From Frustration to Flow:

Optimizing Onboarding for Cognitive Accessibility in Gaming

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Video games, and virtual worlds in general, are increasingly becoming an integral part of everyday life (Salen et. al, 2004). Not only are video games one of the fastest-growing sectors of entertainment, they provide an access point for salient interactive experiences; every year, video games represent more and more significant cultural touchstones, ways of connecting with society at large. Sixty-one percent of the U.S. population plays games for at least an hour every week (Entertainment Software Association, 2024), and 40% of the world population reports playing games regularly, with that number growing by hundreds of millions every year (Exploding Topics, 2024).

Beyond their cultural resonance, researchers are uncovering the eudaemonic potential of video games. Research shows that playing video games can lead to positive mental health outcomes (Boldi & Rapp, 2021), improve reading scores among children with dyslexia (Franceschini et al., 2013), and act as an effective treatment for post-traumatic stress disorder (PTSD) (McGonigal et al., 2020). It is becoming increasingly clear that access to video games and virtual worlds means access to a broader range of effective treatments, therapies, and learning tools. As written by Boldi and Rapp (2021): "The advent of video games, particularly those designed with psychological insights, has opened new avenues for promoting positive mental health outcomes. By fostering experiences of achievement, autonomy, and emotional connection, video games have the potential to serve as valuable tools for mental health support and well-being."

With all of this in mind, it is important that practitioners work towards removing barriers to access in games. There is still a lot of work to be done. A 2022 survey indicated that "66% of gamers with an impairment or condition say they face barriers or issues related to gaming"

(Scope, 2022). The implications of this are far-reaching. It means that individuals with certain accessibility needs are not able to participate in culturally significant pieces of media or partake in activities that could potentially enhance their access to community or improve their mental well-being. While there have been some improvements in video game accessibility, with new standards of practice emerging around basic accessibility features (Shin, n.d), there remains a segment of individuals with cognitive support needs that continues to be ignored by designers: those with cognitive accessibility support needs (Sousa et. al, 2023). LoPresti et al. (2008) define cognition as "mental tasks, including conceptualizing, planning, sequencing thoughts and actions, remembering, interpreting subtle social cues, and manipulating numbers and symbols" (p. 29). As such, cognitive accessibility is "the extent to which products, systems, services, environments, and facilities can be used by people from a population with the widest range of cognitive characteristics and abilities to achieve a specified goal in a specified context of use" (Smith & Jones, 2024).

Cognitive differences can encompass a wide range of conditions, which share the umbrella classification of neurodiversity, including "intellectual disability (ID), autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD), dyslexia" (Sousa et al., 2023). According to a recent CDC study, individuals with cognitive disabilities make up the largest group among Americans with disabilities, with 13.9% reporting cognitive-related challenges (Centers for Disease Control and Prevention [CDC], 2024). As cognitive decline is linked to aging (Bettio et. al, 2023), the need for inclusive design that accommodates cognitive differences will become increasingly important as the gaming population continues to age.

With all of this in mind, it becomes essential to differentiate between the traditional medical model of disability and the social model. The medical model focuses on disability as

medically-defined deviations from a perceived normal. Design solutions in this framework emphasize cure or management within a medical context. In contrast, the social model redefines disability as the result of designed environmental and societal barriers, suggesting that individuals are "disabled by physical barriers, social stigma, lack of legal recognition, [and] adaptive technologies." Instead of focusing on the individual, it scrutinizes social systems and emphasizes "social and environmental phenomena" as sources of disability (Adams et. al, 2015).

Beyond accessibility, such an approach would embody the principles of inclusive design. "Inclusive design focuses on allowing as many people as reasonably possible to experience services" (Palmquist et al., 2024, p. 5); the term has become synonymous with universal design. In her book *Mismatch* (2018)*,* author Kat Holmes delves deeper into the concept of inclusion, describing it as the process of recognizing what she terms "mismatches", which exclude certain individuals. It involves questioning the status quo and envisioning solutions that consider the spectrum of human diversity, supporting meaningful participation and autonomy. Inclusion emphasizes the ongoing process of addressing and fixing exclusionary designs, ensuring that environments, products, and technologies are accessible to individuals with diverse physical and cognitive needs (Foley & Ferri, 2012). This aligns with the shift from the medical to the social model of disability and demonsrates the gravity of incorporating inclusive design in gaming—it reframes accessibility not as something to accommodate limitations within individuals, but as a responsibility of design to accommodate a range of needs, fostering broader participation, enjoyment, and retention.

When considering the range of cognitive differences, as well as the tenets of inclusive/universal design, it becomes clear that including a suite of optional accessibility settings may not sufficiently address the underlying issues. Instead, the core gameplay

experience needs to be designed with cognitive difference in mind. Researchers have identified several ways for designers and developers to accommodate cognitive differences. In the article "Towards Cognitive Accessibility in Digital Game Design: Evidence-Based Guidelines for Adults with Intellectual Disability" (Sousa et al., 2023), the authors established a series of priorities for inclusive design, following a year-long study where developers made games for players with intellectual disabilities. Some of those include feedback clarity (responses to player choices and actions should be clear and easy to interpret by the player), user interface accessibility (interfaces should be intuitive, streamlined, and free of unnecessary complexity), visual information simplification, game/level design streamlining (methods of progression, challenge, and reward should be made accessible), and tutorials.

While these components all influence the user experience (UX) of engaging with a video game, they are also elements encompassed by what Palmquist et al. (2024) define as Player Experience (PX). "While UX aims for efficiency and effectiveness, PX often seeks to evoke specific emotions, immerse the player, and ensure they are entertained and engaged. Enjoyment, challenge, frustration (within reason), and immersion can all be intentional parts of the PX" (Palmquist et al., 2024). As such, it is necessary for designers to focus on areas of the game that have the biggest impact on variables influencing PX, principal among them the player's sense of immersion. A group of researchers developed a model around assessing a player's level of enjoyment with a video game, an adapted version of Csikszentmihalyi's theory of flow. This framework, called GameFlow, speaks to the subjective experience of players (Sweetser & Wyeth, 2005).

With this in mind, truly inclusive design encompasses immersing players in the game's experience. In order for immersion to be achieved in video games, the player must have

developed a certain degree of familiarity with various aspects of the game: its UX/UI features, its mechanics, its controls. Being immersed requires internalization of certain system features, the commitment of certain mechanics and embedded systems into memory by the player (Hodent, 2018, p. 167). In video games and in other interactive media, the deliberate, designed pedagogy around teaching these elements to players is called "onboarding." Conventionally, in video games, the onboarding process occurs during sections of the game called "tutorials", which usually occur at the beginning of the game (Hodent, 2018, pg. 167).

There is substantial research into the efficacy of tutorials as effective onboarding strategies and drivers of immersive PX. One article found that tutorials have a positive impact on non-expert player experience by increasing their perceived state of flow during gameplay (Passalacqua et al., 2020). Tutorials can either be explicit or carefully embedded into the narrative; they can rely on textual elements, dialogue, or otherwise be born from pure tinkering with the perceived affordances of the game system. Of course, the design of those tutorials is essential to ensuring their effectiveness. In the aforementioned article, Sousa et. al (2023) found that, for tutorials to effectively immerse the player and convey key information about the system, designers should prioritize implementing the following features:

1. **Hands-on learning:** Tutorials should require the player to engage in the very systems they are meant to teach. There should be environments in which players are allowed to practice certain skills with a perceived sense of safety.

2. **Optional and skippable elements:** To imbue a sense of autonomy and help players maintain a sense of flow, certain aspects of the tutorial should be skippable. This also allows players to focus on the mechanics or systems that they need the most support with.

3. **Gradual introduction of mechanics:** The concept of "distributed learning" should be considered when designing tutorials; designers should be careful about the pacing of the learning, not overloading players with too much information, and instead dispersing it in a contextual manner as the game progresses, so that they have time and cognitive capacity to internalize new mechanics and features.

4. **Reducing tutorial length and text:** The study found that gamers preferred shorter, action-based tutorial sequences, with quick, interactive guidance, and minimal reading.

These ideas were reinforced by Sara Czerwonka and Victoria McArthur's research in "The impact of Tutorial Design on the Novice Gaming Experience" (2022). Each of these features is closely tied to features of human cognition; by designing tutorials using a framework that prioritizes player experience, as opposed to mere usability, game makers can deliberately and effectively reduce the cognitive load, "allowing players to focus more on the game's core content and further enjoy the experience" (Sousa et al., 2023, pg. 3), rather than squandering cognitive resources on non-diegetic aspects of the game experience—game elements that are neither part of the game's world nor story—that reduce a sense of immersion (Iacovides et al., 2015).

While there is a glut of academic writing and research that confirms and reinforces this approach, there is scant literature suggesting the alternative: that video games should be challenging or inaccessible, or that tutorials should increase cognitive load. Nonetheless, there are plenty of examples of tutorials that do not accord with the aforementioned features, as well as remarks made by game creators betraying a lack of commitment to accessibility. This approach seems to arise from one of two sources: either the perception of game difficulty as an essential part of the core experience or resource limitations.

To illustrate, here is a quote from Gears of War game designer Cliff Bleszinski, when speaking with XboxAchievements: "The more I play games like that the more I'm turned off to them *(sic)* and just want to get back to systems interacting with systems, and get back to a game that, you know, when was the last time a game really challenged you and asked something of you, right? *(sic)* There's a reason why Demon's Souls and Dark Souls have taken off lately. It's because they really require you to actually try" (Bradley, 2019).

This sentiment, that video games are being made easier, usually accompanies criticism regarding the tendency of publishers to prioritize "casual" game development over "hardcore" games, as games in the former vein grow the player base and increase sales. Detractors of this kind are quick to invoke the Souls games—From Software's notoriously challenging and wildly popular games forego accessibility, espousing difficulty as a core game mechanic. Hidetaka Miyazaki, the lead designer behind these games, defends his approach: "The intention behind the high difficulty of the games I direct is to evoke a feeling of joy and accomplishment in the player when they overcome these challenges." On the face of it, this approach does not conflict with the tenets of inclusive design. He continues: "Overcoming challenges by learning something in a game is a very rewarding feeling, and that's what I wanted to prioritize in 'Dark Souls' and 'Demon's Souls'" (Lewis, 2019). Difficulty is not the fundamental issue; it's a lack of adequate scaffolding.

Borrowed from education, scaffolding is defined as "help given to a learner that is tailored to the learner's specific goals at any given time, while also helping them actually learn what they have to learn" (Jensen, 2024, p. 163). In his book *Game Design: A Book of Lenses*, Schell (2008) writes that "Players need to see that they are making progress when solving a difficult problem…what progress is visible and what progress is hidden? Can I find a way to

reveal what is hidden?" (p. 259). Many notoriously challenging games—from the Souls games to The Binding of Isaac to Hollow Knight—might provide an enhanced sense of accomplishment to gamers capable of decoding their intentionally opaque systems, but they also risk alienating a segment of players who may lack the patience or context needed to decipher those hidden layers of progress. The absence of clear scaffolding can lead to frustration rather than a rewarding learning experience, suggesting that the design of such experiences might prioritize difficulty over accessibility.

This raises questions about the elegance of such a design approach. While a game's challenge itself can be a core appeal, designing an experience that can invoke the flow state in a variety of players across a range of abilities is perhaps a more sophisticated goal. Achieving this balance—providing challenge while ensuring players feel guided and rewarded—requires a high degree of design prowess with particular attention to the more intricate components of player experience.

When designing video games, it is essential that makers are vigilant in both understanding and accounting for subjective player experiences and cognitive differences. Designers should seek not to construct arbitrarily enigmatic or unnecessarily difficult gates for players; they should take the time to design unintrusive, embedded keys—adaptive systems for access and immersion. Tutorials and onboarding experiences in general are more than perfunctory afterthoughts or superfluous conventions: they present an opportunity to invite new players into the game experience, providing an important wedge for flow state access and an opportunity for establishing essential cognitive connections (Sweetser & Wyeth, 2005). This is what is meant by inclusive design: designing for inclusivity, with a focus on a range of individual differences, those related to cognition principle amongst them. often leads to improvements that

enhance the player experience and access for a broader audience (Foley & Ferri, 2012). By making tutorials more interactive, taking steps to reduce cognitive load, and diffusing the learning experience across the game instead of unnecessarily frontloading information, game makers can create inclusive experiences that resonate with more players, enhancing immersion, and providing access to experiences that are proving more and more culturally relevant and enriching. Not only is it good for the quality of player experience and even the bottom line—it's the right thing to do.

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