1-4, VS communicated closely with OB, who acted as a sounding board. This *inductive* analysis led to the construction of three themes *(see 4.3)*.

We also stepped through the data in a *deductive* manner, to draw out participants' relationships with 1) nature, and 2) games. We use these descriptions as contextualisation for the inductive themes; to provide an overview of the participants' opinions, attitudes and conceptualisations as a group, and as individuals. Throughout our analysis, we were mindful to oscillate between considering each participant's individual lived experience, and their insights as a collective.

3.3.1 Epistemology and Positionalities. For this study, we adopt a "phenomenologically-situated" approach to knowledge creation [40]: It posits that science is deeply embedded within cultural, societal, and political tensions. We position ourselves and this paper as belonging to the "third paradigm" within human-computer interaction, as outlined by Harrison et al. [41]. Instead of shying away from recognising the forces and lived experiences underpinning this research, we seek to make them visible through transparent reporting, and critical reflection. We conceptualise our paper as leaning on the humanistic essay, as being a piece of writing that considers you, the reader, as an active participant instead of a passive consumer of the information provided [10, 11]. Here, we encourage other researchers to use our work within their own environments and world views, so we can build an interdependent network of knowledges supporting and contesting each other.

In alignment with our epistemology, we sketch out a profile that provides a transparent snapshot of the author team: Our countries of origin include Finland (JH), Turkey (OB) and Germany (VS). VS and OB have a background in design, while JH is rooted in information sciences. Our relationships with nature are all different, but we share common awe, appreciation, and respect for the natural world: Due to Finland's culture towards nature, and its accessibility, we encounter the natural world daily. We take regular trips to cabins in the woods (all), grow and live with plants (VS), go hiking and mushroom foraging (all), or go scuba-diving and engage with water sports (JH). We have been researching the interdisciplinary overlap of games, nature, and technology for over three years now—embedded within a larger, local network of researchers investigating how technology could positively contribute to the relationship between the forest and people in Finland (UNITE flagship). Here, all three of us employ games and playfulness to understand and augment humankind's relationship with nature: This process has re-enforced our understanding of ourselves as one part of many in an entangled web of relationships with other lifeforms. Supporting these interdependencies meaningfully is a feature in both our personal beliefs and professional, academic work.

3.4 Overview of Participants

We report summaries of the participants' answers to the open-ended questions in the first call to outline a profile of them: 1) "Who are you?", 2) "What is your relationship with nature?" and 3) "What is your relationship with games?". All names are pseudonyms. For brevity's sake, we only list the profiles of participants who feature in the *Findings* section *(see 4)*:

- **Lily** is a graduate student in a technology-related field, who identifies as a minority person, that lives in the USA. She enjoys playing single-player games as a hobby, and especially likes Japanese Role-Playing Games. She seeks out nature as a space for exercise and mindful relaxation and connection. ∘ **Game(s) showcased:** *Stray* [G5], slideshow with self-taken screenshots.
- **Yarrow** is a researcher that has grown up in a rural town, and now lives in a more densely populated area in [Western Europe]. Being in nature for him has an escapist, relaxing character. He enjoys playing competitive multiplayer games and strives to receive good rankings in them. ∘ **Game(s) showcased:** *Age of Empires 4* [G14], screen share.
- **Snowdrop** is a graduate student, in a technology-focused subject, living in Finland. He has an ambivalent relationship with nature, due to having grown up in a very urban environment in the Middle East. He enjoys exploring and interacting with nature in single player games that allow for a lot of player agency and freedom. ∘ **Game(s) showcased:** *Genshin Impact* [G11], screen share. *Fallout Series* [G8], screenshots. *The Elder Scrolls V: Skyrim* (Skyrim) [G4], screen share.
- **Orchid** is a social worker from [Central Europe]. He sees nature as an opposite to human everyday life', allowing for relaxation. He enjoys games as a form of escapism, and meaningful stimulation. ∘ **Game(s) showcased:** *Factorio* [G17], screen share. *Stray* [G5], screen share.
- **Iris** is a PhD researcher, working with games from [Western Europe]. She values the escapist tranquillity that nature offers to her as an autistic person, as opposed to often overstimulating urban environments. She enjoys games that allow for exploration, player agency and a sense of discovery. ∘ **Game(s) showcased:** *ArcheAge* [G18], YouTube. *Assassin's Creed IV: Black Flag* [G1], YouTube. *Frostpunk* [G2], YouTube.

- **Wisteria** is a graduate student from [Northern Europe], who works with technology and design. Nature provides them with relaxation, and a space to exist outside their busy, urban everyday life. They enjoy narrative-driven, exploratory games. Playing games for them is an everyday occurrence, and they feel deeply for the medium. ○ **Game(s) showcased:** *Season: A Letter to the Future* [G15], YouTube. *In Other Waters* [G10], YouTube. *Citizen Sleeper* [G9], YouTube. *Alba: A Wildlife Adventure* [G16], YouTube.
- **Marigold** is a PhD researcher that works with games, and lives in [Western Europe]. They enjoy going to and being in nature as an escapist, recharging activity. Playing games is a daily leisure activity for them, and they both enjoy single- and multi-player games. ○ **Game(s) showcased:** *The Legend of Zelda: Breath of the Wild* (Breath of the Wild) [G13], self-taken screenshots. *Dead by Daylight* [G3], self-taken screenshots.
- **Willowherb** is a graduate student from [Nordic country]. They feel strongly about nature, and have a personal connection to the natural world from their childhood onwards. They only started playing video games recently, which may give them a different insight into the medium than people who grew up playing games. ○ **Game(s) showcased:** *Ōkami*, YouTube.

Participants showcased a total of 28 games through a variety of modalities, which they were free to choose by themselves. Participants chose to screen share during the second call (n=6/16), made a slide deck (n=1/16), showed images (like screenshots and illustrations; n=3/16), or used videos found on YouTube (n=7/16).

4 Findings

Before heading into our inductively created themes, we report on how participants described their relationships with nature, games, and nature in games. This overview was put together in a deductive manner, by stepping through all data. We showcase participant quotes to illustrate each discussed topic. These quotes are contextualised with the *person's name* who said them and *when* they were said.

4.1 Players' Relationships with Nature and Games

4.1.1 Players' Relationships with Nature. Participants reported on a diverse set of relationships with nature: All participants described nature as an important part of human life (n=16/16). To describe their human-nature relationship, participants drew from impactful memories with nature, that often were accompanied by strong aesthetic and emotional insights. For example, Lily describes a sense of *reverie* in how "[s]ometimes [nature] can also make me feel very small. Not in a bad sense, but more like there's something greater out there and more expansive", 1st Call. Willowherb expresses a similar feeling of *awe*. Their experiences with forests almost take on a spiritual character: "They [the trees] create this really majestic, almost cathedral feeling because they're very tall trees [...] Sometimes when you step into that space, when it's just an open space [...] it's almost a little breathtaking", 1st Call.

Sentiments were also elaborated from a position of *relationality* and belonging to nature ("I guess everything could be nature, if you think about it, you know?", Yarrow, 1st Call), or by wanting to recognise the life around them ("I kind of like seeing the animals and the life that's present in those [natural] spaces", Lily, 1st Call). Participants also expressed *existential sentiments*, by describing that nature operates on a magnitude beyond human comprehension and action. For example, Orchid describes that "[n]ature is stronger than people. It will always exist forever, in some shape or form" (1st Call), or Lily elaborating on being in nature as a catalyst for self-reflection: "It gives me that chance to realise, 'Oh, maybe the problems that I'm experiencing today... Like, there's something bigger and greater out there. Like, my things are kind of small [in comparison]" (1st Call).

Participants also drew links between nature and humankind in general, as described by Marigold: "I think nature also for me kind of connects to the idea of human nature" (1st Call) . Here, the intermingling of *people as nature and in nature* was seen as "messy", as outlined by Wisteria: "[Nature] kind of includes us as well, of course, because we, I think that every living being [...] is part of nature [...] it's [...] a messy web that finds its own kind of ways to organise itself and react to each other" (1st Call).

Participants also described *escapist sentiments* (e.g., "The idea of [...] escaping and feeling disconnected is probably the main source of things that you get from being in like a nature space", Yarrow, 1st Call) or attuning to it (e.g., "[...] once you're out in nature, you get to hear all this sound and have all these sensations that you don't really get when you're in the city". Iris, 1st Call). Here, *nostalgia* also played an important part. Participants readily draw from their childhoods to explain their relationship with nature. Here, Marigold recalls: "Even as a child playing outside... a lot of my fondest memories of childhood are all [tied to] places", 2nd Call). Participants expressed that being with and in nature *grounded them in mindful ways*, which Willowherb explains: "I realise that sometimes just going outside and lying down on a lawn. And looking up at the sky or the clouds [...] just realising that the world is bigger than my problems is very grounding and relaxed. [...] I don't know if you know this meme, but people need to touch grass", 1st Call.

Some participants reported that their most meaningful nature experiences occurred while *being under the influence*, e.g., Snowdrop recalling a sense of profound connectedness with a park environment (e.g., "[...] like for the first time. I felt that I appreciate it. Nature through this lens", 1st Call).

4.1.2 Players' Relationships with Video Games. Unsurprisingly, given this study's focus, all participants reported playing games, and especially video games, as one of their leisure activities. All participants played single-player games, with the minority also engaging with multiplayer experiences (n=5/16).

The reasons for playing games were varied, including *relaxation* (e.g., "I feel like [games are] a good escape to relax and peaceful" [Lily, 2nd Call]), *meeting friends and socialising* (e.g., "I interact with friends through games" [Marigold, 1st Call]), *escapism and distraction* (e.g., "[Playing games] for the distraction" [Orchid, 1st Call]) and *having a sense of achievement and mastery* (e.g., "[...] I just want to shoot someone and be faster than them and have like, the adrenaline rush of living, being faster" [Marigold, 1st Call]).

4.2 Overview of Played Games

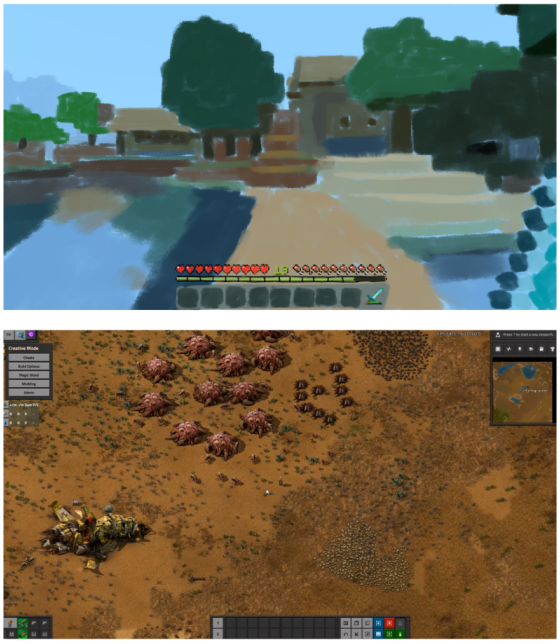

Figure 1: Impressions of *Minecraft* (Snowdrop) and *Factorio* (Orchid) ©*Wube Software*.

In this section, we provide an overview of the games that featured participants played: **Age of Empires IV** [G14] *(see Figure 2)* is a real-time strategy game. The player takes on the role of an invisible overseer, that is tasked with building bases, armies and economies. Building up infrastructures requires the destruction of nature as a scarce resource that the player must carefully manage. The game offers several different sets of units to play, inspired by actual people and peoples[2].

ArcheAge [G18] is a massively multiplayer online role-playing game (MMORPG) from South Korea. Set in a fantasy world, the game advertised itself as a "sandbox"[3]; due to players being able to shape the in-game world through "construction and cultivation" [51].

The Legend of Zelda: Breath of the Wild [G13] is an action-adventure game. The player takes on the role of the hero Link, who seeks to rescue Princess Zelda and save the world from destruction. The game is open-world, and allows players to craft and build, by combing and making use of collected items [47].

Factorio [G17] *(see Figure 1)* is a construction and management simulation game. The player takes on the role of an engineer, who crash-landed on a planet. They are now tasked with building up industrial infrastructures to produce a rocket ship for their escape. Depending on the game mode chosen, the planet can feature an swarm-like alien species that grows more and more hostile to the player polluting their home world [32].

Frostpunk [G2] is a city-building survival game. The player takes on the role of the "Captain", who is tasked with the maintenance and management of a settlement caught in a volcanic winter: Resources are sparse, and the chance for survival slim [23].

Minecraft *(see Figure 1)* is a sandbox game that drops the player into a procedurally-generated, pluralistic world made up of blocks, that can be mined, dug up, collected and reconfigured (e.g., to build structures) [7].

Ōkami [G6] is an action-adventure game. The player takes on the role of the sun goddess Amaterasu, in the form of a white wolf, which is tasked with cleansing a fictional mythological version of Japan [42].

Season: A Letter to the Future is an exploratory, narrative-driven game that " tells the story of a girl on a quest to record the sounds and sights of the last season before a mysterious cataclysm washes away everything" (as described by Op de Beke [69]).

Elder Scrolls V: Skyrim *(Skyrim)* [G4] is an action role-playing game. Set in an open, fantasy world, the player assumes the role of the hero Dragonborn, who finds themselves on a quest to save the world from destruction.

Stardew Valley [G7] is a role-playing game with a focus on being a "country life simulator" (as described by Crowley [25]). The player takes on the role of a character that has just inherited their grandfather's farm. After quitting their city job, they move out to rural Stardew Valley to take care of it.

Stray [G5] *(see Figure 2)* is an adventure game, in which the player takes on the role of a (stray) cat that lives in an enclosed, gated city. The game presents a post-human scenario, in which humankind has seemingly died out. The cat finds itself caught in tensions between hostile alien lifeforms and human-like robots building their own communities [52].

4.2.1 Played Games' Affordances, Framings and Portrayals of Nature. We now turn to explain the games' default framings of nature in more detail. We lean here on the three of the five themed sections for MURAL *(see 3)*. This section sketches out how presentations of nature are facilitated through game mechanisms, affordances, and aesthetic choices. The following descriptions are flexible collages constructed out of participants' descriptions and MURAL notes. Where deemed appropriate, we compliment these descriptions with authors' observations based on official and fan-made materials (e.g., screenshots and illustrations[4], storefront descriptions, wiki entries), and relevant scholarship.

Played Games' "Look and Feel" of Nature. The majority of games featured in this study tended to portray nature in *superlatives and stereotypes* (n=9/11): Either as an idealised idyll (e.g., *Breath of the Wild* [G13] featuring "beautiful, very green and vibrant" landscapes [Marigold, MURAL]), or as hostile, often destroyed death valleys (e.g., *Factorio* [G17] being "bleak, dead wood, desert, brown, dry, deserted before you even arrive" [Orchid, MURAL]). Where games feature multiple different biomes (e.g., *Skyrim*[5]), these sections tend to fall into broadly stereotyped categories [20, 21]: A player might encounter snowy mountains, grassy meadows, tropical jungles, or dry tundras (e.g., "different biomes [are] realistic, albeit exaggerated"

[2]URL: https://www.ageofempires.com/games/age-of-empires-iv/. Accessed 5th September 2024
[3]URL: https://steamcommunity.com/app/304030. Accessed 22nd August 2024.
[4]Where permission from game studios was given, we showcase official visual materials.
[5]URL: https://skyrim.fandom.com/wiki/Category:Locations. Accessed 2th December 2024.

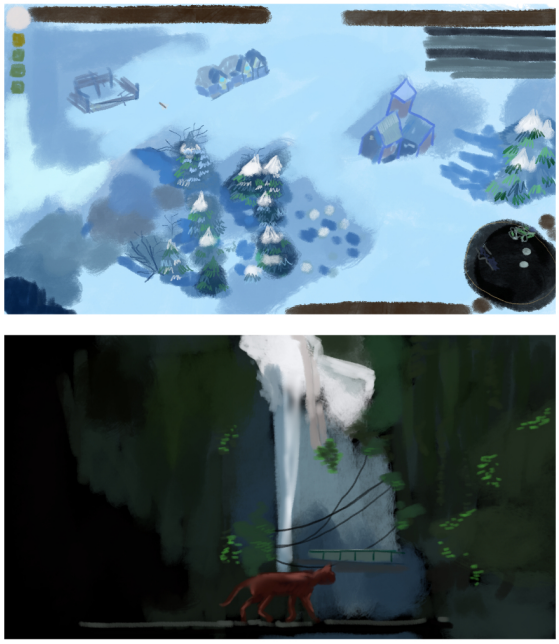

Figure 2: Impressions of *Age of Empires IV* (Yarrow) and *Stray* (Orchid).

[Orchid, MURAL]). Some games *take inspiration from actual nature* (e.g., "auroras" in *Skyrim* [Snowdrop, MURAL]). However, this does not mean that the featured games are hyper-realistic in their portrayal of nature: We speculate here that most games take inspiration from the real-world to keep their portrayal of nature recognisable to players, while putting their own designerly, aesthetic twist on it (e.g., "textures are naturalistic, similar to earth" [Iris, MURAL] in *ArcheAge*; trees have a trunk, branches and leaves, but can grow in fantastical ways[6]). The list of played games features three games that portray nature through a *post-apocalyptic, or post-human lens*: In *Stray*, the player finds themselves in a gated, highly technological city devoid of people. Nature breaks through the old human-made structures, as a sprawling entity outside the walls. *Breath of the Wild* takes a similar approach: Nature has reclaimed much of the world after a cataclysmic event. Finally, *Frostpunk* portrays a world in which a new ice age has taken hold of Earth.

Played Games' "Look and Feel" of the Player. The majority of games features the player as a humanoid character: Here, the player embodies an avatar that allows for a first- or third-person perspective (n=7/11): This ranges from customisable avatars (e.g., creating your own skin for *Minecraft*), to being given a specific character (e.g., playing as Link in *Breath of the Wild*, or as the Engineer in Factorio). However, the player can also take on the role of a disembodied human overseer with a bird's eye view on the game (n=2/11; e.g., as the "Captain" in *Frostpunk*).

Only a minority of games allows playing as a non-human entity: Only in *Ōkami* and *Stray* can the player embody an animal. Either as a fictionalised version of the Shinto goddess *Amaterasu* (a mystical wolf), or as a cat.

Played Games' Mechanics and Interactivity with Nature. All games frame nature as a space that can be explored (n=11/11). Here, most of the games present nature as a resource for the player to engage with (n=9/11): Example interactions here include mining (e.g., *Minecraft*), chopping wood (e.g., *Stardew Valley*), hunting animals (e.g., *Skyrim*) or foraging (e.g., *Breath of the Wild*).

Many games allow the player to shape nature (n=8/11): Either by building structures in it (e.g., *Age of Empires IV*) and/or going so far to terraform all of the natural world (e.g., *Minecraft*). *Here, some games portray nature as infinite, and unlimited (n=6/11):* Flora regrows after being harvested (e.g., planting seeds in *Stardew Valley*), lifeforms respawn after dying (e.g., animal mobs in *Minecraft*) and landscapes can often be extended by exploring further (e.g., worlds being procedurally generated in *Factorio*). *Some games portray nature as finite and limited (n=5/11):* Resource management is often a driving force in the games played. It tends to provide the scaffolding for other game elements to build upon. For example, building up armies in *Age of Empires IV*, or wrestling with difficult choices under scarcity in *Frostpunk* ("the [cold shapes] your decisions/agency", Iris, MURAL). Gathering resources often goes hand in hand with destroying nature (e.g., deforestation being visible in *Age of Empires IV* ["map becomes empty", Yarrow, MURAL]; active machines causing pollution in *Factorio*).

Some of the games treated nature as more than just a resource, e.g., by allowing players to befriend creatures (e.g., *Stardew Valley, Minecraft*). However, this process is often presented as static and final (e.g., taming cats or wolves/dogs in *Minecraft* makes them loyal followers until their death). Beyond resource extraction, we can find examples of different game interactions in *Season*, which allows players to document nature encounters through photos and audio recordings or *Ōkami*, which focuses its gameplay on healing and cleansing nature.

4.3 Inductive Themes

Having established some of the situatedness of our participants and featured games, we now turn to our inductively constructed themes. We illustrate each theme through explicated participant quotes.

4.3.1 Theme 1: Nature-in-Games as an Relational Other. Participants described nature-in-games not just as a simulated space, but as an active system and actor that they engaged with. This theme showcases that players approach nature-in-games as more than the sum of its individual parts: Instead, they treated it as *something and someone* to connect to.

Participants reported paying close attention to what they perceived as nature-in-games: This included each game world's space, objects, and actors found within. Players' engagement with nature-in-games often started from a point of joyful curiosity: To explore, to observe and to experience virtual nature in deep detail.

The next quote showcases this enjoyment in context. Here, Snowdrop recalls observing animals in *Skyrim* [G4]:

> **Quote 1:** "Like, if you observe animals. They behave in some way like normal animals, because you can

[6]URL: https://archeage.fandom.com/wiki/Trees. Accessed 25th November 2024.

> see that they go [around] and sometimes they sleep. Sometimes they wake up and they hunt, and they take care of their children sometimes. [...] And it's really entertaining to watch that. Yeah, you don't have to always interact. You can observe and enjoy [it]. That's a very [...] good experience I can have from these games." (Snowdrop, 2nd Call, *Skyrim* [G4])

In this quote, Snowdrop describes how he perceives the simulated animals in *Skyrim* as life-like ("behave [...] like normal animals"): To him, they seemingly have their own lives and routines, which are visible from the outside ("they go [around] [...] wake [...] hunt"). Here, Snowdrop adopts the position of a passive observer ("[y]ou can observe"): He highlights the option of not needing to "always interact" as one of the potential ways of playing *Skyrim*, as a "good experience".

Participants frequently highlighted non-violent conduct as one of their preferred, go-to modes of interaction. A framing of "letting nature-in-games *be*", and being given a choice was seen in a positive and beneficial light. Here, players reported feeling a sense of mutuality between themselves and the in-game flora and fauna (and actors beyond).

This sentiment is exemplified in the next quote, in which Marigold comments on nature in *Stardew Valley* [G7] being in tune with the player's own decisions:

> **Quote 2:** "Like taking [nature] in, letting it be, it's like... it's its own wondrous thing. And again, like nature is allowed to be dangerous, but it never feels like it's doing that to attack you. It's just like this... it is what's here and it's up to you how you engage with it." (Marigold, 2nd Call, *Stardew Valley* [G7])

In this quote, Marigold elaborates on their perception of nature in *Stardew Valley* as "wonderous" and expansive ("taking it in"): To them, nature is presented as a space and actor that reacts to the player, but without this feedback being biased or dedicated intent ("never feels like"). Marigold does not attach moralistic, human-like decision-making to nature in *Stardew Valley*: Nature responds merely to the player's actions, and choices with the same intensity. As such, Marigold highlights the possibility and value of not interfering with nature directly ("letting it be"). Their quote displays an understanding of nature-in-games that recognises it as a system worthy of recognition and respect, and not as a lesser, other being ("allowed to be dangerous").

The view of nature existing beyond, or outside human intentions, goals, and motivations, was a common framing for how participants made sense of their relationship with nature-in-games. Such a view was also applied to the magnitude, and size of nature as an actor, as compared to humankind. In the next quote, Iris comments on nature in *Frostpunk* [G2], as an antagonist, but one that is agnostic, without ill intentions towards the player:

> **Quote 3:** "The last round of humanity standing within this gigantic and very threatening layer of ice that's slowly progressing and engulfing the population. [...] I thought that was a really interesting use of nature [of] having this natural threat [for] the player rather than enemies that they need to kill. There is no point in the game where somebody else is going to come to attack you. [...] It's literally just you trying to survive the elements in the game." (Iris, 2nd Call, *Frostpunk* [G2])

The quote begins with Iris describing the situation that the player finds themselves within the game ("engulfing the population"). Iris highlights how *Frostpunk* presents nature differently from other games: While it is still a "natural threat" to the player, it cannot be killed or easily subjugated ("[t]here is no point"). In her description, Iris characterises the cold as an actor that exists outside the player's control, yet it is one that they are "trying to survive". Here, Iris alludes to the cold existing on a magnitude and dimension, which is outside of the player's human reach. For her, the cold is not targeting the player or their city because of their (in)actions or choices, but nature just so happens to be like that: Here, Iris locates a subversion of common video games narratives, that propose killing as the solution ("rather than enemies that they need to kill").

Participants readily discussed their expectations of nature-in-games, and were quick to identify tropes, and common motifs. Similarly to Iris' recognition of subversion in *Frostpunk* [G2], Willowherb also interprets nature being different in *Ōkami* [G6]. The next quote describes their view of nature not existing as human wish fulfilment:

> **Quote 4:** "You're this creature just running around interacting with nature. And it's not necessarily that it has to be almost blooming and like everything needs to be [in] perpetual growth, because I think that is antithetical to nature inherently. It's not going to be beautiful and blooming whenever [...] in the game in a way like you have these [different] sections [...] Yes, spring comes eventually in the game, but there are creatures that like being in snow, so it's not like it needs to be this perpetual spring [where] everything just keeps bursting [...]". (Willowherb, 2nd Call, *Ōkami* [G6])

In this quote, Willowherb first summarises the role that the player takes on in *Ōkami* ("just running around interacting with nature"). They describe that virtual nature should not be bound to evergreen and beautiful, similar to actual nature ("antithetical to nature"). Instead, they recognise the pluralistic portrayal of different biomes and spaces in the game as cyclical ("spring comes eventually") for a reason: Different actors in the game are shown to have different preferences, and places to exist in ("creatures that like being in snow"). This narrative reasoning echoes Willowherb's understanding of nature, as not being an evergreen, giving environment ("not [...] everything [...] keeps bursting"). This quote showcases that Willowherb recognises nature, and nature-in-games as an actor not in service for humankind, but as existing on its own schedule and cycles.

Theme Summary: This theme showcases how participants related to nature-in-games, as a multi-faceted space and actor. Players conceptualised virtual nature not just as a simulation of actual nature, but they also approached it from an emotional, affective level: Snowdrop elaborated on observing animals as a meaningful activity in *Skyrim* [G4] (Quote 1), Marigold reflects on nature being allowed to just be in *Stardew Valley* [G7] (Quote 2), Iris considers nature as an agnostic actor in *Frostpunk* [G2] (Quote 3), and Willowherb

explains how nature in *Ōkami* [G6] is pluralistic and cyclical (Quote 4). Here, participants fostered a connection with nature-in-games that was self-reflexive: Players reflected carefully on nature's role in each game, and by proxy, on their own actions and practices.

4.3.2 Theme 2: Nature-in-Games as a Facilitator of Pluralistic Perspectives. This theme outlines how players made sense of their nature experiences in games through their real-life experiences, and vice versa. Instead of nature experiences and nature-in-game experiences existing as distinctly separated, we understand them as one interconnected, continuously negotiated space or spectrum. Participants used these experiences with video games to reflect on their own lives, and relationship with nature and humankind's relationship with nature in general.

One of the possibilities for nature-in-games was the opportunity to take on non-human roles, and to play as a non-human actor. This modality led to participants thinking about how they conduct themselves in their lives, and the perceived and felt differences between them and non-human actors.

In the following quote, Lily discusses how seeing the world from the perspective of a cat in *Stray* [G5] was a meaningful occurrence.

> **Quote 5:** "[…] because I'm a cat in the game, it feels very interesting because you get a different perspective on places and you're able to navigate into spaces you ordinarily wouldn't be able to, like alleyways and like climbing on top of roofs […] [w]hat would it be like being a cat walking around the city […]? […] That's a very different experience than what I've had in other games where you're like a human or like, you know, something more human like." (Lily, 2nd Call, *Stray* [G5])

In this quote, Lily describes how she identifies with the cat in-game ("I'm a cat in the game"). She points out how playing as an animal is different: Here, she points to other games being more focused on providing the player with a human avatar, or "something more human like" to control. Embodying a cat makes Lily wonder about spaces and spatiality in the game, but also in general ("navigate into spaces"). Here, taking on the non-human role of a cat in a still human-made world also highlights the need to find points of connection between them ("[w]hat would it be like"). This quote highlights that being a cat is an unusual, curious undertaking: This novelty contributes to Lily's framing of the game, as providing a different perspective ("you ordinarily wouldn't be able to").

Taking on the role of a non-human also afforded players with the space to consider current approaches towards nature, and sustainability. Here, the complicated dynamics between these concepts surfaced in the next quote, in which Willowherb comments on becoming the sun goddess in *Ōkami*:

> **Quote 6:** "I think it's a way of portraying like […] natural restoration, which is also a whole topic in and of itself, and like how do we restore and what can humans actually do without, you know, messing things up more, et cetera? But I still have to give it to the game that it's not so much [about] killing things, it's more 'Like OK, can we rebalance things that's really strong, yeah?' I feel like I am part of the world in a sense. […] I mean you're the sun goddess. I'm a mother to us all. […] It seems like the animals and nature are the things with power?" (Willowherb, 2nd Call, *Ōkami* [G6])

In this quote, Willowherb outlines "natural restoration" as a way of reading and interpreting the gameplay in *Ōkami* [G6]. Instead of "killing things", Willowherb sees the player as being tasked with "rebalanc[ing]" the world, as "part" of it, or even origin ("mother") of it. Taking on the non-human yet powerful role of the sun goddess leads Willowherb to reflect on *Ōkami* [G6] presenting an inverted power dynamics to the current, human-dominated status quo: They express that "animals and nature" are the important actors and agents in control. Willowherb here highlights the value of operating outside of the expected canon of actions and practices provided in video games: Instead of presenting the player with a power fantasy rooted in subjugation or destruction, Willowherb reflects on power as a care-full undertaking: For them, *Ōkami* [G6] presents a socially-oriented, generative and interconnected perspective of being part of nature.

Similarly to rebalancing the fate of the game world in *Ōkami* [G6], participants also recognised the diverse ways of approaching nature-in-games on a scale beyond their personal avatar. With games featuring post-apocalyptic or world-ending scenarios, participants used these subjects as a springboard to reflect on nature-in-games in broader terms that went beyond their own individual contexts. In the next quote, Marigold reflects on different presentations of the world ending—as promoted by their experience of playing *Breath of the Wild*:

> **Quote 7:** "I just like the implications of imagining a post-apocalypse where it's … maybe it was the end of the world for these types of civilisations. But actually, from the point of view of the world or nature, this wasn't the end of the world, but actually like a chance to recover." (Marigold, 2nd Call, *Breath of the Wild* [G13])

In this quote, Marigold elaborates on their perception of *Breath of the Wild* [G13] presenting a world after a world-changing event ("implications"). What might be devastating for people ("civilisations"), could be approached and leverage differently by non-human entities ("[not] end of the world"). Marigold's framing of the game world expands here beyond the player as an important actor, but it considers the world of *Breath of the Wild* [G13] as a whole. We might ask here: *What is ending for whom, and how?* Marigold's understanding here also implies that an active, existing human-nature relationship is skewed towards people's interests: For example, Marigold describes the absence of human(-like) actors as providing nature with "a chance to recover"; framed as an opportunity instead of a loss.

Like Marigold, several players highlighted darker themes in their engagement with nature-in-games: It was also characterised as a confusing and sometimes difficult undertaking. Here, participants adopted critical, self-reflexive ways to peel back the layers of their human-nature relationship(s)—both in and outside the game.

In the next quote, Yarrow recalls destroying nature as a requirement for playing *Age of Empires IV* [G14]:

> **Quote 8:** "There is this weird aspect of … in the very late game of [the game]. You almost feel a little bit bad because you've taken the resources off half the map and it feels very … you know … as if we had just destroyed this whole land. There's nothing here or it's [just] a few random buildings. […] It can make you feel a little bit bad, almost, even though it's not a real environment." (Yarrow, 2nd Call, *Age of Empires IV* [G14])

In this quote, Yarrow explains that destruction of the environment becomes visible in the late-game in *Age of Empires IV* [G14]. With resources farmed, chopped down, mined, and collected ("destroyed this whole land"), the game environment becomes barren ("nothing here"). Here, Yarrow expresses empathy and compassion for changing nature in-game so tremendously ("feel a little bit bad"). Despite *Age of Empires IV* [G14] demanding the player to scour the environment for as many resources as possible, to increase their chances to win, Yarrow's reflections run counter to this circumstance. Here, he contextualises his in-game actions: The game is not "real". Yarrow draws a clear distinction here between his action concerning actual nature, and what opportunities and actions *Age of Empires IV* [G14] offers him.

A similar sentiment was expressed by Orchid, while exploring the video game *Factorio*. In the next two quotes, he theorises that most games propose some form of exploitation of nature to serve the player's needs.

> **Quote 9:** "[It's] like hyper capitalism. If there were like nothing standing in the way, and no humans to be exploited, but […] robots instead […] just build your way up to insane empires, that in the end have no reason to exist... except to launch a rocket. But you could also [send] a distress call, like 'Hello, can I get a pick up?'." (Orchid, 2nd Call, *Factorio* [G17])

In this quote, Orchid connects the game play in *Factorio* [G17] with a variation of uncapped capitalism ("hyper"): He outlines how the player is encouraged to exploit non-humans ("robots instead"), to build up structures that only benefit them. Here, Orchid describes the player taking on the role of the facilitator of an ever-expanding, unstoppable factory ("insane empires"). Orchid proposes an alternative to this mode of play that is rooted in the game's narrative: The ability to produce advanced technology could be used for communication ("a distress call") instead of destruction to just produce "a rocket".

This interrogation of *Factorio* echoes Orchid's concerns in his first call. In it, he elaborated on how nature is often framed in video games, in his opinion:

> **Quote 10:** "[Nature-in-games] happens often in, like, 'How can I make use of this nature? How can I benefit from it… how can I exploit it best?' Like, not thinking of the consequences? […] There's no consideration if nature benefits from me." (Orchid, 1st Call)

In this quote, Orchid describes how most games present nature as something or someone to be used by the player, for their own purposes ("benefit", "exploit"). Orchid outlines that potential interactions with nature-in-games seem limited and short-sighted ("consequences"). In his opnion, an option for alternative conduct, like mutuality, is not possible ("if nature benefits from me").

Theme Summary: This theme outlines how players make sense of nature-in-games as an interconnected concept, that is not constrained to in-game matters only. Participants make visible how it directly touches on their actual nature experiences: Lily reflects on what it means to be a cat in *Stray* [G5] (Quote 5), Willowherb describes how power dynamics are subverted in *Ōkami* [G6] (Quote 6), Marigold considers nature after humankind in *Breath of the Wild* [G13] (Quote 7), Yarrow considers his conflicted feelings about destroying nature in *Age of Empires IV* [G14] (Quote 8), and Orchid contemplates the role and presentation of nature in *Factorio* [G17] (Quote 9) and video games in general (Quote 10). Here, playing with nature-in-games also becomes part of a meaning-making process about nature, in general terms: It informs and shapes how players think and feel about nature.

4.3.3 Theme 3: Nature-in-Games as a Personal Idyll. This theme explores how participants turn to virtual nature as a space for relaxation and for spending meaningful time by themselves, with themselves.

Idyll, as named in this theme's title, is a concept to describe a romanticised, kitschy presentation of rural life and landscapes. Idylls are often presented as calm, peaceful and pastoral to the viewer or reader; as seemingly perfect, wholesome version of paradise [35].

Within the context of this theme, *idyll* is related to participants leveraging nature-in-games for escapism: They use it to distract themselves from their stress in their everyday life. Here, nature-in-game was often understood as a space to meaningfully "do" and move in. Players derive great enjoyment and meaning from a sense of discovery and taking on the role of an explorer. This sentiment is showcased in the next quote, in which Iris explains her engagements with the game environments in *ArcheAge*:

> **Quote 11:** "[In ArcheAge,] there's a sense of beauty, pleasing aesthetic […] Aesthetic beauty, I guess. And also, freedom, because you can explore anywhere that you want to go, and it has these very vast, very open spaces." (Iris, 2nd Call, ArcheAge [G18])

In this quote, Iris ties having positive "pleasing[ly] aesthetic" experiences to a sense of "freedom" and agency in the game world: To move around unrestricted and to experience it with a sense of curious discovery ("very open spaces"). We can trace an implicit sense of Iris' enjoyment from moving around in *ArcheAge* as an activity in itself: Here, travelling becomes not just a pragmatic means to an end, e.g., to reach a new quest marker. Iris' framing of the game environment goes beyond being a stage to set the scene for the game's other contents: Instead, it becomes a feature to experience in itself—similar to how we might encounter hiking, or going for walks (in nature).

The perceived freedom and agency that was afforded to players in-game was often contrasted with participants' real-life experiences of nature, and their connection to the wider world in general. The next quote showcases this clash, as Wisteria describes the difference between where they live and nature in *Season, a Letter to the Future* [G15].

> **Quote 12:** "It felt more, more like something I haven't seen before. And it's not something … when I look outside my window now, I see buildings, so […] it's a stark contrast, […] it's clear, it's so endless. […] I just love being in the mountains and […] like a lot of grass and nature and plants and trees." (Wisteria, 2nd Call, *Season, a Letter to the Future* [G15])

Wisteria's description here evokes a sentiment of their current urban living space as closed-off, limited and dense ("I see buildings"). They see a "stark contrast" to the environments presented in game, as "endless", pollution-free, untouched ("clear"). This quote also reveals a sense of longing and connectedness to nature outside of human-made places ("love being in the mountains").

Beyond conscious influences, nature in games also surfaced in unconscious ways. In the next quote, Snowdrop recalls continuously dreaming about a self-designed space in *Minecraft* [G12] throughout his life.

> **Quote 13:** "I sometimes sleep in… dream of this location. Granted, […] more realistic than this. […] When I played this on my phone right before I was going to sleep… I would dream, like, of being in there, […] like, building in the woods and having my dog and being alone. […] But when I was living in [busy metropolis]. That was like far, far away from the reality I was living in. It was just like concrete buildings and asphalt and roads and stuff. Just living in a big city. And maybe there are some big parks here and there, but the contrast between the game and the city made it really relaxing for me… […] I could just live alone. This place [in *Minecraft*] is quiet." (2nd Call, *Minecraft* [G12])

Snowdrop describes how *Minecraft* [G12] afforded him a space for escapism, to escape the loud and busy urbanity of the city he was living in ("concrete buildings and asphalt"). As Snowdrop reports, this affordance extended beyond consciously playing, but also informed his unconscious dreams. Here, nature in *Minecraft* [G12] becomes a medium to experience peaceful solitude, and relaxation in ("live alone", "place is quiet"). Snowdrop's description also implies an escapist desire for a seemingly simpler life that *Minecraft* [G12] can simulate ("building in the woods and having my dog and being alone").

This romanticised view did not only surface in participants' ways of using games themselves, but it was also identified in games' themes. In the next quote, Marigold describes how *Stardew Valley* [G7] directly speaks to this view of nature:

> **Quote 14:** "I think there is a transparent connection to nature [in *Stardew Valley*] because it's all about, like… You're gifted your grandfather's old farm, which is kind of in ruin, and you have to, like, bring it back to health and enrich it. And it's all about someone escaping the capitalist nightmare of the city and running away to the countryside." (Marigold, 2nd Call, *Stardew Valley* [G7])

Marigold describes *Stardew Valley* as presenting a literal representation of escapism ("escaping the […] the city"). The premise of the game—returning to the rural countryside—is "a transparent connection to nature" for Marigold. Within this understanding it is implied that being in an urban environment introduces distance to the natural world by default.

Theme Summary: This theme sketches out how participants turn to nature-in-games as a tool to mediate their current relationship with nature—or the lack thereof: Iris reflects on the joy of discovery by travelling through *ArcheAge* [G18] (Quote 11), Wisteria describes the contrast between their urban living environment and sprawling nature in *Season: A Letter to the Future* [G15] (Quote 12), Snowdrop recalls dreaming about environments from his *Minecraft* [G12] world (Quote 13) and Marigold explored the connection with nature in *Stardew Valley* [G7] (Quote 14). Where we already touched on the situatedness of nature-in-games in the previous theme *(see 4.3.2)*, here it becomes visible that it is actively constructed and leveraged by players: To foster contact with nature as an alternative to a perceived lack of access to actual nature. Nature-in-games seemingly provides avenues that participants could not otherwise leverage to the fullest.

5 Discussion

In this paper, we showcased a study that investigated how players may think and feel about nature-in-games. Through encounters with 16 participants *(see 3.4)*, we conducted interviews and invited people to show us video games that illustrate their understanding of nature in video games. We thematically analysed the resulting data two-fold—deductively and inductively *(see 3)*.

First, we produced a deductive overview of participants' relationships with nature and video games *(see 4.1)*, and described the games played:

- **Participants' Relationships with Nature:** Players reported a pluralistic set of opinions and practices with nature *(see 4.1.1)*: Nature was described with awe and respect, as an entity existing outside, beyond and within people. Participants often sought out the natural world for relaxation and introspection, to connect to the wider world and themselves in meaningful ways.
- **Participants' Relationships with Video Games:** Similarly, participants showcased a diverse array of approaches to video games: The majority of players turn to them for personal enjoyment and relaxation, but also to spend time with their friends, or to experience escapism outside of their ordinary, everyday life *(see 4.1.2)*.
- **Overview of Played Games:** Participants showcased 11 different video games *(see 4.2)*. While cataloguing their default affordances and elements, we documented the majority of them falling into common tropes [20, 21]: They provide the player with an idealised vision of nature, that is seemingly theirs for the taking. Only a minority of games feature other modalities or ways of interaction, either by forgoing violence-based game mechanics (e.g., *Season*) or by allowing the player to embody non-human characters (e.g, *Stray*, *Ōkami*).

Second, we stepped through the data inductively, and constructed three themes *(see 4.3)*:

1) Nature-in-Games as an Relational Other *(see 4.3.1)* outlined how players understood nature-in-games as an entity to connect with, on multiple levels. Instead of treating it as a mere simulation of actual nature, players reported feeling for it as an *entity*, and approaching it with respect, care and kinship (e.g., Snowdrop observing animals in *Skyrim* [G4] [Quote 1], or Willowherb reflecting on the cyclical nature in *Ōkami* [G6] [Quote 4]).

2) Nature-in-Games as a Facilitator of Pluralistic Perspectives *(see 4.3.2)*, highlighted how participants linked their actual and in-game nature experiences with each other and compared them with each other. Players showcased that nature-in-games is a pluralistic, but also challenging endeavour: It allowed participants to explore different contexts and (non-human) perspectives (e.g., Lily taking on the perspective of a cat [Quote 5] or Marigold reflecting on nature in post-people world [Quote 7]). However, it also made them contend with exploiting and subjugating nature—both in-game and in the actual world (e.g., Yarrow and Orchid considering the destruction of environments in *Age of Empires IV* [G14] [Quote 8], and *Factorio* [G17] [Quote 9], respectively).

3) Nature-in-Games as a Personal Idyll *(see 4.3.3)*, showcased how participants leveraged nature-in-games as their personal refuge for introspection and relaxation (e.g., Snowdrop dreaming about *Minecraft* [G12] [Quote 13]). Turning to nature-in-games for this purpose was often rooted in a perceived lack of contact with actual nature. Here, players reported on a stark contrast of their living environments and the virtual spaces in-game (e.g., Wisteria reflecting on *Season, a Letter to the Future* [G15] [Quote 12]).

5.1 How do Players Make Sense of Nature-in-Games?

Having summarised our findings, we now return to our RQ *(see 1)*. Here, we outline an overarching understanding of how participants made sense of nature-in-games. This framing is not absolute: It exists in this moment in time, as made by the author team *(see 3.3.1)*.

5.1.1 Insight: Players Situate Games as Part of Their Human-Nature Relationship. Across all themes, we see players (re-)contextualise and (re-)interpret game narratives, mechanics, and affordances to facilitate their own relationship with nature-in-games. Players engaged both with game elements that were presented as nature out-of-the-box by games—they explored environments, engaged with digital animals and shaped landscapes in-games *(see 4.2.1)*. However, players also went beyond what was offered by default.

Most players added their own nuance(s) and meanings through (re-)thinking, (re-)framing or (re-)contextualising the games they played: Here, we encountered Iris elaborating on the joy of discovery of *space and spatialities* in *ArcheAge* [G18] (Theme 3, Quote 11), or Willowherb reflecting on *temporalities* through the cyclical nature of nature in *Ōkami* [G6] (Theme 2, Quote 6). Players also experienced being with and thinking through *non-human actors*, e.g., Snowdrop relating to the everyday conduct of animals in *Skyrim* [G4] (Theme 1, Quote 1) or Lily reflecting on what it means to be a cat, as an *avatar*, in *Stray* (Theme 2, Quote 5). These reflections also go beyond the individual actor, e.g., Marigold reflects on how nature is "recovering" from people in *Breath of the Wild* [G13] (Theme 2, Quote 7), as an *ecosystem*, or Orchid questions the moral and ethical integrity of destroying a planet in *Factorio* [G17] just to build a single rocket (Theme 3, Quote 9).

We also encountered players trying to develop alternatives to what games offered by default: *Here, players articulated different, often careful, ways of being with nature.* For example, we encountered Willowherb reflecting on the concept of *restoration and rebalancing* in *Ōkami* [G6] and the potential of human action doing more harm than good (Theme 2, Quote 6), or Iris outlining nature as an *agnostic, nuanced actor* in *Frostpunk* [G2] that cannot be read or understood through human morals (Theme 1, Quote 3). Similarly, Marigold emphasised the value of letting nature in *Stardew Valley* [G7] happen, on its own *ferality* (Theme 1, Quote 2).

We see parallels here between relating to nature-in-games and processes of sensitisation [85], "affectively identifying" (as described by Alaimo [5]), attuning and noticing (after Tsing [91]) as *more-than-human* practices [26, 36] *(see 2.1)*: These engagements seek to widen the understanding of ourselves, as people, animals, and actors, as existing in (inter-)dependence with others [57].

We arrive at an understanding that supports existing scholarship: Players can engage with games as "possibility spaces" that touch on nature (after Bogost [14, 15]), and read them as "environmental texts" (after Chang [20, 21]). The wide diversity and individual approaches towards nature-in-games point to engaging with nature(-in-games) as a complex, interlinked endeavour: 1) It is informed by how nature is presented and made playable in each game, and 2) by how players apply their own "situated" lenses (e.g., drawing from their thoughts, feelings, needs, politics, "subjective nature experiences" [46] and perceptions of the world). Nature-in-games does not seem to happen in a personal, cultural or societal vacuum, but as a process of meaning-making that is embedded in each player's life.

5.1.2 Insight: Players Negotiate Their Participation with Nature(-in-Games). This interconnectedness between players, games, nature and the wider world also comes with a sense of uneasiness. Players clearly attempted to negotiate how this communion happens: To actively maintain (some) distance and difference between nature and people. A prominent example of stemming this *bleed* between players and games can be found in Yarrow expressing guilt for destroying the environment in *Age of Empires IV* [G14], even though the game is "not real" in his words (Theme 2, Quote 8). We can locate this resistance in participants actively constructing categories of *inside* and *outside* the game—despite sometimes actively playing at blurring the lines between people and nature (e.g., by taking on non-human perspectives, as showcased by Lily in *Stray* [G5] (Theme 2, Quote 5) or Willowherb in Ōkami [G6] (Theme 1, Quote 4).

This framing of nature as an entity operating outside of human frames was often imbued with a strong escapist quality: Nature-in-games as a space to escape into. This fact is also echoed in players' motivation to engage with nature-in-games in the first place: Here, the majority of players reported seeking escapism from their everyday life, and relaxation *(see 3.4)*. Within this context, nature-in-games often provided them with a sense of idyllic, pastoral nature *(see 4.3.3; see 2)*: Such a framing is supported by the played games by default, as the majority of them positioned nature as readily available to players *(see 4.2.1)*.

We wish to unpack this escapist longing further: Such an inside/outside dichotomy definitely echoes the sentiment of nature existing in service of humankind, as providing wellness [87] and resources *(see 2.1)*. However, participants did not express a sense of human superiority or entitlement over nature *(see 2.1)*. Instead, we can trace their desire for the idyll elsewhere: The majority of game worlds have not (yet) succumbed to human influences (e.g., *Minecraft*), and/or have survived it successfully (e.g., *Stray*). This framing sits opposite to the ongoing ecological distress and planetary degradation *(see 1)*. It also provides a counter to the difficulty of surviving in late-stage capitalism [64, 65]—influenced by material constraints (e.g., Snowdrop seeking refuge in *Minecraft* (Theme 3, Quote 13), urban environments (e.g., Wisteria describing the contrast of their own living environments to the vastness of nature in *Season* (Theme 3, Quote 13), and future anxieties (e.g., Marigold wrestling with the concept of apocalypse in *Breath of the Wild* (Theme 2, Quote 7). Here, in the face of ongoing sociocultural limitations and environmental destruction, games may offer a "regenerative utopia", as described by Farca [29]. These engagements can be construed as a way of using games to cope [63] with the status quo of the world.

Considering all these facets together, nature-in-games is not just constructed through players recognising game elements as nature. Playing with nature requires people to wrestle with their stance on the natural world—and their own place in it.

5.2 Design Inspirations: Nature-in-Games and Beyond

Using our collected insights about nature-in-games as a springboard, we sketch out potential future avenues for technology-mediated nature experiences, in games and beyond. Here, we ask: *How can we approach games as a mediator for people's relationship with nature?* These design inspirations are not absolute, but we understand them as one set of potential points of inspiration. We actively and explicitly encourage other researchers to extend, critique, or reformulate them *(see 3.3.1)*.

We see potential to tap into the complexity of reading games as "environmental texts" [20, 21]: Drawing from all our insights, we arrive at an understanding of video games that can shape how people understand the natural world and themselves in it *(see 5.1.1)*. The depth and breath of this influence varied, however all participants connected themselves as people situated in the (natural) world, and games as cultural artefacts representing nature. Here, we wish to note that we do not see games as *the* solution to mend humankind's conflicted relationship with nature, nor are they driving people away from nature outside of screens. We reiterate here that none of the games showcased by participants are designed for the sole purpose to think or feel about nature. While there were commonalities among players, each of them found their affective alignment to nature-in-games in their own ways: It required players to be open to the experience; to acknowledge game features as nature, and to allow themselves to form a connection to the game *(see 5.1.1)*. Interpreting games through such a personal lens cannot be described as a universal experience, or a default mode for reading games as "environmental texts" (after Chang [20, 21]). Instead, players made use of the games' affordances and qualities to (re-)frame them for contact with nature by *themselves (see 4.2)*, based on their style of playing, identity, interests and personal circumstances *(see 3.4)*. Engaging with nature-in-games is therefore not just a matter of being actively prompted, or being showcased explicitly educational content *(see 2). Here, we encourage designers to consider games as one potential avenue meaning-making with, in and through nature.*

We also wish to wrestle with the diversity of human-nature relationship(s): How nature is presented, in a game or in technology more broadly, might distinctly influence a person's relationship with nature—sometimes even becoming a part of their everyday life *(see 4.3.3)*. This especially applies to the default frames games and other technologies may offer: Even if participants (re-)framed and (re-)contexualised what was offered *out-of-the-box*, we encountered participants wrestling with them *(see 4.3.1 or 5.1.1)*. Here, we point back to how we might understand the human-nature relationship as a whole *(see 2)*: Are we a dominator and subjugator of nature? Do we see ourselves as managers and stewards of it? Or do we belong to it, as part of *natureculture*, or even kin? Whether conscious or unconscious, (some of) these stances are 1) enshrined in portrayals in nature and 2) (en)acted on by players, or users more broadly speaking—through affordances, interactions, mechanics, aesthetics, narratives and beyond. We are fortunate to (still) live on a planet with diversity of flora, fauna and everything in between: Beyond different configurations for how one might relate to nature, designers could engage with different aspects of the natural world as it happens in the world (e.g., climate zones). *Here, we encourage designers to carefully consider what frame as their (default) portrayal of nature offers.*

We wish to capture the plurality of human-nature relationship(s): Based on our findings, we can formulate opportunities for nature-in-games: Games could support meaningful, relational engagements with nature-in-games by integrating them directly as signposted core features. Examples for such conduct can be found in rebalancing and cleansing the world instead of destroying and killing it in *Ōkami* [G6] (Theme 2, Quote 6), or taking on the role of a cat in *Stray* [G5] (Theme 2, Quote 5). Leaning into each player's agency and freedom, diverse conduct with nature-in-games could be offered across a variety of choices, as an optional choice. Examples here include opting for passive, peaceful conduct with animals in *Skyrim* [G4] is an example for this (e.g., observing them [Theme 1, Quote 1]), or framing the end of the world as a chance for nature's recovery in *Breath of the Wild* [G13] (Theme 2, Quote 7). Games could also be explicitly designed to not engage with common, current treatments of nature-in-games, and to portray it in different terms: To reject, subvert and reconfigure it. For example, by approaching nature as an agnostic actor beyond the player's reach (e.g., in *Frostpunk* [G2] [Theme 1, Quote 3]). *Here, we encourage designers to play with how they present nature-in-games—whether as explicit core elements, optional features, or as a rejection and subversion of the status quo.*

We seek to consider the wider contexts for human-nature interaction(s): Building on this plurality, *we encourage designers to consider the current cultural, societal, political and environmental climate in which their game, or technology, is being engaged with.* Designers, like players are individual people, but also part of humankind. Our values, beliefs, and operationalisations of nature

are undoubtedly shaped by our lived experiences. As showcased throughout this study, players oscillated between belonging and not belonging to nature, and between interacting in the default, often destructive, offerings of games and circumventing and reinventing them *(see 5.1.2)*: This circumstance can reflect current day anxieties found within humankind's relationship with nature [79] and its ongoing human-led destruction *(see 1)*. We wish to be clear here that we do not see video games, their designers or their players as being bound to higher morals or educational duties than other forms of cultural, artistic expression. However, as we understand human beings and nature as interdependent *(see 2)*, portrayals of nature are not trivial matters: Repeated contact and actions may re-enforce certain values, world views and power dynamics (e.g., becoming desensitised to violence towards animals [22]). Here, we echo current scholarship that advocates for portrayals of nature to go beyond treating it as universal, digital greenery [18, 20, 21, 86]. *Here, we encourage designers to question the current canon of why certain interactions with nature—through games, or technology more broadly speaking—might feel more "natural" than others.*

We wish to envision alternatives for human-nature interaction: *What unique, alternative or different relationships with nature could we envision through games (and other technologies)?* Ultimately, to engage with games as "possibility spaces" (after Bogost [15]) for (re-)imagining the human-nature relationship, we must imagine and articulate these (biopolitical [54]) possibilities first. As spaces of make-belief, imaginary worlds, and diverse narratives, we also see games as a prime medium to explore facets of human-nature interaction that can(not) be realised in actuality. Beyond taking on non-human perspectives, we could ask: What should our interdependence, and shared survival look like—now and in the future? *Here, we encourage designers to use games as a springboard for dreaming up new, different and alternative ways of being (with) nature.*

5.3 Limitations

We wish to outline several limitations that inform our research. **We may have encountered participant self-selection:** The humanistic framing of the study, our recruitment networks, and previously published research may have spoken to a specific set of people: All participants in this study approached nature in games in a self-reflexive, relational, and nuanced fashion; often tying their experiences to wider concepts, like climate change without being prompted to do so. It is evident that most participants have thought about nature in games before this study and have considered it from a variety of different lenses. Here, we see great opportunity to extend this work by speaking to other communities of players—particularly those who may not have yet considered nature in the games they play.

We wish to highlight our epistemology once more: The insights presented in this paper are constructed through the research team by engaging with the lived experiences and tacit knowledge(s) of the 16 participants who joined this study. Here, we refer to our epistemology, to emphasise the situatedness of the knowledge(s) created through this study *(see 3.3.1)*. As a set of contextual insights, they are not to be understood as generalisable or universal insights: It is likely that the topic of this study, and our recruitment strategy attracted people who were already attuned to nature in games. The study was undertaken in English, and favoured people who have the means to be available for research. Nevertheless, we present a snapshot of situated richness that may serve games- or technology-aligned research communities as inspiration.

We wish to draw attention to the timing of this study: It took place in 2022. As such, the aftermath and still ongoing effects of the COVID-19 pandemic cannot be understated as a potential influence on this study. The pandemic reconfigured how many people approached both video games and nature in many ways (often as an important coping tool [71]), that are yet to be fully studied. Therefore, the knowledge highlighted in this paper is situated and not to be understood in absolute terms. Instead, it is a contextual snapshot of some people's understanding, which can serve as inspiration and as a starting point for further research, designs, and developments.

6 Conclusion

This paper reports on a study that investigates the perception of nature portrayals in video games. We interviewed 16 people and invited them to "show-and-tell" us about video games that made them think about their relationship with nature in video games. We thematically analysed these encounters: First, we outlined participants' relationship(s) with nature, video games and nature in video games in a deductive way. Second, we stepped through our data in an inductive fashion to create three themes: *Nature-in-Games as 1) a Relational Other, 2) a Facilitator of Pluralistic Perspectives and 3) a Personal Idyll*. Based on our insights, we outline design inspirations that illuminate 1) how games can be understood as a part of people's relationship with nature, and 2) how designers, researchers and developers might create frames for meaningful engagements between players, nature and the wider world.

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A Guiding Questions for 1st Call

Questions: About the Participant

- Please tell me about yourself. Who you are? What you do? What do you spend your time with?
- Why you were interested in the study?

Questions: Nature

- What is nature to you? How would you describe it to an alien, that has never encountered it before?

- What is your relationship with nature like? Do you seek it out in your everyday life?
- Are there any events or situations that stick out to you that shaped your understanding of nature, e.g., a childhood memory or a particular moment or encounter?
- How does nature make you feel?

Questions: Games

- Which games do you play? Any genres, elements or characters that draw you in?
- How often do you play games?
- What do you enjoy about interacting with games?
- What's negative, difficult about games for you?

Lead-Out

- Do you have any ideas for which games to show us?
- Are there any games that stick out to you regarding nature in games?