Towards Qualia-Driven Game Design

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ABSTRACT

Video games act as engines that communicate aspects of experience through player interaction. We argue that this communication of first-person experience (qualia) is unique in its ability to interact with a player's mind-body in a potent and observable way. Unfortunately for designers and researchers, many of the desirable traits of video games are not inherently measurable via traditional, quantitative means - they are emergent properties dependent on the perspectives with which they are observed.

This paper investigates the work of video game designers as it relates to phenomenology and embodied cognition and lays out a path for future researchers and designers to leverage phenomenology as a foundation for video game creation. We offer that the intersection between embodied cognition, game design, and phenomenology suggests a path from descriptions of conscious experiences (qualia) to real, distributable design recommendations in video game design and study.

Keywords

Game Design, Phenomenology, Embodied Cognition, Game Research, Game Production

INTRODUCTION

Video game design, as a discipline, is under a century old yet rapidly maturing. Video games dominate the entertainment market from an economic perspective, producing $180.3 Billion in revenue in 2021 (Wijman, 2021). The academy rapidly integrates game design across disciplines, leveraging games as teaching tools or frameworks to run experiments. The monetary, intellectual, and artistic success in games-as-a-media has led designers and researchers to search for techniques to consistently incorporate reliable, reproducible features that guarantee a creator's desired outcome. These outcomes are imagined and arguably evaluated against player perceptions emergent from their experience with the game. I.e., the creator hopes the players find their game experience fun, scary, and so on. Unfortunately, implementation techniques and strategies often must catch up when consistently trying to reproduce these emergent properties from games. A readily identifiable example of this is balance - many studios place substantial effort into balancing a

game so that a player feels the game is appropriately fair throughout play. Even with this investment, games are released yearly with balance problems requiring forced internet updates to fix (Švelch, 2019).

This paper presents a conceptual framework that uses our player's conscious experience to build an interpretable and measurable framework for video game development rooted in embodied cognition literature. We do this by leveraging the concept of Qualia, sourced from philosophy of mind and the cognitive sciences. We argue that this process is already present in many successful games and studios and sheds light on why purely reductionist or metrics-driven approaches seem to struggle to produce games that impact us.

RELATED WORK

Player Experience in Existing Game Design Frameworks

Existing game design frameworks often highlight player experience as a critical aspect of the game development process, lensed frequently through playtesting and brainstorming activities. (Fullerton, 2014) highlights the importance of developing "player experience" goals, or key experiences that you want players to experience, as well as playtesting early and often. This is echoed in *The Art of Game Design*, where a key lens of viewing game design is capturing the "essential experience" of a game in your design (Schell, 2008). The Mechanics, Dynamics, Aesthetics (MDA) framework captures the importance of player experience in the aesthetics components that contribute to outcomes like "fun" for the player (Hunicke et al. 2004). (Koster, 2013) uses a slightly augmented take, highlighting cognitive processes and quirks that impact how players and users experience games in unexpected ways. (Salen and Zimmerman, 2006) highlight experience: "To play a game is to experience the game: to see, touch, hear, smell, and taste the game; to move the body during play, to feel emotions about the unfolding outcome, to communicate with other players, to alter normal patterns of thinking."

Developer Experience in Game Production and Studio Studies

Experience also has been noted to be core to the active production of video games, where designers pursue and build games influenced by their personal values - "...designers do not begin afresh with a blank mind, but rather have their own motivations, their own reasons for wanting to design, their own sets of beliefs, values and attitudes" (Kultima and Sandovar, 2016). This is combined with the fact that game-making is often a collaborative experience means that development in studios is driven by inter- and intrapersonal experience as much as it is by formal frameworks or development practices. (O'Donnell, 2009) highlights how the everyday life of game developers involves a fusion of work and play to influence the trajectory of game development. On a similar note, (Whitson, 2020) shows how the experiential composition of teams and technology compose the core of game development, noting that "...the real action is: the (often messy) sociomaterial negotiations between team members and their technologies". The branding and values of a studio can also impact the experience of game development and play, as noted by a studio that prioritized "charming" work and social environments to build games with details that in turn felt specifically catered to their players (Pelletier, 2022).

2

Phenomenology and Embodied Cognition in Game Design

Aspects of phenomenology and embodied cognition have been applied to games and their design and player perspective as well. In (Juel Larsen and Kampmann Walther, 2020)'s *The Ontology of Gameplay: Toward a New Theory*, gameplay is interpreted through the lens of Heidegger's *Dasein*, highlighting gameplay as an oscillation between the absorbing, situational activity of play and the awareness of the reality of the game in context of a wider experience. Game's phenomenological properties are captured in (Crick, 2011), where it is noted that "...contemporary videogames are phenomenologically experienced in way that is as spatio-temporal, embodied, immersive, interpellative, visceral, mobile, and animate as the cinematic". Crick goes on to integrate Merleau-Ponty, using his work to suggest video game play is a holistic experience that combines visual and tactile aspects into one indistinguishable whole. Phenomenological approaches to video games have been used to understand disordered play, investigating how perspectives on gaming and the holistic experience of gaming contribute to addictive play (Karhulahti et al., 2022). Embodied design was suggested as an approach by (Abrahamson and Lindgren, 2014), who argues that almost all activities in learning are actually embodied, and we can design to take advantage of the embodied aspects of teaching and learning activities. Strategies for embodied design have been suggested by (Fdili Alaoui et al., 2015), where techniques such as attunement, attention, and kinesthetic empathy are used to try and replicate embodied experiences across design modalities. (Jagoda, 2020) sums up the unique affective properties of games in *Experimental Games: Critique, Play, and Design in the Age of Gamification*: "To better understand video games as a unique aesthetic and expressive medium requires a more intimate understanding of the new sensorium that they open up - that is, the specific experiences of spatiality, temporality, velocity, interactivity, participation, system perception, procedural activity, and networked sociality that video games make available".

REDUCTIONIST SCIENTIFIC ENTERPRISE AND METRICS-DRIVEN DEVELOPMENT

The race for developing consistent game development strategies is not only motivated by expression, money, or reputation - we are also rapidly discovering that games can have potent sensory effects on players over time. Research suggests that games can be effective education tools (Martinez et al., 2022). Games have been used in medical interventions and prescribed as medication (Evans et al., 2021). Game communities form modding circles, co-creating content to express themselves and deepen their relationship with a game world (Poretski, 2017). A growing body of literature suggests that these effects are partly due to games evoking embodied experiences. (Melcer, 2018) A short illustration - In his seminal work on game design, "Game Feel," Steve Swink describes a phenomenon where players experience illusory tactile and kinesthetic sensations when playing a video game (Swink, 2009). A typical example of this might be observing someone who leans into turns while playing racing video games, emulating leaning against the force of a turn in a real car. Game Feel is one of many other observed effects (e.g., the proteus effect) that stem from the quality of experience produced between a player and a video game, driven by an experiential lens. Swink understands this and frequently uses first-person examples and onomatopoeias to emphasize the role of the user's experience in game feel implementation.

Contrary to Swink's approach, many professional and academic disciplines have oriented around metrics-driven quantifiable approaches emphasizing a reportable, reproducible design framework. This approach is attractive for these audiences because it enables one to convincingly show metrics that indicate if a study is successful in some specific regard (Christ, 2014). This indication should reduce the risk that a project will not produce desired returns in a design environment where multi-year development times are the norm. Examples of this might be a high enough volume of players or the recorded sentiment after a game. Fuzzy-yet-intuitive concepts are tied to these gameplay metrics: did the player find the game fun, immersive, balanced, educational, and so on. However, if we look too closely at these concepts, simple definitions tend to fall apart. How do we get from attempting to create "fun" to a quantitative metric? While there are approaches to mitigate this problem, the space between our attempts to create emergent game properties and developing metrics to measure them is daunting. This issue mirrors a key tension in the scientific literature around the reductionist scientific enterprise - which asserts "...a phenomenon is understood by investigating the structure and dynamics of subcomponents of which it is constructed". (Lacalli, 2022) While a successful approach in materialist fields (e.g. physics, chemistry), there are pronounced shortcomings when framing production or scientific efforts that involve analysis of a user's conscious experience into metrics, which inevitably must be sourced by attempting to translate user introspection of one sort or the other by either the researcher or user.

While we can reason about the value of creating and using such metrics, the lack of consistency in definitions makes it challenging to reuse metrics across use cases. In addition, these reported metrics do little to tell designers how to make a game - aiming for a specific metric still leaves the designer to (at least implicitly) build out assumptions underneath the metric in an attempt to capture conscious experience. When discussing the outcomes of games, metrics give us a language to use but are insufficient as a design or research strategy to get the embodied outcomes we described before.

DEFINING QUALIA

The tension around understanding aspects of a person's experiential phenomena has a rich foundation in philosophy and the cognitive sciences. Namely, the term "Qualia" (singular - "Quale") has been used to describe the non-representational "phenomenal character" of experience. (Tye, 2021) Qualia can be considered the experience of sense data and mind and can only be concretely accessed through introspection of the agent who has experienced a Quale.

A thought experiment consistently used in cognitive sciences that illustrates what Qualia discusses is the experience of a "color scientist" named Mary. Mary is an esteemed researcher of the color red and has spent their entire life understanding every physicalist property of color. However, Mary has never been exposed to the color red. Instead, Mary has stayed in their study, religiously pouring over black-and-white textbooks and diagrams illustrating the wave nature of light, indexes of what color what objects are, and so on. One day, Mary steps outside their office and sees a red object (a rose) for the first time in their lives. If Mary had perfect knowledge of the color red before seeing the rose, has Mary experienced new phenomena by experiencing the sight, smell, and texture of a red object? Most

would contend that the experiential phenomena of redness fundamentally differ from the literal knowledge learned from Mary's research. (Jackson, 1998)

While this thought problem is meant to illustrate what qualia are and is under continuous debate, it highlights how reductionist enterprises strip away seemingly critical components of experience to the researcher Mary. Many would intuitively say that Mary has experienced a new color-related phenomenon by having a new Quale about redness. In this regard, we gain a new theoretical tool for investigating the phenomena of redness - one that is non-representational, crosses and unifies sense data and is seemingly critical to the agent's being in the world.

QUALIA LENSED THROUGH PHENOMENOLOGY AND EMBODIED COGNITION: A DIRECTION FOR RESPONSIBLY INTEGRATING USER EXPERIENCE INTO GAME DESIGN

In this paper, we leverage Qualia as a theoretical tool in the context of video game design and production - how do design and research activities change as we lean towards accounts of Qualia and away from purely reductionist, sense-restricted, metrics-driven approaches to game design and development. That being said, games are, by default, technical, mechanistic systems that require some translation into code, assets, mechanics, and so on - meaning that crossing the "explanatory gap" between reported qualia must be attempted at some point during video game production processes. The question is - how do we attempt to encode a theoretical tool that, by its very nature, resists reductionist approaches into a game production pipeline? If Qualia are multi-dimensional sense and perceptual phenomena, what tools can we use to capture and represent them in a game world effectively?

A philosophical framework named "Phenomenology" provides us with a useful design toolbox in addition to quantitative-driven development that can help us cross this gulf. This discipline sought to restore the importance of a first-person, experiential viewpoint in the face of increasing suggestions of metrics requirements to make scientific claims (Smith, 2018). That being said - a completely unstructured approach to capturing first-person experiences might be difficult to validate as good or bad for an end user and, indeed, would be cumbersome to integrate into the high-intensity, iteratively focused environment that often arises during video game development. This is where we can turn to another blossoming field in HCI to structure, validate, and ensure ethical outcomes for our players: embodied cognition. This scientific enterprise aims to wed a user's physical nature and extended environment with more conventional, computational models of mind. In a few words, embodied cognition recognizes agents as a mind-body inside of situated contexts that extend, augment, or influence their biological and cognitive processes instead of an isolated cognition "brain in a jar". (Shapiro et al., 2021)

While primarily used theoretically, we can repurpose qualia through phenomenology and embodied cognition as a design tool and evaluation subject in video games. We can design to attempt to evoke specific qualia or interview an individual about their qualia to discover critical elements triggering the qualia and the logical outcomes that follow them. Using qualia as a tool is not only the way designers might intuitively do their work but also provides better access to the substantial impacts that games can provide when played.

PHENOMENOLOGY OVERVIEW

Phenomenology is concerned with understanding the "...conscious experience as experienced from the subjective or first person..." of an individual (Smith, 2018). Phenomenology was initially formally introduced as an academic discipline in the early 20th century by Edmund Husserl, who was frustrated that intellectual analysis was increasingly being performed in theoretical terms abstracted from human experience. Husserl opens the field by distinguishing objects of perception and the act of perception as separate, allowing future philosophers to explore the space between experienced objects and their mental representations.

Husserl had a cadre of acolytes that provided critical dimensions to phenomenology. Heidegger zooms out from perception and includes being, maintaining that perception and representation are cognitive elements of a more encompassing state of being. Schutz incorporated social structures into phenomenology, discussing how experience is informed and reformed by compounding social observations and performances. Heidegger and Schutz are important examples to reference in design as they couch the cognitive, environmental, and social elements of experience as inextricably tied together. For the HCI community, perhaps the most relevant classical phenomenologist is Maurice Merleau-Ponty, who incorporated a naturalistic understanding of the human body into their analysis of experience (Smith, 2018).

(Dourish, 2001) provided a modern approach to phenomenology and technology, viewing embodiment and phenomenology as critical to interactive design practices. Embodiment is not physical awareness, and phenomenology is more than first-person reporting - both are deeply involved with analyzing the totality of being. Dourish's work forms a foundation for including phenomenological perspectives in digital design, establishing guidance for developing a practice oriented around embodiment and meaningful actions. (Dreyfus, 2002) uses a Merleau-Pontian perspective to describe skill acquisition, pointing out that we do not acquire phenomenal information and then process it for available options, but rather that an agent "...immediately sees things from some perspective and sees them as affording a certain action".

Recently, investigations into how games are played as epistemic and ontological activities have yielded insights into video games as culturally and historically situated frameworks for play. In Miguel Sicart's work on Playthings, for example, the activity of play within the framework of things represents a materially situated experience moderated by the presented affordances of the system and the disposition of the user that engages with it. This reflective nature of video game play, changed by how the user engages with the video game, represents an acknowledgment that video game play does not occur in isolation from the world (or body-mind) but rather a situated engagement between the plaything and player themselves (Sicart, 2022).

PHENOMENOLOGY IN VIDEO GAME DESIGN

The private industry has successfully incorporated phenomenology into product development. Good design is now popularly argued to stem from a detailed and diverse understanding of possible user experiences. Dan Norman's bible on Human-Centered Design is a hallmark of this pivot: we design for people, not for requirements (Norman, 2013). Norman points out that objects with observed

affordances (properties of things that indicate how they will be used) drive "good" design. The spread of human-centered design into communities, such as human-computer interaction, has produced diverse approaches to incorporating phenomenology into practical product development practices.

For example, "Persona" analysis has been a tool in software development to capture a diversity of viewpoints when designing products. This type of analysis requires a research period where the practitioner must create a profile reflecting a semantically meaningful user category. Personas then become design and evaluation tools - how will this platonic persona use the designed system? This approach generally involves a range of interviews, reading firsthand accounts, and collecting important contextual information about a critical customer segment to create a summarized representation of their goals and capabilities. (Salminen et al., 2020)

Phenomenology in game design extends beyond persona analysis, however. Phenomenology was used masterfully by Liel Leibovitz to describe the parallels between deep video game play and religious exploration, discussing how our continuous conversation with the rules and mechanics of video games mirrors our larger struggles with spirituality and religion. (Leibovitz, 2013) From yet another lens, David Sudnow described a descent into abstraction through engaging with the game "Breakout," providing a stage to demonstrate the depth of experience one can gain from games we might now consider simple or outdated. (Sudnow, 1983) This unique phenomenal experience is not just restricted to gameplay - game designers and engineers all engage in substantially different groups of phenomenological experiences, as seen in figure 1. (Gladden, 2019)
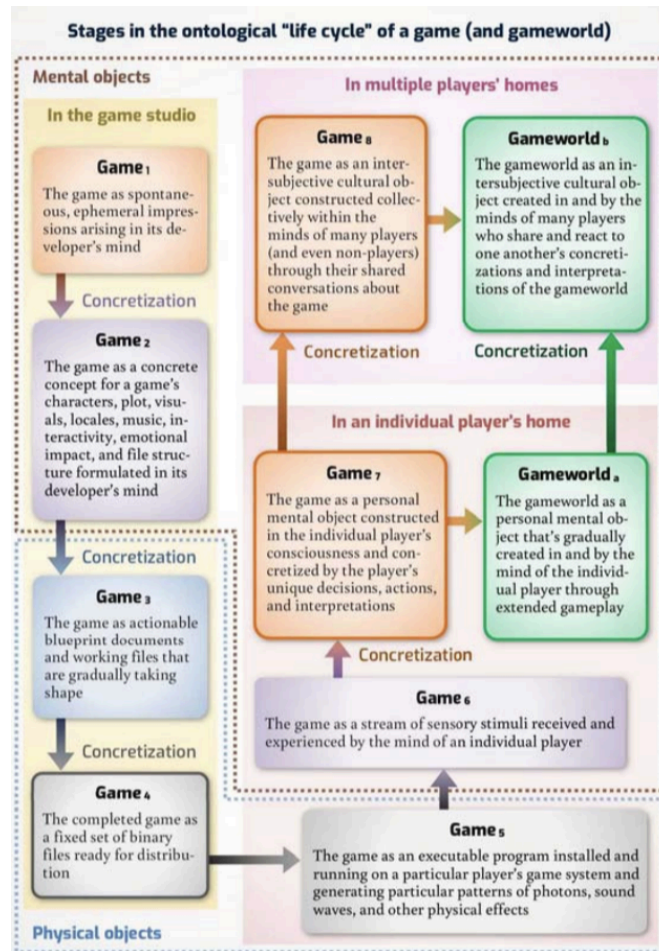
Figure 1: A diagram demonstrating Matthew E. Gladden's categorization of different ontologies produced by games over their development and release lifecycle. This lifecycle demonstrates how the phenomenal character of a game artifact can vary greatly depending on the use case, period of development, and perspective of the end user. (Gladden, 2019)

In general, phenomenological game design practices involve a conversation between a designer and an audience surrounding a subset of qualia, informed by the usage (or imagined usage) of the designed artifact by an individual and the predispositions of the individual reporting on it. This reporting can be quantified and used in further software development, automating phenomenologically-defined quantitative profiles in advertising targeting, recommending systems, etc.

EMBODIED COGNITION OVERVIEW

Embodied cognition states that the mind is not abstracted from the body but necessarily embedded in our body. Embodied cognition, like phenomenology, is less of a specific field and more of a research program oriented at centering understanding through the lens of a mind-body. The similarity between embodied cognition and phenomenology is no accident - the work of Husserl's entourage

influenced the foundations of the field. Embodied cognition opposes the idea that the mind/brain controls the body from a privileged position, separate from the body. This grounding in bodily responses has made embodied cognition approaches portable to areas such as sports psychology or psychiatry (Leitan et al., 2014).

Virtual, extended, and augmented reality research has yielded significant findings regarding embodied cognition in the framework of games. Conceptual frameworks for embodied cognition in extended reality show that game mechanics such as avatar selection, avatar representation, and even camera positioning yield differentiated outcomes for users - as all of these items modulate how embodiment is experienced in a virtual environment. (Mejia-Puig et al, 2022) The Proteus Effect, where users map properties of a controlled avatar onto their immediate personal experience, provides a lens for us to understand how epistemic framing in a video game can directly influence conceptions of experiencing a mind-body. (Yee et al, 2007) These effects have been investigated thoroughly in Serious and education-oriented games, where emphasizing different forms of immersion and bodily presence presents different outcomes in learning and gameplay. (Southgate, 2020)

EMBODIED COGNITION IN VIDEO GAME DESIGN

In Video Game Design, gameplay experience has frequently been claimed to be embodied or deeply seated in the mind-body. (Gee, 2008) uses a model that views the mind as a simulation of embodied experience. Gee views the mind as an engine to simulate, predict, and prepare the body for upcoming embodied experiences. Similarly, (Isbister, 2018) points to "grounded cognition" as a wellspring for cognitive reactions in video games. Grounded cognition seeks to explain behavioral responses in the context of the individual's prior "grounded" experiences. In other words, how we react to situations, actual or simulated in a video game, will still be tied to our mind-body reactions in our past experiences. Our brains root for new mental experiences as reconfigurations and transformations of previous experiences.

This conclusion has been reflected in some empirical respects as well. For example, character-based video games have been found to evoke embodied feelings of extension (Lankowski, 2016). We see a character with a familiar form, and we feel what happens to that form through an embodied lens. Core game design elements - managing player challenge and enabling player agency - directly overlap with cognitive science concepts of flow and personal agency (Isbister, 2018). Uncertainty is used as a way to trigger and influence player engagement in similar ways that behavioral schedules might be articulated (Costikyan, 2013). The use of virtual reality for neurorehabilitation proves to be promising, prompting a flurry of research that leverages the embodied properties of the format as a therapeutic tool (Perez-Marcos, 2018). (Melcer, 2021) articulates how embodiment as a concept lacks a singular coherent definition, instead having applications across many domains such as design and the brain sciences. In the same paper, Melcer notes the potential for embodied interfaces to specifically promote increased benefits in learning games and simulations, providing a design taxonomy to fulfill such goals. Melcer's exploration transitions nicely into our next section, where we explore the potential mental and physical benefits of embodied cognition strategies along with observed behavioral and sociological effects attributed to video games.

EMBODIED COGNITION AS AN EXPLANATION FOR POSITIVE OUTCOMES IN VIDEO GAME PLAYERS

While it might be easy to dismiss embodied cognition as a specific paradigm of phenomenology, embodied cognition has produced testable benefits in understanding how learning with the body can accelerate learning or relieve various conditions. For example, embodied cognition has contributed to a movement in trauma therapy treatment that leans heavily on re-establishing the mind-body connection as an avenue for treatment. This treatment style has proven markedly successful, competing in efficacy with previously established treatments. Meditation practices, trauma-sensitive yoga, and eye-motion desensitization response (EMDR) are all interventions that lean on the embodiment of the mind to operate to great success (van der Kolk, 2015). The success of these campaigns and their connections to embodiment provide a template for understanding why video games have the potential to cause strong cognitive reactions in players.

Suppose embodiment is critical to certain psychiatric interventions and can be produced by video games. In that case, it should follow that we can trigger relevant psychological interventions if we can figure out how video games produce embodiment. While the literature is young, there are multiple peer-reviewed publications detailing the creation of serious games targeted at specific neurological ailments. Some examples include using Virtual Reality environments and games to provide stroke rehabilitation (Charles et al., 2020) and a tablet-based game to teach children with ADHD emotional regulation skills (Evans et al., 2021). The potential is beginning to be shown for video games managing autism spectrum disorders. (Jiménez-Muñoz et al., 2022) Experiments connecting a video-game interface to a pain-management minigame successfully produced changes in patient perception of said pain (Huang et al., 2022). As referenced in work from Melcer and Isbister, incorporating movement into activities increases the educational potency of those activities.

These are examples pulled to emphasize connections to existing literature concerning mental illness, education, and brain science - but the observed phenomena around video games show that there is still significant uncharted territory regarding the type of cognitive effects we can evoke with games. The following section will explore two effects, each driven by an individual's experience of a digital interactive system.

EXAMPLES OF VIDEO GAME EFFECTS RELATED TO EMBODIED COGNITION

The Proteus Effect

The Proteus Effect shows that a player's "occupation" of a virtual avatar leads to real-world differences in player behavior. First described by (Yee et al., 2007), the effect is significant because it demonstrates how the aesthetics of a game's avatar alone can trigger substantial personality changes, both with and without the knowledge that said changes are happening. A hypothetical example of this might be a player acting uncharacteristically intimate when assigned an attractive avatar to occupy (Yee, 2014). A notable trend in the literature surrounding the proteus effect is that it only tends to happen when the player experiences a high level of embodiment. Further, it tends to only happen on character traits that the player

views as positive - negative traits are avoided for personal incorporation and even act as a literal obstacle for embodiment during a game experience (Praetorius et al., 2020).

From a design perspective, one can already see how one might leverage this effect to evoke specific behavior patterns from players. One can lean on cultural tropes to encourage players to act along them implicitly or design avatars to help players feel confident enough to enter an intimidating area. Outside of pure entertainment, one can imagine creating characters that help players occupy personality traits they wish to embody - sociability, confidence, and so on.

Game Feel

Game Feel is the illusory tactile and kinesthetic feelings players perceive during gameplay (Swink, 2008). Game feel might be the sense of movement one feels when racing around a racetrack in the game or the shock and jump of receiving a high-impact hit in a fighting game. Game feel requires experiential consideration because it relies on learned cues across various affordances to invoke the feeling of movement. It also helps to make movement predictable and consistent between a game experience and an authentic experience (Pichlmair et al., 2021). Returning to our racing example, we might observe players engaged in a tight race, leaning into turns or jumping as they bump into obstacles. Playing a game with no pre-thought game feel elements might not evoke this reaction. Games like *Need For Speed* blur the edges of vision, adding screen shake to emulate engine rumbling, jostling player hands with controller feedback, and applying the Doppler effect to give experiential similarities to going very fast in a car. Implementing game feel is not possible along one dimension. One has to first consider the complete perceptual experience of the thing before including the appropriate list of signifying effects to evoke it in the audience (Hicks et al., 2018).

An abstracted example of game feel provided by Swink is the expectations players develop in response to Game Feel Aesthetics. If we drop a textureless, gray ball on a textureless, gray floor, we might not expect it to bounce, interpreting it as concrete falling on the floor. If we gave the ball a basketball texture, we might expect it to bounce. Similarly, the sound feedback from the ball hitting the ground would set our next expectation: "BOING" or "THUD"? Game Feel is vital for our analysis because it explicitly encapsulates a desirable outcome of games that is only observable at run time and evaluated through a first-person perspective. Combined with characters and audio-visual metaphors we can project onto or empathize with, game feel becomes an even more potent tool for driving player reactions (Carter, 2022).

TOWARDS QUALIA-DRIVEN DESIGN

The core premise of working with accounts of conscious experience as a critical foundation for video game development that is often minimized. This tendency is driven by the tension between 1.) video games being artifacts that require tremendous technical skill to implement and 2.) the volume and complexity of detail from the experiential perspectives needed to execute game development in valuable ways to a potential player. Taking the approaches phenomenology has taken in understanding conscious experience, the mind-body can also be leveraged to understand and replicate the most surprising mental and physical outcomes in video

games. By attempting to capture the qualia of an experience that we want to share with another, we can bracket off irrelevant information about those experiences until we end up with experiential attributes that we can reproduce in a digital game environment. A high-level overview of what this would look like in a game production environment is presented in figure 2.
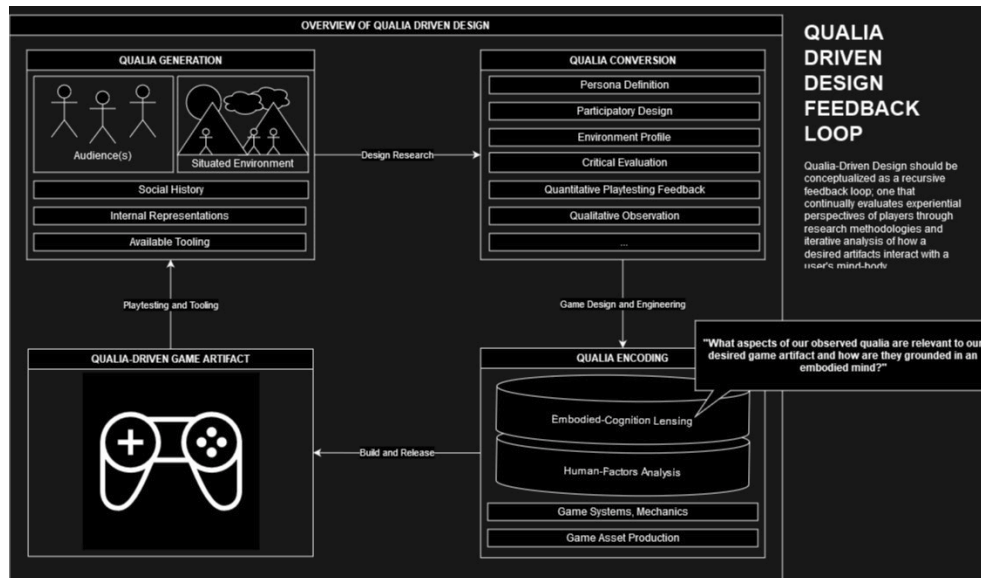

Figure 2: A conceptual overview of how
qualia-driven design practice might be structured
and the critical step of understanding observed
qualia against embodied-cognition literature.

We have little interest in producing a framework that is only understandable through a sophisticated enough vernacular. Instead, we wish to provide concrete and replicable tasks and recommendations to benefit from experiential-driven design practice in video games. Our approach to video game design can be summarized as follows: use our intended player's conscious experience to build an interpretable and measurable framework for video game development rooted in embodied cognition literature. The core benefit of this approach is that we create an implementable path between the nebulous yet attractive properties we observe in video games and the underlying design strategies that produce them.

We will use the rest of this section to suggest processes to capture relevant information from qualia and then use that information to build out relevant game-design information. We will also discuss approaches to create generalizable engineering recommendations in the design space and to evaluate if a given interactive digital system is ethically viable. The following processes are not meant to be linear or exhaustive. Video game development is far too messy and chaotic to suggest a solely linear mode of collecting data is realistically implementable; these recommendations are more to build a "mode" of operation in readers while they tackle such issues.

QUALIA GENERATION AND CONVERSION

An essential tension has not been addressed throughout this paper: the "capture" point of qualia is inevitably a quantification in and of itself that strips away the unique properties of the experience itself. This tension has also been hinted at when discussing existing metrics - it cannot be that they are all inherently bad, as the new wave of metrics we create from analyzing qualia would be just as susceptible to such criticism. There is an ineffable, uncrossable gulf between the perception of experience and the communication of that experience to others; this discussion asks when and where we should attempt the crossing. This paper's argument is not that all existing metrics and quantifications are bad, nor that a purely experiential-driven approach would be successful; rather, critical design aspects are embedded in the holistic experience of an artifact that is not captured by metrics alone. Thus, we must embed a phenomenological approach into a game design or research practice to increase the likelihood of building a game with desirable but complex emergent properties (e.g. balanced, fun, educational).

This perspective has two implications: first - the richness of qualia we attempt to represent in gameplay experience should be drawn from similarly rich accounts of qualia. Simply put - designers, engineers, and all manner of video game creatives need to develop relevant qualia for reference and contribution to their craft. This point is an argument against crunch or underpaid creatives - work outcomes will diminish without reference experiences that can be compared and contrasted with their teammates. This is pointed out in the seminal paper Game Changers, where successful video game development teams are understood as the balanced tension between varied viewpoints controlled by structured development practices that allow the richness of contributor experience to be explored productively. (De Vaan et al., 2015)

The second implication is that generated qualia must, at some point, be translated into game systems. At some point in a qualia-driven development practice, we have to decide the relevant and meaningful features of a group of qualia and how we can affect them. Luckily for us, the last few decades in marketing, product design, and software development have provided us with numerous approaches to capturing how end-users might interact with a given artifact and translating that into a relevant design strategy.

CAPTURING AND ENCODING QUALIA

When we have discussed qualia, we have often switched between discussing it as a mental concept and as a literal thing that exists. This usage is not a mistake. While we acknowledge that qualia are inherently inaccessible to all but the observer due to structural mind-body and cultural differences, qualia have shared traits that can be productively used. Our first tasks in a qualia-driven design practice entail collecting and analyzing experiential accounts.

Another subtext that needs to be addressed is the multiplicity of phenomenological analysis generated by different academics over the years. We do not specifically suggest that a specific phenomenological framework is ideal for game development but that such a framework is a priori and essential. The diversity of game audiences' targeted qualia means it would be naive to think that we should get a unifying

phenomenology that tells us how to design games. Instead, we should embrace that each desired experience engine develops a phenomenology in and of itself that depends on the interaction of its creators and users to form a language. Such inclinations of devices forming a specific literacy have been emphasized in works by Keogh in embodied literacies (Keogh, 2018) and Winograd and Flores (Winograd and Flores, 1976) in device-specific ontologies. These engine-specific phenomenologies can be empowered by tying them to mind-body concepts that produce mental or physical effects.

In terms of functional practices that can help Qualia capture, we turn to a variety of established practices in playtesting and artifact evaluation in HCI. As mentioned previously, defining Personas for intended audiences that are created through a thorough research paradigm can help bracket what types of qualia we need to design for, so long as we include information about the environmental context in which those personas occur. Critical analysis can help us situate game designs in larger social-cultural systemic contexts. Dominant studios such as Valve have long utilized playtest feedback, forming the bedrock of game designs. (Ambinder, 2009) While there is not enough space in this paper to fully cover phenomenologically grounded research techniques, these few should provide a pointer to a rich literature on how we ground game artifacts in player experience.

EMBODIED COGNITION GROUNDING: HUMAN (MIND)-BODY FACTORS ENGINEERING

A downside of phenomenological approaches is their relative need for anchoring to a generalizable framework. We might use phenomenological approaches that are wildly successful for our users, but we cannot port such techniques easily from one game experience to another. While phenomenology might be more successful in explaining or designing a causal experiential chain of events, connecting a purely consciousness-driven explanation to observable outcomes we want to see in a player is more complicated.

The cognitive sciences, specifically around the concept of the mind-body and embodiment, provide us with a solution. Designing for humans does not stop at an experiential consideration; we must also include a person's physical and mental anatomy considerations. Quirks of memory, attention, neurodiversity, and so on represent areas where we can be aided or burdened by our digital systems.

An approach we can borrow from engineering practices is that of "human factors engineering," or the practice of making technical specifications out of the various physiological, behavioral, and physical limitations of human beings. The core of the idea is that better interfaces are designed and implemented when we incorporate some of the natural dispositions of the human mind and body (Lee, 2017). While we do not have nearly a sophisticated enough understanding of these limitations in video game design, we can use HCI research as a foundation to continue building out recommendations for different mechanic implementations. These recommendations respect a biologically human end-user. Video games are a productive research platform for human-factors engineering.

A naturally beneficial side-effect of embedding embodied cognition concepts into a video game practice is that it provides us with a usable ethical scale to interpret

different experiences. If we can point out how different mechanics are exploitive and then back it up with explicit research foundations, we might have better luck at getting ahead of concepts like "loot boxes" that target children or neurodiverse populations. Using a holistic view of the gameplay experience also provides us with a secondary avenue to investigate potential ethical transgressions of digital designers.

CONCLUSION

In this work, we have reviewed phenomenology and embodied cognition in the context of game design, establishing links between the unique experience of a video game and embodiment. We synthesize this knowledge by suggesting a framework for "qualia-driven design," which proposes a design strategy that prioritizes a phenomenological approach to firmly ground a game design in end-user experience. This framework suggests that games are engines to produce qualia in the audience's mind; thus, attention to qualia overall is critical to a design process. This framework implies that many supposed technical measurements of video game properties (balance, immersion, enjoyment, etc.) should never be taken at face value. These properties are highly sensitive to the context and use case of the engine in which they are embedded. Immersion in a horror video game looks very different from immersion in a puzzle video game - though some scales may attempt to compare the two. Such properties are not useless, pseudo-scientific labels - instead, they are situational measures that we must use consistently in the context of the first person's experience of a given game to understand fully. Over time, consensus-building on these properties and their relevant taxonomies may allow for such portability. As for now, the current literature suggests that one should start asking questions when they see concrete claims of emergent properties produced by video games. In future research, we want to emphasize the interaction between embodiment, phenomenology, and emergent properties of video games. As for designers, we hope to see these three areas leveraged as foundations for future "good" games.

ACKNOWLEDGMENTS

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17

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