

Difficulty of Video Game Difficulty

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Difficulty is considered a significant part of video games, yet it is not much researched topic, especially regarding difficulty levels and player experience. This study aims to mend lack of comprehensive written works about video game difficulty by addressing questions of what difficulty means in video games, should games have selectable difficulty or not and why, and what is the best way to implement difficulty levels. To answer these questions, posts from Game Developer website were collected and analyzed as the main material. In addition, a model which attempts to map all possible categorized difficulty affecting elements both inside and outside a game is proposed.

As difficulty is a complex concept, it is challenging to define it thoroughly, but it could be seen as an opposing force to the player affecting how much effort they need to put into something. Here “something” depends on the context but also what that opposing force is in practice. Answers to both whether there should be selectable difficulty in games and how to design difficulty modes the best can depend on what kind of experience the designer wants to prepare the player as different ways to implement them have own pros and cons. The study also revealed that there may be a misconception among older players why older games are more difficult than modern games. Even though the early decades of game design were based on arcade games where difficulty had financial purpose, it was more often technical limitations than design which led to high difficulty on home consoles. Furthermore, a misconception of accessibility meaning easy difficulty was discovered. In addition, the study found out that difficulty and accessibility settings have similar issues of being ineffective but that there is also no established distinction between them.

To address some challenges with designing difficulty modes and scarcity of best practices for it, this study proposes some best practices that can be used to guide the design. Moreover, the introduced arguments for and against difficulty selectors supplement the best practices, as difficulty selectors are not suitable for all games or genres. As for the introduced difficulty model, it can be used as a tool or framework to map difficulty affecting elements in a game to analyze what makes the game difficult.

Keywords: video game, difficulty, difficulty level, difficulty mode, game design

Vaikeutta pidetään merkittävänä osana videopelejä, vaikkei sitä ei ole tutkittu paljoa, erityisesti vaikeusasteiden ja pelaajakokemuksen osalta. Tämä tutkimus pyrkii täydentämään kokonaisvaltaisesti videopelien vaikeutta käsittelevien teosten puutetta keskittymällä seuraaviin tutkimuskysymyksiin: mitä vaikeus tarkoittaa videopeleissä, pitäisikö peleissä olla valittavaa vaikeutta vai ei ja miksi sekä mikä on paras tapa toteuttaa vaikeusasteet. Näihin kysymyksiin vastaamiseksi kerättiin ja analysoitiin pääasiassa aineistoa Game Developer -verkkosivulta. Tässä tutkimuksessa esitellään lisäksi malli, joka pyrkii kartoittamaan kaikki vaikeuteen vaikuttavat tekijät luokitellusti, niin pelissä itsessään kuin sen ulkopuolella.

Koska vaikeus on monimutkainen käsite, on haastavaa määritellä sitä kokonaisvaltaisesti, mutta sen voisi nähdä vastavoimana, joka vaikuttaa kuinka paljon pelaajan tulee ponnistella jonkin asian eteen. Tässä ”jokin” riippuu asiayhteydestä, mutta yhtä lailla mikä tämä vastavoima on käytännössä, riippuu siitä. Vastaukset kumpaankin kysymykseen siitä, tulisiko valittavaa vaikeutta olla videopeleissä ja miten suunnitella vaikeusasteet parhaalla tavalla riippuvat millaisen kokemuksen suunnittelija on halunnut valmistella pelaajalle, sillä eri vaikeusasteiden toteutustavoilla on omat hyvät ja huonot puolensa. Tutkimus myös paljasti, että vanhemmilla pelaajilla saattaa olla väärinkäsitys siitä, miksi vanhat pelit ovat vaikeampia kuin nykypelit. Vaikka ensimmäisimpien vuosikymmenten pelisuunnittelu pohjautui pelihallipeleihin, joissa vaikeudella oli taloudellinen merkitys, useimmin syynä korkeaan vaikeustasoon myös kotikonsoleilla olivat tekniset rajoitukset eikä suunnittelu. Saavutettavuutta koskien puolestaan paljastui väärinkäsitys siitä, että saavutettavuus tarkoittaa helppoa vaikeutta. Lisäksi tutkimuksessa paljastui, että vaikeus- ja saavutettavuusasetuksilla on saman kaltaisia tehottomuusongelmia, mutta niiden välille ei ole myöskään vedetty selkeää rajaa.

Tämä tutkimus ehdottaa joitain hyviä käytäntöjä vaikeusasteiden suunnitteluun, joilla puututaan joihinkin siinä esiin tulleisiin haasteisiin ja hyvien käytäntöjen niukuuteen. Näitä hyviä käytäntöjä voidaan käyttää vaikeusasteiden suunnittelun tukena. Lisäksi tutkimuksessa esitetyt perustelut vaikeusasteiden puolesta ja vastaan täydentävät hyviä käytänteitä, koska vaikeusasteet eivät sovi kaikkiin peleihin tai pelien lajityyppeihin. Esiteltyä vaikeusmallia puolestaan voidaan käyttää työkaluna tai runkona pelin vaikeuden analysointiin kartoittamalla vaikeuteen vaikuttavia tekijöitä.

Asiasanat: videopeli, vaikeus, vaikeusaste, vaikeustaso, pelisuunnittelu

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1 Introduction

Difficulty in video games is a topic often discussed but lacks a common definition [1]. Difficulty affects various things related to video games, such as game design [2, 3], user experience [4], reasons to play games [5], and definitions of what is a video game [6, 7]. Complexity of the topic may be one reason why there seems to be no comprehensive written work about video game difficulty that attempts to map all elements affecting the difficulty.

Game design books consider difficulty from game design perspective but do not give detailed advice for designing difficulty levels. Jesse Schell's book *The Art of Game Design: A Book of Lenses* (2014) mainly recommends increasing difficulty gradually [2], while Ernest Adams's *Fundamentals of Game Design* (2014) focuses on giving advice on designing dynamic difficulty adjustment (DDA) system and explaining why difficulty levels are beneficial and often better choice than DDA [3]. Therefore, these books do not explicitly explain, for instance, how the market, technology, or intellectual property (IP) owner can affect difficulty.

In this thesis, there is only one study which focuses on how difficulty level choice presentation affects player experience, Smeddinck et al.'s "How to Present Game Difficulty Choices? Exploring the Impact on Player Experience" (2016). In the study, they used a casual and a life simulation game and utilized questionnaires. The players expressed preference to player-selectable difficulty but did not mention DDA negatively. The study suggests that difficulty choice interaction mode might

have a minor role in casual games compared to other design choices. [8] Lomas et al. (2017) conducted a study where the player could decide their difficulty level with or without knowing what difficulty the selection sets or get randomly selected difficulty level blindly or knowing the difficulty. However, as the name of the study, “Is Difficulty Overrated? The Effects of Choice, Novelty and Suspense on Intrinsic Motivation in Educational Games”, suggests, it focuses on how difficulty affects motivation compared to other elements of challenges. In the study, they used a math learning game for 4-8 graders and only used gathered data from game sessions. [9] Therefore, studies cover only a few game genres and aspects of difficulty level design, and there are no comparable studies.

When difficulty is concerned in literature, it can be “hidden” behind the term *challenge*. According to Thomas W. Malone (1982), attractiveness of video games is determined by following traits: challenge, fantasy, and curiosity. In his model, increasing difficulty makes the game also more challenging, which means that difficulty relates to challenge. To make the game challenging, achieving the goal should be uncertain. If the player knows for certain that they are going to win or lose, the game does not feel challenging. Different difficulty levels are one way to make the game uncertain. [4] Therefore, whenever challenges are mentioned in the context of video games, it can be argued that difficulty is included in those occasions. But difficulty and challenge are not synonyms [10] but closely related terms. Challenges can be said to come from difficulty [11], because there is no challenge if there is no difficulty.

Challenges, and therefore also difficulty, are considered inseparable parts of video games. After inspecting various definitions of a game, Jesper Juul (2003) created a detailed definition, where a game is a rule-based formal system with changing and countable results. The end results are different values which are not equal in favor. In addition, the player has a significant role in striving to affect results and is

psychologically committed to wanted result. Lastly, the consequences of the game are negotiable, which means it is possible to play the game without permanently affecting real life. In Juul's definition, player commitment is another way to express that games are challenging, contain conflicts or are interactive. [6]

Chris Crawford introduced similar definition in his book *The Art of Computer Game Design* in 1984. According to him, all video games share following four traits: representation, interaction, conflict, and safety. Games are closed formal systems that represent partly the reality, and it is possible to affect them with actions with consequences. Due to having a possibility to make multiple choices, games are branching in nature, meaning that the players can create their own narrative. Conflict refers to challenges in the game, and those challenges are obstacles that prevent the player from attaining the goal easily. In addition, games are a safe way to experience reality because they are always less harsh than the situations they are depicting. [7]

As for Nicole Lazzaro (2004), she identified four key traits which both affect player experience and are reasons to play video games. Firstly, games are played to affect one's feelings, like for relief. Secondly, games are played for "hard fun", which relates to feelings that the player experiences from winning a difficult challenge. The third trait is "easy fun", which relates to player's immersion. Lastly, socializing can be a reason to play, like passing time with friends. [5]

Crawford also mentions reasons to play in his book. According to him, the main reason for playing is learning. Games are a safe way to learn and desire to learn does not need to be conscious. He also mentions other reasons to play which can be more meaningful than learning: imagination, nose-thumbing, proofing own skills, social lubricant, practicing, and the need to be seen. He highlights imagination as particularly important motivator because games help to escape strict reality. [7] Here, importance of challenging challenges is not explicit, but to take an example,

one can hardly show one’s skills, to oneself or to others, if given challenges barely require effort to win them. If the challenges are too easy, the player is not given a chance to learn from their mistakes either.

According to Dagmara Dziedzic and Wojciech Włodarczy, in literature, difficulty and complexity are often used interchangeably, because they are not distinguished from each other [12]. Thus, difficulty can be hidden under another term: *complexity*. In Schell’s *Book of Lenses* [2], this is evident when he discusses flow. In video game context, flow is a term which is used to describe a state where a player is highly immersed in the game world and loses the sense of time. It is also often used to signify “balanced difficulty” [13], because when difficulty of the game feels right for the player, it enables flow state. Originally, flow is Mihaly Csikszentmihalyi’s psychological theory to explain happiness (1975). Regarding flow in game context, it is often mentioned that too much difficulty makes players anxious and too easy challenges bore players, which refers to Csikszentmihalyi’s words “[w]hen there are too many demands, options, challenges, we become anxious; when too few, we get bored” [14]. However, instead of using term difficulty to describe what affects the player’s ability achieve flow state, Schell uses the term complexity [2]. In contrary, Ernest Adams discussed flow in context of difficulty in his game design book [3]. Nevertheless, flow is one core theory which supports importance of having suitable difficulty in video games and how it can affect players. However, according to Jesper Juul, it can only explain partly how games interact with players [15].

In truth, getting difficulty to feel right for all the players is an impossible task, because players have different skills, experience, and preferences. But it does not mean that it cannot be achieved at all for some section of players and that there could not be good practices for designing and implementing difficulty in games. Some players can prefer “easy games” while some other players can prefer games that really challenge them, but these groups are not excluding each other either.

However, the level of difficulty is a sum of many factors, where the players are only one piece. Therefore, it is understandable why difficulty is a complex topic and why game developers often say that it is challenging to get right.

This thesis aims to mend this absence of works related to difficulty in video games. The focus is on commercial entertainment single player offline premium video games which have a win or completion state. For example, you cannot usually define when you have won or completed a life simulation game, like some *The Sims* series game, which changes the aspect of how difficulty is looked at. Difficulty affecting elements outside the official product are also left out, such as mods and trainers. This includes cracked versions of games which were released by cracking groups with cracktros (crack introductions), which had the trainers implemented into the game itself. These trainers can be viewed as indirect difficulty selection menus because they can give the player, for example, unlimited resources or invincibility to cheat in the game.

In this thesis, following research questions will be addressed:

RQ 1. What difficulty means in the context of video games?

RQ 2. Should video games have selectable difficulty or not and why?

RQ 3. What is the best way to implement difficulty levels?

In addition, this thesis presents a difficulty model which aims to describe from which elements the difficulty in games can consist of and thus it can also illustrate of why difficulty is a complex concept.

This work is divided into seven chapters, where the current chapter offered the introduction to it. The following Chapter 2 introduces historical background for difficulty in games, difficulty terms and categories, and how difficulty is designed, evaluated and adjusted. History section gives a background for understanding how difficulty in games has evolved and how it affects discussions around difficulty. Dif-

difficulty terms and categories section introduces terms that are being used when difficulty is being addressed but also how difficulty is defined when it is discussed. It also introduces difficulty taxonomies that were found during this research. Designing, evaluating and adjusting difficulty section introduces how difficulty is designed and necessary concepts which affect it. It also presents ways that are used to evaluate and adjust difficulty.

Chapter 3 explains how material for this study was gathered and main discussions that were found. The main discussions present how discussions around difficulty have changed during this century and what affects the discussions. The main discussions consider change in video game difficulty and accessibility, which are addressed in their own sections.

Chapter 4 presents the difficulty model. First, an overview of the model is presented, and then a more in-depth look into two main categories: difficulty elements outside or around a game and in-game difficulty elements. The model is presented as a diagram, and each subcategory of the main categories is justified to explain how they can affect difficulty of a game.

Chapter 5 takes a closer look at difficulty levels. First, it discusses definition of selecting a difficulty level. Then arguments for and against difficulty selectors are presented, and lastly based on the introduced arguments and views on how to design difficulty levels, best practices for designing difficulty levels are conducted.

Chapter 6 explains significance of the study and what limitations there were regarding the study. It will also propose possible further research topics which arose during the study.

Chapter 7 ends the thesis by answering the research questions and discussing the main findings of the research.

2 Difficulty

To prepare the ground for understanding what difficulty in video games is about, this chapter looks at development of video games and core concepts regarding difficulty. In the first section, history of difficulty and difficulty levels in video games and its legacy is being discussed. The second section presents how difficulty has been defined, what kind of difficulty terms are being used and how difficulty is categorized. The last and third section focuses on how difficulty is designed and relevant terminology in game development but also how difficulty can be evaluated and adjusted.

2.1 History

Early video game development started in the 1950s when computer scientists did demonstrations of what could be done with the current hardware [16, 17]. *Tennis for Two* developed by William Higinbotham in 1958 is generally considered as the first video game. It was a playful demonstration of his expertise in display systems and circuits. [17] Experimental video game development continued in the 1960s and 1970s in universities, marketing, urban planning, military, and engineering schools, but it was not documented well [16]. The first game design book is considered to be Chris Crawford's *The Art of Computer Game Design* from 1984. Crawford also founded the first Computer Game Developers' Conference in 1987 [18]. In the 1990s, video game development education started to take form to answer to need for

qualified workers in the industry. The first university to offer a computer gaming degree was Abertay University in Scotland in 1997, and the first university offer a Bachelor's degree in game design was DigiPen Institute of Technology in its campus in Redmond, Washington, in 1998. [19]

Difficulty levels can be considered to become a part of video games when video games become commercial products. Popularization of video games started from arcade halls, and difficulty had its part in the arcade business. Arcade games had physical difficulty modifiers, dual in-line package (DIP) switches, which were accessible only to the owner of the machine. For instance, in *Star Wars* (Atari, 1983), switches could define starter shields, shield bonus rules and overall difficulty. Difficulty was modified to affect how profitable the players' playtime was. If the game was too easy, the player would spend too much time playing compared to how much coins they put into the machine. If the game was too difficult, it would discourage players from playing it. But some arcade games also let the player choose their difficulty by themselves. The first known video game which featured player-selectable difficulty level was Taito company's arcade game *Speed Race* from 1974. It featured "beginner's race" and "advanced player's race". Higher difficulty level could mean skipping early levels to get straight into more challenging levels, but also more difficult enemies or less resources. But as if to encourage the players to choose higher difficulty, higher risk came with a higher reward: higher score bonus. In arcade context, it could mean a higher chance to get one's three letters to the leaderboard. [20]

Offering difficulty settings for the player was not standard practice, but Atari was one company that started to popularize it, in both coin-op arcades and home consoles [20]. Approach to difficulty depended on the system, as the arcades had to consider how profitable the playtime is. Home versions of classic arcade games, like *Berzerk* (1982) or *Joust* (1983) for Atari 2600, usually added different skill level selection. [21] It seems like Atari embraced providing different difficulty or skill

levels to make everyone find joy in video games. Atari's Video Computer System (VCS) catalog from 1978 says that the system has "difficulty options so the games get better as you get better". It also seems that Atari saw that difficulty levels give replay value and more playtime for the games. [22] The Atari VCS (1977) itself had physical "Skill/Difficulty" switches for both two players individually: A for "Expert", or B for "Novice". This hardware level difficulty selector let players with different skill levels to play together. VCS developers could also present software level difficulty options which could be accessed using "Game Select" switch on the console. Atari's approach to difficulty could stem from its founder's, Nolan Bushnell's, principle that the "best games are easy to learn and difficult to master". [20]

In the home market, more common way to provide selectable difficulty or challenge types was using challenge rating. Companies used it to help the customers to know which game to buy. Epyx games were rated with three icons: action, strategy, and learning. Every game box had a combination of these icons on it. For example, *Temple of Apshai* (1985) has two strategy icons on the cover to indicate the nature of challenges in the game. Likewise, games of Strategic Simulations Inc (SSI) had defined difficulty levels (intermediate and advanced) and estimated play times on the side of the boxes. [21]

Hardware level difficulty settings were around in coin-op arcade cabinets well into the 1990s but dropped out sooner from home consoles. When Atari 7800 ProSystem came out in 1986, hardware level difficulty switches were replicated in software, and no other notable home console manufacturer had physical difficulty toggles either. Therefore, providing difficulty options for the players was left as an option for the developers. [20] Even if companies had various ways to provide difficulty levels, they seemed to become a notable part of video games relatively soon from their first occurrence, as Thomas W. Malone argued already in 1981 that most good computer games have different difficulty levels. He mentions three ways to how the difficulty

level can be chosen: automatically based on the player’s performance, player-selected from difficulty level options, or based on the opponent’s skill. However, the first way may not mean DDA but that difficulty level depends on the player’s skills, as he mentions examples of that kind of difficulty choice *Breakout* and drill-and-practice. [23] Nevertheless, according to Ernest Adams, the earliest video game with DDA is *Astrosplash* (Mattel Electronics, 1981) for the Intellivision console [24].

Difficulty having a financial role did not stop to arcade halls. *The Lion King* (Virgin Interactive Entertainment, 1994) game is famous for being an extremely difficult game, and it was made difficult for a reason. During that time, renting games was a significant business. Disney researched how likely the customers are to buy the game after renting it from Blockbuster. It turned out that after getting far enough in the game, the customers did not buy it later. *The Lion King* was made very difficult on purpose to prevent the players from getting to that point. [25] Therefore, the game was made difficult to boost the sales. The game was released in 2019 as remastered and with new features of some which help the player get through the game. The players can, for example, skip forward and use quick saves which let them save whenever and wherever they want.

It is a common discussion in gaming community that older games used to be more difficult. There are multiple reasons for such conversations, which are more discussed in Section 3.1. One major reason is technical limitations which, for instance, made saving the game challenging, and thus not all games, like many old Nintendo Entertainment System (NES) games, had a saving function to save one’s progress [26–28]. In the 1980s, cassette tape computer games were an affordable way to play video games, but saving the game required saving the data to separate tape. Such method required precision and knowledge of where the data was saved on the tape. Therefore, such a method was likely to be present only in games that could require it for its gameplay, like long role-playing games (RPGs). One of such

games was *The Bard's Tale* (Electronic Arts, 1985). [29] One way to bypass challenges of saving the game was offering passwords. The first *Crash Bandicoot* game (Sony Computer Entertainment, 1996) for PlayStation offered both passwords and memory card saves, because Sony did not want to require people to own memory cards at the beginning of the first PlayStation era. However, saving the game is possible only if the player manages to get to the end of bonus levels or acquires a gem after breaking all the boxes in the level without dying. This system added more difficulty into the game, and saving the game is significantly harder compared to later *Crash Bandicoot* titles, where saving the game does not require completing such challenges. [30]

Crash Bandicoot games is a good example, because such long-time game franchises are a good way to see how games have changed over time. One of the latest titles, *Crash Bandicoot 4: It's About Time* (Activision, 2020), features two ways to play: retro, and modern. Retro uses traditional playstyle, which features limited tries called lives. Modern playstyle features unlimited tries, and it is encouraged by the game. It can be seen a way to help the player get through the game because the player can keep trying from the latest checkpoint as many times as they want. But this change does not mean that the game is easier compared to the previous titles. *Crash Bandicoot 4* is often said to be the hardest *Crash Bandicoot* game to complete if the player wants to beat every challenge in the game [31]. But when considering only getting to the final boss, the first *Crash Bandicoot* game is often mentioned. Therefore, difficulty of the game does not only depend on time context or technical limitations, but also on the player's goal. But it is good to keep in mind that difficulty has a subjective side.

The retro playstyle in *Crash Bandicoot 4* comes from the design of classical *Crash Bandicoot* games, which derives from the legacy of arcade games. Arcade games were basis of game design for many decades [32], which meant in terms of

difficulty that games on home consoles had similar punishing difficulty than arcade games [33]. Elements from arcade games are still present in modern games, which is evident, for example, in free-to-play social and mobile games with microtransactions [34, 35], but there are also premium games which take inspiration from older games, for example, regarding difficulty or graphics. This change in video game difficulty is discussed more in Section 3.1, as this legacy also affects how modern games are looked at.

2.2 Difficulty Terms and Categories

There are various difficulty terms and categories in use when difficulty is being discussed. Some of them are established, while some appear to be uncommon and thus difficulty terminology can vary around the same topic. However, how difficulty itself is defined is also not established and can be hidden under terms challenge and complexity, as was discussed in Chapter 1.

Difficulty is often defined to mean a gap between the player's skill and required skill [36–41]. Starr Ravencroft defines difficulty to concern “how much tenacity or raw skill it might take to overcome an obstacle” [42]. Ernest Adams presents three types of difficulty in his book. *Absolute difficulty* is determined by intrinsic skill required and stress. Intrinsic skill required means “the level of skill needed to surmount the challenge if the player had an unlimited amount of time in which to do it (regardless of the player's actual abilities)”. Stress refers to time pressure and is defined as “how a player perceives the effect of time pressure on his ability to meet a challenge requiring a given level of intrinsic skill”. *Relative difficulty* means “difficulty of a challenge relative to the player's power to meet that challenge”. But the most important type of difficult for the player is *perceived difficulty*, which is about how difficult the player finds a given challenge and consist of absolute difficulty, provided power and in-game experience. [3]

Aponte et al. propose a definition for difficulty to be probability to lose, but difficulty should also be defined in a way that it is quantifiable, either binary win or lose state or discrete from zero to N points [1]. Similarly, Lomas et al. define difficulty being probability to fail [9]. John Rose argues difficulty being about tension and release [43]. Michal Mycka uses a definition of difficulty from psychological perspective, where difficulty is defined by how much effort, especially mental, one should put to find a solution [44]. Josh Bycer mentions in his post, how in one of their game developer roundtable discussions, Tomo Moriwaki brought up that “difficulty as a concept is not based on the designer or the game, but how the player approaches playing it” [45]. Quentin Meteau definition for difficulty in a way combines the presented definitions for difficulty:

“Difficulty is equated with mathematical balancing, the current psychology of the player, as well as the choice of designers to give or not to give the necessary tools to pass an obstacle.” [46]

Even the definition does not mention the player’s skills affecting the difficulty and is not complete, it captures the complexity of difficulty and some essential elements which affect difficulty.

There are various more specific difficulty terms, where some appear to be less common within this research. Christopher Gile presents in his post terms *continuous and aspirational difficulty*. Continuous difficulty is about how well the player must play to not lose, and aspirational difficulty means how well the player must play to win. These terms are similar to skill floor and skill ceiling but have significant differences. Skill floor is the lowest skill level requirement for doing some action in the game, while continuous difficulty is about, for example, how often or long the player needs to do the action. Skill ceiling is the highest skill level the player can achieve, but aspirational difficulty is about how good the player needs to be at a game to win or accomplish a goal in the game. [47] In another post, he writes about *self*

selecting and self defeating difficulty, which relates to if the game should get easier or harder when the player is performing well. Self selecting difficulty makes the game harder when the player is playing well, while self defeating difficulty rewards the good player with easier difficulty. [48]

Josh Bycer discusses in his post term *sculptable difficulty* which means that the player can alter the difficulty in various ways, which can impact the way the game is played, and the game rewards the player for it [49]. When the game lets the player adjust the difficulty of challenges, it may be also called *self-difficulty tuning* [50]. Alex Vu instead uses term *organic difficulty* to describe a situation where “the game allows the player to interact with it in certain ways to make it easier, or harder, for themselves” [51]. These terms seem similar but may have some fundamental differences.

Lauren Poling presents two types of difficulty, which have been around for decades: *difficulty tiers and universal difficulty*. Difficulty tiers refer to the player selecting difficulty level from menu, and universal difficulty has only one difficulty level. Universal difficulty can be divided into *standard and moderated universal difficulty*, where standard systems have no extra challenges or side quests, while moderated systems have them. [52]

Cheap difficulty means a game using unfair situations to make the game harder [53–55]. Similarly, there is a term *unfair difficulty*, which can, for example, make losing feel like it did not happen due to lack of skills but being stopped “maliciously” by the game [56]. *Darwinian difficulty* is described to mean difficulty which follows principle of “adapt or die” and therefore games with such difficulty require high degree of skills [57].

One definition for *subjective difficulty* is that difficulty of a challenge is based on the player’s skill level, like by providing different solutions for different skill levels to beat the same challenge [58, 59]. Therefore, this term does not necessarily mean the

subjectivity of difficulty but takes into account how the player’s skill level affects the difficulty. However, it also has other definitions which relate more to the subjective side of difficulty. Another definition for subjective difficulty is “the player’s own evaluation of their chance of failure” [60]. However, it is recognized that subjective side of difficulty is complex, and the player does not estimate their chances to lose only based on short term estimations [61]. In addition, these differing definitions show how definitions can vary depending on the usage context. As an opposing term, *objective difficulty* relates to estimating the difficulty based on the gameplay variables and events [60].

Dynamic difficulty changes the difficulty based on the player’s performance, like making the game easier for struggling players and harder for well-performing players. *Scaling difficulty* is similar to dynamic difficulty, but they adjust difficulty differently. Scaling difficulty does not consider the player’s performance but progression, like leveling up, to adjust the difficulty and thus it is more fixed in nature compared to dynamic difficulty. [41]

Artificial difficulty refers to changing numerical values of variables which affect difficulty. *Designed difficulty* is about forcing the player to learn new mechanics or use already known mechanics in a different way to master them through enemies or other hand-crafted interactions. [39, 41] *Fundamental difficulty* is defined to demand “a minimum amount of skill to complete” [41].

Besides different terms, there are some difficulty taxonomies to analyze difficulty in games. Rhys Frampton (2021) presents a taxonomy of difficulty, because he thinks that people should reconsider how they talk about difficulty in video games. This is because he thinks that difficulty is often oversimplified as a scale from “easy” to “hard”. His taxonomy consists of three categories: *comprehensive difficulty*, *executive difficulty*, and *strategic difficulty*. Comprehensive difficulty relates to “the difficulty of understanding the core rules and objectives of a given task”, while exec-

utive difficulty is about “the levels of physical prowess (such as strength, dexterity, or reflexes) that are required to reliably perform an action”. Strategic difficulty concerns how factual information of a game should or can be applied. It differs from the others in a way that high strategic difficulty can be desirable because it can be rarely completely mastered and thus can keep up enjoyment from continuous self-improvement for a long time. [62]

Kyle Orland (2022) presents another difficulty taxonomy, “Ars Difficulty Matrix”, by Ars Technica to help with analyzing difficulty of a game. He uses game *Elder Ring* (Bandai Namco Entertainment / FromSoftware, 2022) as an example for the analysis, as the context of the post is that when FromSoftware releases a new game, difficulty discussion is evoked again and thus the taxonomy is meant to help with the difficulty discussion. It consists of five incomplete subcategories: *mechanical difficulty*, *punishing difficulty*, *arcane difficulty*, *grindable difficulty*, and *difficulty walls*. Mechanical difficulty is defined to mean “the way games require players to hit a certain set of buttons in a certain timing window to complete the next objective”, and thus it is also called a “reflex test” at times. Punishing difficulty is about how much penalty failing to complete an objective costs the player, like how many mistakes the player can make before getting a “game over” and what happens when the player gets a “game over”. Arcane difficulty considers how well a game can explain “its inner workings” to the player, like how the player is taught to play the game or guided. Grindable difficulty refers to how the player can make their character artificially stronger by spending time on gaining resources to do so, like killing enemies for experience points or currency. Difficulty walls are like insuperable walls, which stop the player from proceeding further in a game, like a boss fight which is required to beat to gain access to the next area. [63]

In conclusion, different definitions for difficulty revealed that it is not simple to define what difficulty means in video game context and its definition may depend on

the context. If difficulty of a game is defined to be a measurable value and used in DDA context, it does not take into account how the player feels about the difficulty but their performance and the state of the game, because it adjusts the difficulty automatically did the player want it or not. Therefore, there can co-exist different definitions for difficulty, which look at it from different perspectives.

2.3 Designing, Evaluating and Adjusting Difficulty

Designing difficulty is a challenging task because there are various factors which affect the difficulty of the game [64]. First of all, developers know their own game the best because they both know the design and have played the game frequently during the development. Therefore, they cannot really know how inexperienced players see or feel the game and how they figure out the optimal way to play the game. [65] Alongside the experience, players have different skill levels which affect the difficulty. [64] In addition, different players also experience difficulty differently and thus the same game can be too hard for someone while someone else can find it hard enough. Furthermore, some players, but also some designers and developers, prefer difficult or very hard games [66–68], but the majority of the players may prefer easy difficulty [9, 69–73]. Players preferring easy difficulty are often seen as casual players and those enjoying harder difficulty are seen as hardcore players [74]. Nevertheless, both player types enjoy challenges but differently [75], but for challenge-driven players, having a regular cycle of challenge and success is essential [76].

Despite all this, it seems that players are less likely to complain the game being too difficult than easy [15, 77]. Furthermore, in 2008, a large-scale European study of non-active video game players was conducted, which revealed that the main reason for not playing games was lack of time and the least answered option was that video games are too difficult. [78] This is possibly due to people having busy lives [79]. Therefore, casual players likely have different needs than hardcore players, which

affects what difficulty level they select and what games they play but also how they play. Players who lack of time but would like to play time-consuming games may use guides to gain more knowledge about the game to speed up their progress, as it makes playing the game easier. However, guides can interfere with the designed experience, like discovery and surprises, but this is outside the designer's authority, even the designer can affect the provided in-game information to the player.

The best level of difficulty is something that can be felt but not seen [52]. It could mean that the game feels challenging but the player does not think of the game being difficult or notice the DDA system. If the game is too easy, it can feel too boring to play, but easy games also have other problems. Easy games can decrease potential player investment eventually, because the more difficult the game is, the more time and skill is required to beat the challenges of the game. Therefore, it is better to make the game too difficult than too easy, even if it is against conventional wisdom. [80] When the game is made too easy, it can also be about underestimating the audience in a way. If the player dies in an "easy game", the player can become upset and accuse the game's design of their failure. But when the player feels like the game is designed to be difficult, the player may blame themselves for dying in the game. [81] However, in this case, the difficulty should feel fair, because if the game's difficulty feels unfair or cheap, the player is more likely to blame the game's design for their failure. Players who are more likely to call a game "too easy" are hardcore players, because they care the most about challenges in games [82], but it can also relate to them having more time to invest into the game compared to casual players.

Some games are designed difficult just for the sake of wanting to make an exceedingly difficult game, but such games have a risk to become those "unfair games", as creating a hard game on purpose is hard and requires careful designing [83]. Better approach is that difficulty must have a purpose in the game [84]. Difficulty can make winning challenges more memorable and rewarding and thus make the game

worth playing [66, 85]. *Dark Souls* (Bandai Namco Entertainment / FromSoftware, 2011) and its predecessor *Demon's Souls* (Sony Interactive Entertainment / Atlus / Namco Bandai Partners, 2009-2010) are known for their difficulty, but it has a purpose. All progress the player makes in the game feels like a victory, because of the difficulty which requires the player to hone their skills. When the player is defeated, they are likely to blame themselves for it and feel like they must learn from their mistakes, because the controls and game mechanics feel tightly designed and, despite the difficulty, the combat system feels fair. Difficulty is also a part of the atmosphere and immersion in these games, which are likely to strengthen their memorability. [84, 86] Therefore, considering what purpose the difficulty is serving in the game while designing it is essential. For instance, not all players are into beating difficult challenges but enjoy the story and game world the most. In such case, the difficulty is more hidden, because it can relate to exploration, discovery, or choices the player must make to progress in the game.

Another important aspect to consider is how the player can affect the difficulty of the game, because it affects how the player feels about the difficulty. If the player cannot modify their character or take alternative routes, their experience is likely to be worse compared to games where those are possible [87]. For example, in *Dark Souls*, the player can change their playstyle, choose their preferred weapons, and make their character and weapons more powerful by leveling up and reinforcing. This way the player can try out another way to approach the part of the game they are struggling with or make their character stronger before trying the difficult section again. In addition, the player can also explore the game non-linearly and in open space and this way also control the difficulty. If the player could proceed only linearly or could not modify the player character, the game would likely feel more difficult and not as fun, because the player's freedom is more restricted. When the player can control the difficulty of the game, they are more committed to keep playing

despite the difficulty [83]. However, difficulty design is also linked to the genre of the game because they have their own special traits which should be considered as well. Those traits can affect what kind of purpose the difficulty could have in the game but also how the players feel the difficulty, because they are likely to assume what the game is like based on similar games. But the first impression of the game is also important, because if the player is introduced to the game so that they understand the optimal way to play incorrectly, it can cause a significant difficulty spike after the introduction section [88].

Keeping the level of difficulty consistent is important [3], as inconsistent games have a risk of player losing the trust in the game, because they noticed that something illogical or unfair happened in the game [89]. Inconsistency can occur when game breaks its own rules because the rules define how the game world functions. Rule-breaking can make the difficulty appear “cheap”, which frustrates the player, but also creates a significant difficulty spike. However, if the game lets the player break the rules to gain an advantage, it can be beneficial, like for collectible card games. [90] In addition, inconsistency can break the player’s suspension of disbelief and thus immersion [90, 91].

Difficulty curve is a visual way to describe how difficulty of the game changes over time and designing one is often a critical part of the game [92], because it has an essential part in preventing the players quitting the game [93]. There are various shapes the curve can take, like a straight increasing line which indicates constant fixed increase in difficulty or a fixed logarithmic wave where the difficulty increases and decreases in varied phases but has a maximum difficulty level. [92] Increasing and decreasing difficulty curve can indicate that the game has higher difficulty spikes, which can be boss fights, and after them there are calmer moments to let the player rest for a while and possibly learn to use new abilities they got after beating the boss. This kind of varying difficulty can empower players, as they

get time to relax and it can make them enjoy the game more, which can also make them finish the game more likely [94]. The game can also start as difficult, which gives the game a reversed or inversed difficulty curve. However, such difficulty curve requires careful design to make the game balanced. [95, 96] If the difficulty feels too high at the beginning, the player can feel like the game is not for them and stop playing the game. This is even more likely if the first experience is unfair and punishing [79]. Dan Fester gives a personal example of how knowing *Dark Souls* being a difficulty game and going to area where he was not supposed to go yet despite the non-linearity gave him an impression of the game being tediously slow [97]. *Dark Souls* uses difficulty to guide the player especially in early game, but it can lead this kind of misunderstandings. Therefore, the first impression the game gives to the player is crucial.

Common way to make the hard initial difficulty more feasible for the players is to provide tutorials so that the players are aware of the mechanics and the controls of the game [98]. But to keep the player playing the game when the game gets difficult and caring about the outcome, Douglas Baker mentions that the player should know their objective, their part, and what is at stake [99]. Thus, the player has a clear idea of what they should be doing and why, which is even more important at the beginning of the game. Along with the early game, endgame is another special section of the game which requires careful design, as it ends the experience of the playthrough [100]. It is common that a game has a frustrating difficulty spike at the end, or the ending feels too similar to the midgame [101]. The game can also feel like it ends all the sudden or the endgame feels too long [100]. When the game feels too long, it is likely caused by the game not challenging the player enough [102].

Another curve to consider when designing the difficulty curve is learning curve. If the learning curve is identical to the difficulty curve, the game can feel too arduous and boring. Therefore, the game should always provide the player with the

opportunity to keep learning more, because it keeps the game fun for the player. This kind of learning curve would ideally be a straight line. [103] However, it is likely that realistically players' learning curve is not a straight line. Ideally, difficulty and learning curve together keep up the cycle of tension in the game. The next challenge in the game should be a bit higher than the player's skills, and after the player beats the challenge, the tension relents and player gains new skills and abilities. [1] If the challenge feels too difficult, it can make the player feel like they cannot win it and thus harms the player's confidence in their proficiency [104]. This kind of cycle can also give the player a sense of progression because if the enemies get stronger the same way as the player does, the player does not feel true sense of growth [105].

Different game genres require different skills from the player to master it, which can make understanding a game more difficult. In action games, instant feedback is one key factor in mastering them. If the player fails a jump or timing, the player dies or takes damage as negative feedback. This can make action games significantly easier to master compared to abstracted games, where the player should already be a master to make informed decisions by themselves. [106] Nevertheless, good challenges give cues and feedback to the player, so that when the player fails, they feel like they can do better. This supports the player's learning and improving, and players do not need to succeed in the first try but feel a sense of progress. [39] In fact, failure is an essential part of game experience [15] and games would be boring without failing, especially when it is human to make errors [107] and failure is bonded with success [108]. Thus, players expect to fail but while having a fair chance [109]. Some games can require the player to use different playstyles, which can cause a distinct difficulty spike, when the player's preferred playstyle is disadvantaged in that situation [110]. Therefore, difficulty can also restrict the player's self-expression, because it can cut number of options to progress in the game [111]. For example, if the player only uses fire attacks, but the enemies have fire resistance, the player should adapt to

use another attack type. Teaching the basics for the player is not easy, because the developers know their game well, tutorial can feel “too easy” for them when it is good for new players [112]. But this is up to how difficult the early game is intended to be and if difficulty is used to teach the player how to play the game.

It is usual that games have risk-reward system, which gives greater rewards the harder or riskier the challenge is. It can encourage the player to try or keep trying harder challenges, because beating the challenge feels more worth it due to the reward. But some players can find the difficulty itself as reward, because they want to keep testing themselves with harder challenges. [113] Thus, difficult games can be seen as a challenge the developers have given to the players to test their skills. When it is about a game series which is associated with high difficulty level, the player can see the next game as a following challenge. But when the next game seems easier than the previous ones, hardcore players likely dislike it. [114] It is essential that the reward matches with the challenge, as otherwise the reward can feel unearned or frustrate the player [115]. The game can contain both intrinsic and extrinsic rewards and which one works better depends on the player, but the player can find both motivating as well. However, they require a tough but fair difficulty system to impact the player the right way. [116] Along with rewards, what the player finds fun also affects if the difficulty feels right. If the player enjoys masocore games, very hard difficulty feels right for them. [117]

Some games use luck or RNG (random number generator) to affect the probabilities in the game. It can add uncertainty to the game and thus more difficulty but also replayability. However, it should be balanced to mitigate cons of it. If the winning relies too much on luck, the victory does not feel as satisfying and earned compared to winning based on skills [118]. When there is too much luck, the game becomes easy, while for unlucky players the game can be too hard and frustrating and make them stop playing [119, 120]. Luck can also distort the difficulty curve,

when the player gets some powerful random loot on their first try, but it is more subtle compared to the player who needs to try multiple times to get it [121]. Therefore, games which have randomization as one core element of the game can have side systems to help unlucky players [122]. They are ways to keep the change of winning in the player's control, because it makes the game more enjoyable to play [120]. In *Dark Souls*, the player can get loot from killed enemies, which depends on the enemy. Getting the item has certain probability to which the player can affect using a certain ring to increase their item discovery, which can be obtained at the gateway to the second half of the game, and consume certain resource to boost it further. If the player gets a powerful weapon drop, it makes the game significantly easier for them. Therefore, it is important that items and resources are balanced or the game's difficulty depends on them [123]. When some resource or item makes the game easier or even depends on it, it can cause the player to "grind" it, meaning that the player repeats certain actions, like killing certain enemies on repeat, in order to get something, like loot or in-game currency. Therefore, grinding is a negative term and likely makes the game frustrating to play [124], especially along with luck for hardcore players who seek to find the most optimal way to play the game [120]. It is important to notice that luck or RNG does not only take control away from the player but also from the designer.

Game designers lack robust tools to create a well-shaped difficulty curve. To mitigate this, Aponte et al. (2011) propose a method, which can be used to examine a relationship between difficulty of a challenge and abilities the player must develop to win. For instance, in shooting games, the player learns to aim more accurately and preventing better the other players aiming at them. The method utilizes subgoals, because the main goal of the game is to win and games tend to require repetition of basic behaviours which they call abilities. Subgoals must be precise enough to be usable, like killing a certain enemy not surviving, and abilities are assumed to

be measurable during play session. The method can be also used to evaluate better which abilities are important in a specific challenge, as the designer might not know exactly which ability is the most important for winning a specific challenge. This can deepen the understanding of what makes the challenge hard or easy, when components the challenge consists of are understood better. [1]

After examining different implementations of DDA, Dagmara Dziedzic and Wojciech Włodarczyk (2018) propose three different techniques to measure difficulty in DDA systems, which can be used while developing one: examining game tree, chosen features of the game, and direct player examination. Which technique fits the game the best depends on its structure of gameplay and purpose of DDA system, and not all of them can actually be used for the same game. The technique utilizing game tree examination can be used for games with a formal definition and suits the best board and logic games, like chess, tic-tac-toe, and connect four. The technique can be used to estimate the shortest route to victory or an average route to failure. Chosen features technique is suitable for games that are too complex for forming a complete game tree, like games from first-person shooter, tower defense, and platformer genres. In these games, it is not possible to estimate all the possible moves the player can make and there can be random events or time-related tasks. In this technique, chosen features depend on the genre and features of the game, and therefore designers of DDA systems must choose them by themselves. Direct player examination technique suits all games because it is based on measuring the player's feelings, which can be done, for example, by using questionnaires or physiological tests. This technique produces the most reliable information about perceived difficulty but can be challenging to apply in commercial projects. [12]

Rafael Vazquez (2011) proposes a method to measure and compare how difficulty increases and decreases during the game regardless of player's skill. This method tries to tackle the problem of difficulty being subjective and dependent on player's

skill by using difficulty graphs. Difficulty graphs are graphical representations of changes in difficulty throughout the game. Two main difficulty graph types are time- and distance-based. In the first one, the spikes in difficulty are defined based on spent time on challenges, and the latter places the spikes based on placement of the challenges, assuming that there is a linear route from start to goal. Which graph type is better to use depends on type of game that is being tested. Data for forming the graphs is gathered from different playtesters conducting playthroughs and taking average from them to see likely average player experience. In Vazquez's method, one needs to first define what the game's standard conditions are, which is the player's minimum power level during a certain segment of the game. Then one needs to define the base enemy and set its threat level to one; the threat level of the other enemies is adjusted in accordance with the base enemy's stats. After this point, the game is being playtested with different kinds of players who have different play styles. Then one needs to check which situations contain the enemies and assign values to the situations depending on how the mechanics and enemy behaviours let the player to fight them. Then one needs to define how the encounters function, how many enemy waves each encounter has and what enemies the waves have. Each enemy's threat level gets multiplied by situation multiplier and they are added up for each wave. Lastly, one plots them in graph based on the time when they appeared or the distance from the starting point where the player meets them. [117] Because Vazquez's method relies on the game having enemy waves, it is not suitable for all games, but it could be modified to fit other games better, like instead of enemies and threat levels, there could be obstacles and their difficulty. However, the phase where the game is tested with different kinds of players is universal and can be a good way to see how an average player experiences the difficulty of the game.

Playtesting can give a better picture of the game than theoretical models, because the game is seen in action during it and games are complex [97]. However,

playtesting is time-consuming [1] and proceeds rarely from one testing stage to another gracefully [97]. It can let the developers see how inexperienced players see and feel the game, because the developers play the game frequently during the development and thus can have years of experience of playing the game. They know how the game functions and see technical details the players do not think of and thus the game has no novelty value for them. One can also easily become blind to one's own work, because of being used to it. [125–128] Therefore, playtesting can reveal something that is easy for the developers to be difficult for the inexperienced players [129–131]. Sometimes, it can also happen that the developers are afraid of something being too difficult for the players, but the playtesting reveals the testers enjoying the game [132]. Playtesting can create more certainty about the difficulty of the game, because without testing, the developers can misjudge the difficulty curve [133]. To keep the testers representing inexperienced players, it is important to change testers to get fresh eyes, because otherwise the testers start to learn the game and then represent experienced players [134, 135]. It is beneficial to have as much testers as possible [64].

Balancing the game is done to avoid broken gameplay [136], like dominant strategies which outplay other strategies in the game [137]. According to Ernest Adams, when the game is balanced, perceived difficulty of the challenges rises or does not change [3]. The game is more difficult to balance the more elements or features the game has and therefore it is beneficial to keep the list of features short and concise [137, 138]. One method to see how each element affects the difficulty is utilizing rational (level) design, but it is mostly used by larger teams or on projects with significant financial accountability [139, 140]. Balancing difficulty also depends on the genre, like in general, in puzzle games, the player cannot level up to make the game easier or switch to easier difficulty mode [141, 142]. In addition, games are harder to balance when there is a wide audience, especially when considering player

experience varying from none to decades of experience of playing video games. Thus, the gap between novice and advanced players is wide and it is even more essential to consider when the game belongs to a long-time game series. [40, 143]

Game companies can gather data from the players and their game sessions, not only during playtesting but also after the release. This collected data can contain various details about the sessions, like performance of the player, where and when they died, which decisions the player did and how long something took to do. [144, 145] However, interpreting the data is a complex task, because it does not reveal how the player felt or why the player did something. If the player is dying constantly, it may not mean that the player is struggling and frustrated but having fun or does not mind failing constantly [146]. Therefore, the designers should not only rely on data but focus on the experience they want to create [147]. Games can also gather data about how actively the players play the game and when they stop playing the game. Churn rate is a term that is used to show how much players the game has lost to a certain activity day or progression point. It can reveal possible problems with the difficulty curve, if the churn rate is high after a certain level or section [93]. This way data can be used to adjust the difficulty of the game, when possible imbalanced sections of the game are known [148]. Gathered data can also be used to adjust the difficulty with DDA systems and the most exposed way to see how it is done is patents.

Sony Interactive Entertainment (SIE) has a patent called *Adaptive difficulty calibration for skills-based activities in virtual environments* (2023). In SIE's invention, methods can collect data from one or multiple games the player plays to decide if difficulty of the game should be adjusted. Collected data can be used to identify if the player's performance matches expected performance. If not, parameters affecting the difficulty may be adjusted gradually automatically until the performance meets the expectations. These parameters concern, for instance, moving speed, latency or

hesitation, character's strength, and number of competitors. Expected performance can change and the process can be repeated, since the player's skills develop over time. [149]

Electronic Arts (EA) has patents for adjusting and measuring difficulty. One is called *Systems and methods for automatically measuring a video game difficulty* (2022). The method proceeds in following steps: First the game session is simulated with game agents collecting telemetry data. Then based on the collected data, difficulty is calculated automatically or a recommendation regarding how to adjust the difficulty is given. [150] Another one is a DDA patent called *Dynamic Difficulty Adjustment* (2018) which utilizes gathered player data, for example, to assign difficulty preference to formed user clusters [151]. In 2020, this patent caused a class-action lawsuit where a group of Californian players accused EA of using DDA to push players to buy more loot boxes in some *EA Sports* games [152]. This made EA to state that they do not use it in *FIFA*, *Madden* or *NHL* games and do not have plans to do so in the future either [153].

To truly evaluate the difficulty of the game, it is important to understand what values exist at the core experience. However, it can be challenging when games tend to have a mix of skillful play with free play. For example, if the game has an easy main route but provides difficult optional challenges, it can make the game misunderstood as “too easy” game. [154] Not all games are meant to have tangible difficulty and therefore it is essential to understand the nature of the game but also the target audience to evaluate the difficulty.

In conclusion, difficulty is often considered to be good when it feels “right” [155, 156], but it appears to belong to the nature of difficulty that it is unnoticeable when it is at good level. Good difficulty is something that does not feel unfair and make the player feel helpless but makes the player feel like they can win and encourages them to improve their skills [157–160]. But as difficulty is a complex concept, it

is challenging to make it feel “right”. There are various sources that can affect the difficulty, which are presented in Chapter 4.

3 Discussions around Difficulty

The following chapter goes into data collection process and used methods. First, the way data for this study was gathered and limited is explained. Then, main discussion themes and trends around difficulty in video games are covered.

Data for this study was gathered from the Game Developer website, where people in the game industry write to other game developers. Search feature of the website was utilized using “difficulty” as a search term and the posts were filtered using “Design” from topics. The search resulted in 2,224 post, and data gathering was conducted between August 13, 2025 and September 26, 2025. Later, on December 11, 2025, another search was done using “Game Platforms” as topics filter with 801 results, because more relative posts were discovered under that topic tag. Term “difficulty” was only used because it is the core term of this study and searching with other terms was not within the scope of the study. The searches resulted posts between years 1997 to 2025. The posts were mainly gathered to answer the research questions, but they were also used as material in general due to scarcity of literature focused on difficulty in video games.

Almost all 3,025 search results from both in total were checked if difficulty is mentioned related to the context of the study, as difficulty can be mentioned in context of something being difficult in general. Checking was done by opening the posts individually, using browser-based search feature to highlight usage of word “difficulty” in the post and cursory reading the posts to get more context. The

posts were checked individually because the title was not enough for judging if the post is relevant and because the search results only showed the title, author, main topic tag, and publication date. Due to amount of search results, not all possibly relevant posts were collected because they would have likely not been used as they only mentioned difficulty in common context and did not relate to the main aspects of this thesis. Some posts referred to posts outside the Game Developer website and some of the writers post or republish posts to or from other websites, like their own blog, and thus they are equal to Game Developer posts in this study.

In total, 1,106 posts were collected to a text document with their title and web address but also possibly used part of the post or explanation what the post is about to make managing the material easier. Collected posts were sorted based on which topic they related to get a better picture of from what elements the difficulty in games consist of and how the difficulty has been discussed. While sorting the posts, the most likely used posts were collected to another text document and sorted based on which thesis-related topic they related to, like research questions; the document contains 501 Game Developer posts. From collected posts 224 were used in this thesis.

The following section will present found discussions and trends around difficulty in video games. Discussions were mainly focused on the following two topics: how difficulty has changed over time – especially how older games are significantly more difficult compared to modern games – and accessibility.

3.1 Change in Video Game Difficulty

The one of most common discovered discussion topic revolved around change in video games regarding difficulty, particularly how modern games are easier than older games [26–28, 32, 44, 81, 108, 154, 157, 159, 161–176]. This phenomenon is also referred as “casualization”, which refers to the rise of casual gaming. This thesis

does not go in detail why it happened, but Jesper Juul has authored a book about the topic, *A Casual Revolution* (2010). In the book, he explains how the success of the Nintendo Wii (2006) and explosive increase of browser-based games, mobile games and social games changed video games fundamentally during years from 2000 to 2010. According to Juul, the casual revolution is a reinvention of both video games and players. [177] The discussion on this topic began in 2010 and started to fade after 2015.

Some developers expressed how they miss the higher difficulty and lack of “hand-holding” in games. Len de Gracia writes in her post “Nostalgia: When RPGs were a pain, yet several times more rewarding” (2010) where she expresses that games are “getting too easy and too reflex-heavy”. She seems to miss how RPGs used to be before:

“In a way, gone are the days when plots were made interesting because a gamer ultimately feared that a wrong dialogue choice would change the course of the story forever. Gone were the days when interactive game assets weren’t marked, when solutions to plots relied entirely upon the gamer’s ingenuity.”

These traits made RPGs impactful for her. [161] Cary Chichester discusses in his post “The Problem With Easy Games” (2011) how difficult is important for creating engaging gameplay and some problems with easy games. He seems to be delighted to play *Dark Souls* (Bandai Namco Entertainment / FromSoftware, 2011) after playing some AAA titles which are more approachable and forgiving, because he is a “masochist”. However, difficulty is not the only way to make a game engaging, but difficulty can make the player pay more attention to what they are doing and thus give more rewarding experience. For instance, when the game has “hand-holding” or predictable AI, the player can feel coddled during playthrough. [81]

Josh Bycer mentions in his post “The Fine Line between Challenge and Masochism.” (2012) that it is usual that older players mention difficulty as one of the key points why games were better before. There are also players who interfere the discussion about difficult areas in games like *Dark Souls* by saying that the players are just not good enough, because the game itself is “fine”. Bycer argues that good difficulty is something that the player can beat either by skill or character development, not something that feels crushing. [159]

Caleb Compton touched the same topic in his post “The Difficulty Dilemma Part 1” (2019). It seems that when a game is associated with high difficulty, there are expert players who respond to complains of the difficulty of the game by saying “git gud”, which is a gamer expression meaning “get good”, or calling them “noobs”, which is another gamer term meaning “newbies” but often as an insult. Thus, there seems to be a division with people who see difficulty as an obstacle which gatekeeps the players from proceeding in a game and who see high difficulty as a challenge to be beaten. There are also highly difficult games, which are a response to modern game design. Compton mentions in his post game *Getting Over It with Bennett Foddy* (Bennett Foddy, 2017) as such, since the creator himself has expressed such in interviews and in the narration of the game. According to Compton, Foddy’s game is a direct response to that requiring the player to start the game from over again from the very beginning when the player dies has gradually disappeared from games, and Foddy believes that there is an audience who enjoys this kind of experience. Compton argues that one of main reasons why modern games are more forgiving than games from the late 1970s and early 1980s is increased memory space and ability to save the game. Arcade games were also designed to be difficult for business reasons and thus starting over at the beginning of the game after losing was a part of the monetization, not really about game design. When home consoles started to take their place in the market, many early console games were direct ports of

arcade games and other games took inspiration from them. Another reason he sees is changing demographics among gamers. In the early days, video games were also mainly targeted at children and teens, which tended to have more free time and less games to play and thus were more willing to play the same levels over again to master them. [26]

Richard Terrell argues in his post “A Defense of Gameplay part.3 [sic]” (2012) that as the video game industry expanded, video games have gotten more non-gameplay features as their selling point. Therefore, “[t]he heavy focus on story, graphics, and sound along with a lowering of the skill floor overall has pushed the industry closer toward producing games that focus more on passive entertainment and interactivity rather than gameplay”. Terrell argues that players were before more willing to put more time and effort into learning games. He sees that “[f]or better and for worse, games have changed to be more accessible for gamers with less experience, less patience, less time, and therefore a gamer who is less likely to be intrinsically motivated by gameplay”. He has noticed that there is a trend of that game developers focus either on gameplay or non-gameplay. Another trend is a lower skill floor, which refers to games requiring less skill from the players. Terrell brings up that NES and SNES games often had only one difficulty mode and players had to read instruction books to learn the controls or figure things out while playing. Similar to Compton [26], he thinks that one reason why older games were harder was that hardware was more limited and thus saving a game was much more limited compared to modern games. Therefore, old games required more skill to beat them, especially when the player had to start again from the very beginning after game over. The third and last trend he has noticed is that games are using explicit positive reinforcement loops, like loot drops, leveling, collectables and reward schedules. [163] Similarly, Steve Mellbye-Stolen mentions in his post “The demanding art form that is games” (2013) that “[o]ld Nintendo 8-bit games are

known for their brutal difficulty” and often did not have a save function. There are many indie and mobile games, which utilize the gameplay mechanics from previous eras. In the other hand, there are modern AAA games which remind of movies with long cut scenes, frequent saving, regenerating health and unlimited tries. Mellbye-Stolen argues that gameplay is crucial in games, no matter how much story the game has to tell. [27]

Corey Moore writes in his post “Game Difficulty” (2012) how discussion about games has changed. According to him, people started to say that they have finished a game instead of beating a game. He also mentions how many players say that modern games have been “simplified”, “dumbed down” or made for casual audience when they are compared to older games. This describes how at the time some players were frustrated at how the games have changed in general. Moore does not think that easy games are necessary bad games, but there are players who demand being challenged. The lack of sufficient challenge can quickly bore the player, but the player might end up adding their own self-imposed challenge to make the game more interesting to play, like play through the game without taking any damage. The main point of his post is that the players who have already beaten the game and want a bigger challenge should not be forgotten. [157] Similarly, Chris Waldron talks about in his post “Failure – I Choose You!: The Rise of Self-Enforced Hardcore Modes” (2012) how this difficulty debate has been around for years and how it causes some players to make their own challenges. He summarizes the change as “games no longer exist to beat us; they exist to be beaten”. [108] Similarly, Michel Sabbagh brings up in his post “10 years later, F.E.A.R. is still the ultimate shooter experience” (2015) how modern games provide features, which attempt to keep the player playing the game after experiencing the main part of it, like additional difficulty modes or New Game Plus [178]. John Mawhorter discusses in his post “Throw the Hardcore a Bone, Not Just Your Table Scraps” (2010) how hardcore players seem to have been

“ignored by some in the shift to casual/Wii/portable gaming”. Thus, he argues for importance of taking hardcore players into account in games by adding difficulty modes, even if they were not the target audience. [162]

Brandon Kidwell mentions in his post “GDotD - CONTEXT & DIFFICULTY [sic]” (2014) that decreasing difficulty in games is brought to discussion repeatedly, and thus “seasoned gamers” look elsewhere for more challenge and more casual players are involved. Kidwell thinks that this is partly true, and it is important to have games which entertain both hardcore and casual players. To do it, he argues that designers need to focus more on how mechanics are created and how information is displayed to players. In his post, he gives some advice on how to do it. [174] Similarly, Matthew DeLucas discusses his post “Thoughts on Fighting Game Difficulty and Casual” (2016) how fighting games are attracting more casual players. He also gives some tips on how to do it by analyzing why fighting games are difficult and providing solutions how to make them more appealing for casual players. [175] Whereas ML Azar gives in his post “Making Hardcore levels for Casual” (2014) some level design tips to create “hardcore levels” which can suit casual audience better. With that he seems to refer to making levels for casual players but with “old school feel”. [176]

Glen Joyner Jr discusses in his post “Is the video game industry “dumbing down” for the casual?” (2013) the change in video games. Like Juul [177], he sees that games started to change when Nintendo DS (2004-2005) and Wii (2006) were released, but mobile games made the change even more evident. The change made the games become more accessible and thus decrease difficulty and, in some cases, also complexity of games but they are also simpler to control. Before that, games were mainly developed for old-school audience, and this change has made some hardcore players worried that difficulty decreases even in “the most hardcore of games”. Another thing that has made games easier is restore points, which lets the player store

the exact state of the game and return to it later on. In addition, in the post, he mentions that when developers of *Dark Souls* expressed interest in adding an easy mode to the game, many players were against it, arguing that it would ruin the experience of *Dark Souls*, because it is supposed to be hard in their opinion. Later, it turned out that the easy mode was a mistranslation and would not happen, but the reaction itself is worth noting. Offering difficulty levels has become more varied in modern games, but despite that, “Very Hard” difficulty might not feel as hard as before for some players, which could indicate that the industry has “dumbed down” the difficulty. This likely affects the expert players’ experience because that difficulty mode is targeted at veteran players and difficulty modes should match their target audience. However, it is not easy to do but it would be good to keep in mind during the development. Joyner Jr agrees that having a larger audience can only be beneficial if the features to cater different players do not detract from the game. After all, game development is a business aiming to get profit. But more importantly, game developers create experiences and thus it is important to ensure that it is kept at the center of the development, even when targeting a wide audience. [164]

Josh Bycer discusses in his post “Debating Old School Design” (2015) old school design. He defines old school as “[d]esigning a game without using modern views of design or systems”. Back then, there were significantly less standards and restrictions, like regarding accessibility, which gave more freedom to the designers. However, in contrary to this time, they had more technical limitations. Bycer also brings up how those games had no save feature, not to make the game difficult but because the technology lacked standardization. Nevertheless, for modern players, old school often means difficulty: “Games where you’re not led on a path, have to deal with tutorials, treated like a child, etc.”. According to him, this is why it seems like “there has been almost a renaissance of both the term old school and increased difficulty”, which refers to games like *Dark Souls*, *Super Meat Boy* and many

Rogue-like games, which were designed around being challenging. Modern games that claim to be old school still often have modern features, like checkpoints, so term “old school” can refer to different things, like graphics. [28] In his earlier post, “Smoothing out the wrinkles of game design.” (2010), Bycer mentions that “[o]ne of the oldest arguments between older gamers and younger ones is that games these days are not as complex/good as they were back in the day”. This seems to signify that the discussion has lasted longer than the collected posts indicate. But the main reason Bycer thinks that older players see modern games being “dumbed down” is that systems and mechanics have been streamlined to improve their understandability, which is positive in his opinion. Compared to older games, modern games have standardized controls, moved information from physical manuals to game itself, and provide more help to the player. Another common argument by older players Bycer brings up is that games have become easier. Bycer partly agrees with it, because it is important to understand why older games were more difficult. If difficulty was caused by UI or mechanics which were challenging to understand, it is not a sign of a good game. [165]

Josh Foreman discusses in his post “Rogue-Lite Life Lessons” (2016) time when he was leading a team which developed a retro game that aimed to capture feeling of difficulty from NES platformers. It made him research NES games and decide to beat one of them. He says that “[y]ears of easy games had softened [his] tolerance for repetitious failure”, referring to the first hour of playing the game being exceedingly frustrating due to continuous failing. But after some hours of playing the game, his mindset changed which led him learn from his mistakes. [171] In a way, this can be seen as one reason why someone may think that older games were better, because they required more from the player and thus improved their perseverance.

Michael Abbott discusses in his post “Easy does it harder” (2012) how games have become easier, but harder to control. He does not think that it is not necessary a bad

thing that games offer less challenge for “serious players” and are easier to approach for casual newcomers. He gives different game examples of how this change is shown and how even games that are considered “the hardest of hard” have gotten easier, which refers to *Dark Souls* being easier than its predecessor *Demon’s Souls*. [166]

Brandon Sheffield interviews in post “The Design Challenges of Resistance 3” (2011) Insomniac’s Cameron Christian. They both seem to be vexed at how difficulty of games needs to be lowered compared to what games used to be. The difficulty conversation derives from that one enemy was originally a lot more complex but turned out to be too complex during playtesting and therefore had to be simplified. Christian thinks that players seem to have changed a bit, and Sheffield brings up that players are more likely to give up these days. Christian sees the reason to be that games have become a broader medium, which is unfortunate in his opinion. He probably thinks like this because he identifies as a hardcore gamer and prefers old-school games, where players had to figure things out. Sheffield also mentions how there are indie games, which are more like those old-school games in terms of difficulty, but also *Demon’s Souls* is mentioned. [167] While Christian Nutt interviews *DayZ*’s project lead Dean Hall (2013), he mentions how AAA games are making things easier and more seamless for player, like “checkpoint every five seconds”. But he also mentions how during recent years, some “aggressively difficult games” have been released, like *Dark Souls* and *Spelunky*. [168]

Stuart Ryan discussed in his post “Are modern video games too easy?” (2015) if all modern games are now “too easy and predictable”. He mentions how some players complain how modern games are being “dumbed down” and have more “hand-holding”. However, not all new games are “too easy”, where *Dark Souls* series is, yet again, brought up as an example. Ryan also discusses how games can be considered “extremely powerful storytelling devices”, where cut scenes have a significant role. But the answer to his own question is in his opinion “no”. There are now “a huge

variety of games available to all types of gamers” and thus the change is not necessarily a bad thing or does not make new games worse. [169] Ruth Keena touches in her post “Learning to Teach” (2015) the discussion by exploring why modern games are seen as easier regarding in-game instructions, especially tutorials. She finds herself often around the topic of “the increasing simplicity of games” in conversations. According to her, “[m]any gamers, students and designers believe that the games they used to play were harder, and as a result, better”. In her post, she argues that well-made tutorials do not simplify a game or make the use of mechanics easier but mitigates unnecessary frustration and expresses the player what is expected from them and what they should be doing. Thus, lack of tutorials does not make a game more difficult or challenging, but confusing or frustrating. [170]

Michael Clarkson discusses in his post “Two (too?) easy games” (2011) the topic by arguing how it is challenging to say accurately if a game is “too easy”, but it is also not easy to define if a game is “too hard”, because it can depend on the player’s skills, experience and values. Many game reviewers are skilled and experienced players and thus have played since the early days of video games “when challenge was practically all a game could offer in terms of fun”, which affects how they see and review the games. “Too easy” is often used to express “too boring”, and Clarkson thinks that some games are misunderstood to be “too easy”. He argues that since games tend to mix skillful play and free play together, they can appear “too easy”. For example, the main path of the game is easy, but the game contains optional difficult challenges, which reward skilled players. Therefore, to judge a game’s difficulty, one should understand what values are at the center of the game experience. [154]

Josh Bycer mentions in his post “Lessons of Game Design learned from Super Mario Maker” (2015) that at the time he wrote the post, there has been five or six years of significant surge of challenging games coming to the market, like *Super Meat Boy* and *Demon’s Souls*. According to him, many players “have proclaimed

this as great and a throwback to the days of classic games that were meant to be brutally difficult”. These players judge the quality of a game based on its difficulty and scorn on criticizing it. However, Bycer points out that it is skill-based gameplay, not “overwhelming difficulty”, that makes the *Souls* games praised. [172]

Xander Markham argues in his post “Do We Really Want Difficult Games?” (2010) that there are developers who claim their games to be more challenging than they are in reality [173]. Similarly, Richard Terrell mentions in his post that “[a]dvertisers and marketers often appeal to our egos when they claim we can be bigger, badder, and more powerful than ever when we play their game” [163]. Markham also mentions that “[d]ifficulty is one of the main points of contention for modern gamers fearing that their hobby is being diluted as to bring in new audiences”. He thinks that when people express their opinions on games, they do not “give much thought to exactly what makes a game work” but judge individual segments of play without looking at their relations to each other. When people discuss the difficulty of a game, some may also boast about their skills, which may not always be true. [173]

In conclusion, it seems that some players might have a misconception of why games were more difficult “in the old days”. More often, older games were difficult due to technical limitations, not because they were designed to be difficult. However, this “unintentional difficulty” seems to be what people remember and some also cherish, but nostalgia may also affect how older players look at the older games. It is understandable how some hardcore players were not happy about the “casualization”, because it changed video games in general and player demographics in a significant way. The discussion also shows how difficulty is an important factor for a certain player group, for better or worse. In addition, the posts support and supplement Juul’s book [177] regarding reasons for casualization.

3.2 Accessibility

Discussion around accessibility regarding difficulty started in 2005 but it got significantly more active since 2019. This discussion has a connection to the discussion of change in video games, as accessibility is a part of making games enjoyable for a wider audience. However, more importantly, it is about gaining more potential consumer groups to buy games, because the industry's primary goal is to gain profit [179]. Therefore, taking accessibility into account is especially important for AAA games which have high production cost.

But what accessibility means in a video game context seems to be ambiguous. Lars Doucet (2011) defines accessibility in his post “RPGs, Challenge, and Grinding” (2011) as “expanding your game’s audience by removing barriers”. He seems to refer to both disabilities and being able to progress in the game with accessibility. [180] Similarly, Ernest Adams (2005, 2007) approaches accessibility from disability and progression view [181, 182]. Adams also mentions how accessibility legislation is growing and to avoid possible suing in the future, it is wise to consider accessibility in one’s game [182]. As for Henry Ewins, he discusses in his post “Rewriting the horrors of mental health representation in games” (2022) that content or trigger warnings are a part of accessibility [183].

Mattie Brice writes in his post “Mass Appeal vs. Accessibility in Video Games” (2012) about tension between “hardcore” players and a wider audience regarding RPGs. He argues that those hardcore players he refers to see terms “mass appeal” and “accessibility” as interchangeable. He sees that their way of thinking derives from that “[v]ideo games reflect themes and skills found in boys’ styles of play as children, and any introduction of qualities that are different from that (especially if tagged as feminine) are cast out as inferior “casual” games”. Therefore, this kind of discussion stems from boy culture and it can create barriers for players who are not keen on such “difficulty paradigm”. Brice defines accessibility as a design philosophy which does

not change the experience for the original audience but opens up games for more players. [184] Similarly, Amr Al-Aaser argues in his post “Permission to Fail” (2015) that “too many gamers treat accessibility as a failure” and difficult games itself are not the problem but expectation of that everyone can and should be able to beat frustratingly difficult sections in games. He argues that it should be acceptable to lower the difficulty level and to decide not to push through frustrating things, as there are players who judge other players based on their performance. But there are also games, which possibly judge the player for selecting easy difficulty level, like *Wolfenstein: The New Order* (Bethesda Softworks, 2014) where the easiest difficulty is implied to be for “babies”. Al-Aaser’s main point is that players should be able to define their own experience, not external forces. [185]

Jim Rossignol discusses in his post “Blogged Out: ‘Difficulty Setting’” (2007) related to what EA’s CEO at the time, John Riccitiello, said in the Wall Street Journal. According to Rossignol, Riccitiello made a “valid point”: “We’re boring people to death and making games that are harder and harder to play.” Rossignol argues that at least “the most mainstream of games” should be accessible to make the medium accessible for everyone. According to him, mainstream games should feel comfortable for everyone, “whether they’re too easy for the hardcore, or too populist for the fanboys”. [186] Lewis Denby argues in his post “Analysis: Video Games – Don’t Be So Difficult” (2009) that difficulty games should not “remain part of some elite party to which [he is] not invited”. With the post, he expresses that people who are not so good at video games or do not have much time to play should also be able to enjoy games they choose to play. [187]

Josh Bycer mentions in his post “How Difficulty Design Affects the Experience” (2017) that whenever a challenging game is released, discussion about difficulty ignites again. At the time, the game was *Cuphead* (Studio MDHR, 2017) and developers seemed to argue if high difficulty is limiting or a feature. Bycer argues

that difficulty has an important purpose, but making a game extremely difficult is not good. According to him, when difficulty is talked about, accessibility is often a part of it. He mentions one discussion between developers on social media, where it was argued that difficulty settings go along with accessibility settings like color blind modes and subtitles. Bycer himself disagrees with it because difficulty settings change the gameplay while accessibility options do not. He illustrates it by saying that “[p]eople who feel that difficulty settings are easy to design sit next to those who say that multiplayer modes can be done in a week”. However, one of his main points is that “[a] game designed for everybody is a game designed for nobody” and thus a game should have an intended audience to create a solid experience. He also thinks that “[a] great experience is not the same as an accessible one” which could be interpreted to mean that accessibility itself does not make a great experience. He also seems to encourage the developers to make decisions which suit the intended experience, not just add something because some other game has it, because he highlights that “[j]ust because one game does X, doesn’t mean that every game can and should do it”. [33]

Leigh Alexander argues in her “Opinion: If You’re Not Having Fun, Play Something Else” (2009) how “‘Everything For Everyone’ Means Nothing To Most” (stylization removed by author). Her post relates to how games are becoming more accessible and have become mass media entertainment, causing hardcore players to become a minority in demographics. She thinks that it is essential that all games do not try to be everyone’s games, because if everyone enjoyed the same, there would not be such variety of games. When there are various kinds of games available, it also enables a very diverse audience. [188]

Alissa McAloon brings up in her post “God of War director: accessibility isn’t at odds with creative vision” (2019) another discussion on social media, where it was *Sekiro: Shadows Die Twice* (Activision / FromSoftware, 2019) which started the

difficulty discussion this time, but as the conversation went on, it was about “the relationship between accessibility and a developer’s creative vision”. In the discussion, some developers and “accessibility advocates” argued that accessibility options can make a game playable and enjoyable for a wider audience. It seems that the discussion can end up being about accessibility being seen as easy gameplay, while it is more like about options. [189] Keith Burgun’s post “My thoughts on difficulty in games” (2019) is also inspired by the difficulty discussions stemmed from *Sekiro*, but from another perspective. In the post, he brings up how in player community some players seem to think that one needs to gain “legitimacy” by reaching some bar to truly talk about the game, which should not be the case in video game culture in his opinion. Burgun himself does not think that having accessibility options makes a game lose something, in contrary to the players he refers to. He thinks that good ways to make a game more accessible are, for example, easy modes, cheat modes, and in general options which make experiencing the full experience more accessible as many as possible. Thus, in his opinion, if someone wants to boast their skills to gain credibility, they can just say that they beat the game on hard mode. This refers to that there are many people who build their identities around games they play, because they view video games as an important cultural phenomenon. Therefore, to belong to some group, people can feel pressured to play or not to play certain kinds of games. He personally wants games to be more inclusive and thus games “should have more options to allow players with different needs and abilities to engage with them”. [190]

Caleb Compton discusses in his post “The Difficulty Dilemma Part 2” (2019) how difficulty can be an accessibility issue. Compton argues that it is not easy to make games more accessible, as it is more complicated than adding subtitles or taking into account color blindness when accessibility looked at from difficulty perspective. He thinks that one way to make games more accessible is to support multiple different

controller types and configurations. Another way is to provide a wide variety of adjustable options to help the players to get through parts of the game which may be overly difficult due to a disability. Such settings could, for instance, slow the game down or add additional auditory cues to enemy attacks, and thus the game could be made more accessible without need for difficulty settings. [191]

Bryant Francis interviews in his post “Q&A: Evolving the combat design of id Software’s *Doom Eternal*” (2020) game director, Hugo Martin, of *Doom Eternal* (Bethesda Softworks, 2020). One of Francis’ question stems from that there is “a ton of work going on with accessibility design in the shooter space right now”, so he wanted to ask “[w]hat does designing accessibility mean in a game with a game like *Doom Eternal* that’s fixated on learning and mastery” from Martin. Martin answers that it is “important to make it as accessible as it should be”. He seems to think that the game can be accessible when the game is able to educate players effectively and difficulty level is right for the player’s skill, possibly by providing difficulty modes. He compares this being similar to how basketball can be made accessible for everyone. The studio has also tested the game with colorblind people and people with other disabilities to ensure appropriate accessibility features. Martin mentions that there was a “brief conversation about how games needed to be easy” and with what he disagreed, because there are non-easy games which have a huge audience, like *Call of Duty* and *Fortnite*. But he also mentions that skill-based games have large audiences in general. [192]

Josh Bycer discusses in his post “What Does Accessibility Mean in Game Design” (2021) topic of the title. According to him, “[a]ccessibility means different things for different people” among both consumers and developers. There are no checklists for accessibility, but even if there are universal accessibility elements, like control rebinding, volume sliders and text size adjustment, which can suit any game, accessibility should be “approached differently for each genre and each gameplay loop”.

This is because there are accessibility features which relate to specific elements of a game, which can stop someone proceeding in the game. Bycer brings up that many developers and consumers have a misconception of that difficulty modes are enough to make a game accessible, while Bycer himself argues that they do not guarantee accessibility. He also argues that “good game design is accessible game design” (lower case by author), but the problem is that many see UI/UX design (user interface/user experience) only as UI/UX design. Bycer makes a division between approachability and accessibility, which approach an accessible game from different sides. Approachability, or UI/UX design, relates to altering the gameplay and design of a game to enable more people to play it, while accessibility solutions are something that can be toggled on or off or elements that can be “layered” onto the core gameplay and design of a game to make it more accessible without changing the way the game is played. [193]

In his another post “Debating Difficulty in Game Design” (2021), Bycer explains how difficulty is not a part of accessibility, but designers need to pay attention to it. In the post, he mentions that “every game should be built around accessibility features”, and thus he does not focus on accessibility hurdles in the post. With the post, he wants to end the discussion about that difficulty is “an accessibility hurdle”, because it does not belong to accessibility but approachability debates. He argues that accessibility features do not “save a game with a poor UI/UX or problematic core gameplay loop”. Therefore, even if one should consider accessibility options as early as possible during development, it should not mean ignoring the playability of the game. Bycer brings up how some developers have used invincibility as an accessibility feature, like in *Psychonauts 2* (Xbox Game Studios, 2021), but it does not help the player if they are struggling with platforming. Thus, accessibility should be designed based on the gameplay of the game. Bycer also argues that understanding the skill curve and pain points of one’s game is essential, because if the

designer fails that and tries to add difficulty modes, it is harder to notice problems with the core gameplay loop on easier modes while the problems are more evident on harder modes. Therefore, difficulty is a part of approachability, not accessibility, and according to him, the best examples are games which have integrated difficulty design into the core gameplay loop. The goal of approachability is to improve the design so that people want to engage with the core experience, not turning off game systems to enable people to play the game. [194]

Bycer continues the topic in his post “Why Accessible Design Can’t Save Inaccessible Gameplay” (2021) but discussing the design trap of only considering accessibility but not UI/UX or approachability, because it can make an accessible game inaccessible. He uses games *Toodee and Topdee* (dietzribi, 2021) and *Celeste* (Maddy Makes Games, 2018) as examples of games which feature “assist mode”, but despite of that have a high churn rate. This makes him ask a question: “Why do games with complete accessibility tied to their gameplay not helping people finish it or have high clear rates?” Both games he used as an example have implemented their accessibility features outside of the core gameplay loop and UX. According to him, the core gameplay loop and UI/UX of a game are the most important elements of a game, and therefore, if they are not well-designed, nothing else, like story, aesthetics or accessibility, can keep players playing the game. He illustrates using assist modes or in-game cheats being like “trying to fix a hole in a ship with band-aid”. Therefore, the best ways of implementing difficulty options concern integrating them directly into the game, which can be done either implicitly or explicitly. He argues that it is better to put difficulty settings directly into the game compared to having them in a menu. However, he mentions that if one considers making one’s game “consumer-friendly”, it is better to have difficulty settings, even if they were imbalanced, compared to having “one blanket difficulty setting”. This is because he has noticed such games being able to keep the players playing the game better. His

main argument is that accessibility features are no substitute for UI/UX design and do not alone improve the playability and approachability regarding player retention. If accessibility is the only focus and playability of the game is ignored, the result is a game that everybody can play but no one wants to. [195]

Bycer continues the topic of inaccessible accessibility in his post “Prince of Persia’s accessibility is inaccessible to some” (2025), which was inspired by *Prince of Persia: The Lost Crown* (Ubisoft, 2024) winning the best accessibility feature in a game award at the Game Awards for 2024. While he thinks that the awarded feature is original, it was implemented as a part of playing the game, did the player want to use it or not. The ability lets the player take screenshots to make notes, but only a limited amount before needing to delete previous ones to take more. The player can also gain more screenshot slots by completing some optional and harder platforming challenges. Therefore, the accessibility feature is used as a consumable or resource, which is how accessibility should not be implemented in Bycer’s opinion. Instead, accessibility features should always be available when they are needed. Accessibility features should not be used to “fix” problems in the game, because they cannot save a poorly designed or unpleasant game. Thus, a balanced game is necessary for having a good basis for accessible and approachable game, but accessibility features should be tailored for the game and support the experience. [196]

In conclusion, accessibility in video games is considered and implemented in different ways. There seems to be a misconception of accessibility meaning easy difficulty, both among some players and developers. It can cause games have ineffective accessibility options like invincibility mode which may only help with certain challenges in a game. But accessibility should not mean designing a game for everyone but making a game accessible for people who enjoy the targeted experience, because people enjoy different things but people who enjoy the same thing can have

different needs. Having a disability does not remove desire to be challenged in video games [197].

4 Difficulty Model

Difficulty has been one core element of commercial video games since the beginning, as Section 2.1 explained. Despite this, within this research, there has been no model which attempts to map all relevant elements which affect the difficulty, inside and outside a game. Game design books look at the difficulty from game designer's perspective, but not all difficulty comes from the design or is intentional. Difficulty is a vast and complex topic but also has a subjective side, and thus, design covers difficulty affecting elements only partly. In addition, presented difficulty taxonomies in Section 2.2 categorize difficulty into explicit difficulty categories based on in-game elements, leaving out difficulty affecting elements which do not explicitly relate to difficulty.

Therefore, in this chapter, a model which attempts to categorize and map all difficulty affecting elements is proposed. However, the model is not complete and aims to explain why difficulty in video games such a complex topic is and from which elements the difficulty in a game may consist of. The model is based on collected material and the author's knowledge about video games. It considers difficulty affecting elements in and around games in general, not regarding specific genres. It can also be used a tool or framework when analyzing difficulty of a game.

First, overview of the model is presented and then it is explained in detail in the following subsections.

4.1 Overview

The model is separated into two parts: *outside or around game* and *in-game*. The outside or around game part consists of elements which are not a part of the game itself as software but can affect the difficulty. In-game part considers elements which are a part of the game as software but also information which is bundled with the game, such as manuals and the package. Overview of the classification is shown in Figure 4.1.

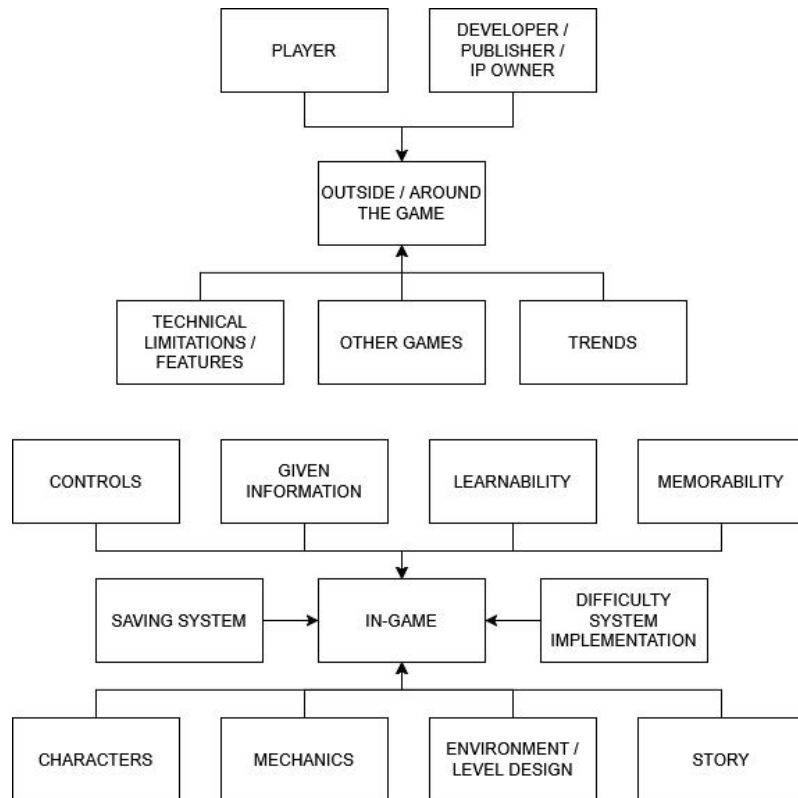


Figure 4.1: Overview of difficulty model

The following sections explain what these classes include and why they are included in the model. Some of the subcategories have a deeper classification structure, which is presented in their subsections. The subclasses are not complete but aim to explain what the class includes in a general manner, but they can be altered or

expanded to analyze difficulty elements in a game or in a certain genre. Thus, this model can also be utilized as an analysis tool.

4.2 Outside or Around Game

This section introduces elements which can affect the difficulty of a game outside or around it. The outside elements refer to elements which are directly or explicitly in touch with the game but are outside the software itself, like the player and the development team. The elements around the game refer to more indirect elements, which can affect the difficulty, like other games and trends.

4.2.1 Player

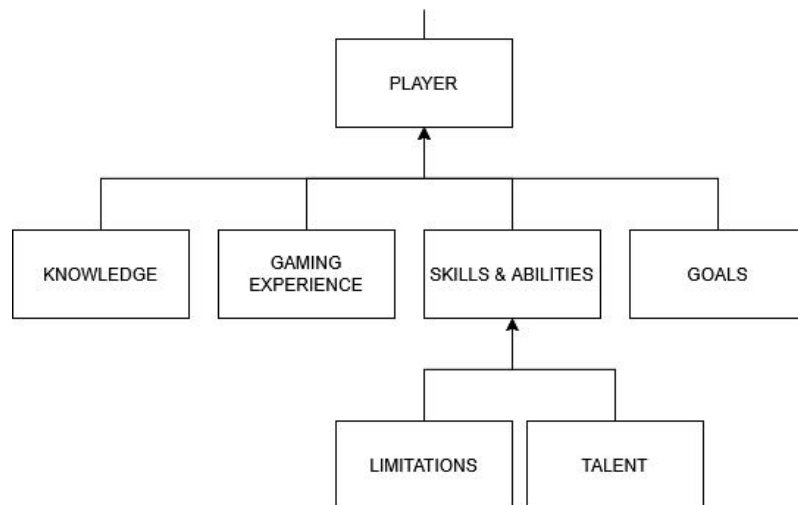


Figure 4.2: The player class structure

Players are different and thus can experience difficulty of the same game differently. One affecting factor is what kind of skills and abilities the player has. If a game requires quick reflexes, a player with slow reflexes can struggle with it more than a player who can react quickly. Another game could require the player to solve puzzles and, in this case, difficulty of them depends on the player's puzzle-solving skills. A game can contain different kinds of challenges, and this makes

the game difficulty progress differently for different players. This is why there are games which allow the player to control specific challenge type difficulty. *Silent Hill 2* (Konami, 2001) lets the player to select difficulty level individually for action and riddle challenges, while *Shadow of the Tomb Raider* (Square Enix, 2018) has combat, exploration and puzzle difficulty selectors and the combination of them is used to display overall difficulty of the selection. Therefore, player's skills and abilities can be both limiting and enabling, but if a player is a talented player of a game, it can make the game easier for them compared to how an average player feels about difficulty and progression of the game, especially during their first playthrough.

Knowledge of a game can affect how easy the game feels, especially if in-game knowledge is scarce. In *Dark Souls* (Bandai Namco Entertainment / FromSoftware, 2011), the player is not given any information to which direction they should continue after they arrive to the hub area for the first time. However, the player is instructed what they should do next to progress in the game, but only if they talk to one specific NPC (non-player character) at the hub. The game does not give much information about the game in general and therefore using guides can be helpful to learn more and quicker about the game. If the player utilizes a guide when they are playing *Dark Souls*, especially for the first time, they can get recommendations in which order they should proceed the areas or when they should go to a specific area to make playing the game easier and avoid getting stuck in areas they were not supposed to go yet. The game also contains hidden bonfires, which the player may not be able to find without a guide as they are hidden behind an illusionary wall. However, whether the game makes the player rely too much on a strategy guide is another question. Even secrets are one mainstay of games, information can be too hidden and the player needing to rely on a strategy guide to finish the game is not a good sign [198]. When a player makes a decision which is based on information outside the game, it is called "metagaming" [199].

How long has the player played video games in general, or the specific video game can affect how they feel about the difficulty of the game, as playing games cumulates knowledge and experience about them. If the player is used to playing a certain kind of games or genre, they are likely to feel a new such game familiar and thus easier compared to someone who has never played such games. The experience can also affect to what the player is used to and thus they may have expectations regarding specific games, like how difficult they “should” feel or be, which can affect if the difficulty “feels right” or if the game is “too easy”.

What the player wants to achieve or do in a game can affect the difficulty, as some goals are more difficult to accomplish than others. Some games can contain branching stories and what kind of decisions the player wants to make story-wise can affect the difficulty. In *Baldur’s Gate 3* (Larian Studios, 2023), the player can make a vast number of decisions which affect the story of the playthrough but also the difficulty. The player can decide if they want to follow a good or evil path, which can affect, for example, which items they can obtain or which fights or which version of a fight they need to win. The player can also have their own challenges, which are outside the game, like playing the game without taking any damage or using only certain weapons during the playthrough. However, those challenges are outside the intended difficulty, but the design enables them. In addition, there are players who want to collect and unlock or achieve everything in a game, which can make playing the game harder for them compared to players who just want to experience the main game.

4.2.2 Technical Limitations or Features

Difficulty of a game can depend on technical limitations or features, which are unrelated to the game itself. For example, difficulty can depend on region because there are different regional power frequencies which affect frame rates. NTSC (National

Television Systems Committee) region, like in North America and in Japan, utilizes 60 Hz, giving 30/60 Frames Per Second (FPS), while in PAL (Phase Alternating Line) region, like in Australia and in most of Europe, 50 Hz is used, giving 25/50 FPS. For this reason, games run faster in NTSC region compared to PAL and thus game experience and difficulty of the game can depend on the region.

In *Crash Bandicoot 3: Warped* (Sony Computer Entertainment, 1998), it affects time trials. NTSC-U (National Television Systems Committee - United States) and PAL versions use different rounding of times: NTSC-U times are rounded to the nearest 30th of a second and always end in 0, 3, or 6, while PAL times are rounded to the nearest 25th of a second, meaning that hundredths of a second can always be divided with 4 but not when they end in 2, and they are never odd numbers. [200] About one of third PAL time trials are harder than in NTSC-U version, especially two last bonus levels [201] but is due to them missing in NTSC-U version which was released first [200]. At the time, games could not be updated or patched via Internet connection, so some bugs and missing or incorrect things in the first region release could be fixed in later regional releases. Some enemies are also tougher in PAL version, but it is uncertain if it was done to compensate FPS difference [200]. The game also contains optional time trial challenges, developer times, which are the fastest level completion times of the developers of the game. However, they are more difficult and some impossible to beat in the PAL version due to the frame rate difference. Therefore, these developer times are not displayed in the PAL version, as the developers did not want to expose the players to impossible challenges. [202]

Technical limitations affect how games can be technically implemented. As mentioned in Section 2.1, saving a game was not as straightforward as now in the early decades of commercial video games. Hardware memory and capacity of data storage was also much more limited at that time, which affected size of the games and how game data could be processed. Thus, older games could not have as much complex-

ity and content as modern games have and to make the games last artificially longer or the arcade games more profitable, difficulty was utilized [191, 203].

While technical difficulties can limit or affect the way games are designed, it is not necessarily negative. *Space Invaders* (Taito, 1978) is said to be the first game with a difficulty curve, where the game is slower at the beginning and then speeds up when there are fewer enemies. However, it was unintentional, because it was caused by a glitch in the microprocessor, which sped up the enemy animations, when there were fewer of them to render. [41, 204]

After having the possibility of updating games via Internet connection, games can be altered to be easier or harder after their release. For example, when *Oddworld: Soulstorm* (Oddworld Inhabitants, 2021) was released, some of the players complained about difficulty of the third level, “The Blimp”. Later the same year, the level was updated to make avoiding being hit by dropping projectiles easier by improving covers and adding cross-hairs to indicate where the projectiles are going to land. In addition, timer of the secret door was removed, making full completion of the level easier.

4.2.3 Development Team, Publisher, or IP Owner

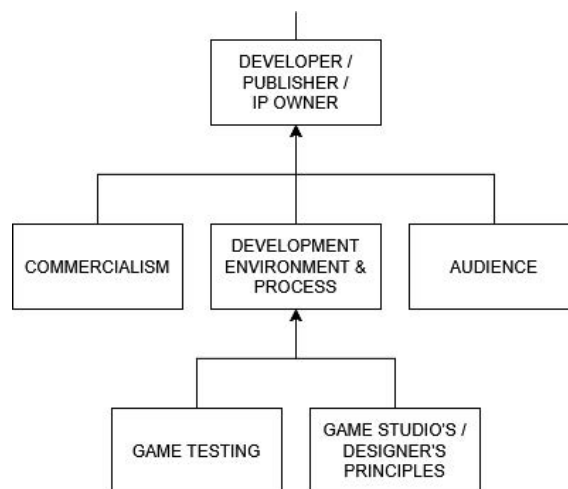


Figure 4.3: The development team, publisher, or IP owner class structure

Lion King (Virgin Interactive Entertainment, 1994) presented in Section 2.1 was an example of how an IP owner can control the development and, in this case, also the difficulty of the game. Disney requested the developers to make the game difficult to prevent the renters from getting too far in the game to make them more likely buy the game. Developers did not have much time for it, so they made a challenging puzzle, which caused a significant difficulty spike. [25]

Jon Burton, director and designer of *Rascal* (Psygnosis, 1998), discusses a likely reason why the game is often claimed the worst game of PlayStation One. He was busy with another game, which left managing the game to the publisher. According to him, it let the publisher make an unwise decision: changing the controls from directional controls to rotational controls, also known as tank controls. At the time, *Tomb Raider* (Eidos Interactive, 1996) was a popular game with rotational controls, and the publisher thought that a part of its success was its controls. The change of controls caused problems with *Rascal*'s camera engine, as rotational controls rely on the camera always being behind the player character. The development team tried to change the publisher's mind, but they refused to change the controls back to directional. [205]

Development team can also affect difficulty of the game in diverse ways and for several reasons. For instance, game testing is recommended, because the developers know their own game well and therefore do not know how someone without their knowledge and experience of the game feels the difficulty. *Rayman* (Ubisoft, 1995) is famous for being an exceedingly difficult game, which was unintentional, because the reason for the high difficulty was that the game was never playtested [206]. But playtesting is not a guarantee of the game becoming easier if it seems too difficult for the testers, because the team makes the final decisions based on feedback. This was what happened with *Ninja Gaiden* (Tecmo, 2004). Testers of the game expressed the game being too difficult to which director and producer of the game, Tomonobu

Itagaki, responded by making the game even more difficult. [207] In case with the first *Ninja Gaiden* (Tecmo, 1988), the game was “too hard” even for the development team. When the game was in bug-checking process, “team members were basically crying while trying to get through the game”. The game also did not come out as its director intended, because the player was not supposed to continue from the beginning of the level after dying close to the end of it but from the middle. The director, Hideo Yoshizawa, says that one of his programmers lied to him that he would do it but he did not. The game is also highly difficult due to lack of playtesting. [208] It is worth noting that games are not tested only to test the design but also for bugs or glitches, which can also affect the difficulty but unintentionally. A bug can, for example, give the player an advantage, which is often called an exploit, or make doing something more difficult if not impossible.

Game studios can have principles which affect how the games are designed, including difficulty. According to Josh Bycer, Nintendo tends to design games with a main path, which is on “easy” or “normal” difficulty, but there are optional challenges, which have higher level of difficulty [106, 209, 210]. FromSoftware’s games are known for their difficulty, like *Dark Souls* series, but their difficulty is not meant to “go too far”. The president of the company, Hidetaka Miyazaki, says that there has been moments when he has considered the difficulty of the game carefully, but instead of judging if the game is “too difficult”, he contemplates if the difficulty is “unreasonable” and uses that term when he discusses with the development team. [211]

To which audiences the game is designed to can affect the difficulty, as discussions in Section 3.1 explained. The games being commercial products affect the design, which can be seen since the arcade games from the 1970s, which was presented in Section 2.1, but also why the games have changes, which is touched in Section 3.1 as well.

4.2.4 Other Games and Trends

Other video games can affect the development and design of a game. As it could be seen in *Rascal's* (Psygnosis, 1998) case [205], a successful game affected its controls, which were unsuitable for the game. There are likely to be multiple cases when another game has affected a game significantly, but such information is mainly available explicitly if the developers want to talk about it in public.

Crash Twinsanity (Vivendi Universal Games, 2004) developers John McCann and Keith Webb discuss on their YouTube channel, JMac & Webbsta, about the development of *Twinsanity*. It is mentioned in multiple videos how game called *Jak and Daxter: The Precursor Legacy* (Sony Computer Entertainment, 2001) influenced the development of *Twinsanity*. For instance, *Jak and Daxter* had no loading screens, which made them want to achieve the same, as loading screens felt obsolete for year 2002. However, they were unable to stream levels like developers of *Jak and Daxter*, which made them add long tunnel sections into the game to hide the loading. [212] In these both cases [205, 212], taking reference from a popular game did not make the game better but worse according to the developers.

When it comes to taking reference to difficulty modes, *GoldenEye 007* (Nintendo, 1997) is said to be the game where doubling damage in hard modes started, as other game developers wanted to copy its formula of making the game more difficult. Reason for this is likely its simplicity, as difficulty levels are often added at the end of the project. [213]

Trends outside video games can also affect the difficulty of a game, like accessibility bringing more accessibility features into games. It affects how the players can customize the game to suit their needs better, which can make the game more accessible and, in a way, easier for them to play, but it is rather enabling them to play or progress in the game. However, as accessibility discussion in Section 3.2 re-

vealed, games can have ineffective accessibility features or accessibility is associated with easy difficulty.

4.3 In-Game

This section introduces elements which are direct part of the game and can affect the difficulty. Overview of the in-game difficulty elements is presented in Figure 4.4. Deeper subclasses are presented along with their explanations in the following subsections.

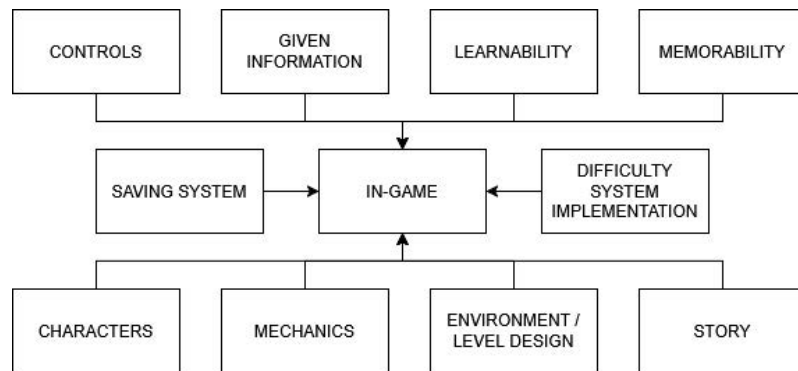


Figure 4.4: The in-game classification overview

4.3.1 Given Information

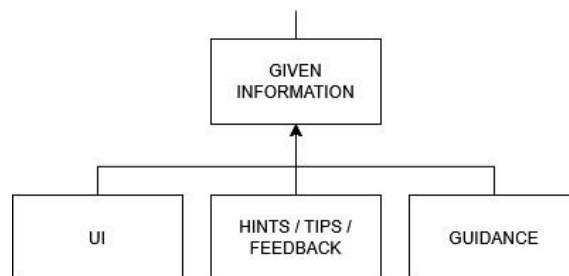


Figure 4.5: The given information class structure

Given information refers to all information that is presented to the player, like through UI, visual cues, item descriptions or character dialogue. Information can be

used to tell the player, for example, what they should be doing, what is happening or has happened in the game world but it can also provide feedback, for example, how they are progressing or how well they performed something, which can affect how the player sees the difficulty of the game. If one core elements of the game is navigating in the game world, it is easier if the game provides a map, compass and map symbols compared to the player navigating only relying on their mental map.

Information can be used to guide the player, which can help them to know what they should be doing instead of utilizing trial and error. One often mentioned reason why *Dark Souls* is highly difficult is that it has minimal guidance, which forces the player to figure out mechanics, item purposes and navigation by themselves. Given information can also cause difficulty when it becomes a hurdle. *Crash Boom Bang!* (Sierra Entertainment / Vivendi Universal Games, 2006) is a party game on Nintendo DS, where the players can send each other messages utilizing “motion panel” system. These messages cover a significant part of the screen and because they can be sent during mini games, they can make seeing the game more challenging. The messages can also be sent by computer-controlled players, and it happens frequently, making the feature a hindrance, because it constantly covers a part of the game screen. In general, this is called “screen cluttering”, which in this context affects how difficult it is to see and focus on the game.

4.3.2 Controls

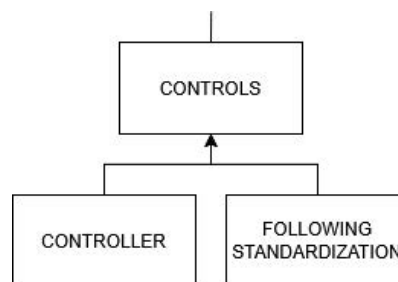


Figure 4.6: The controls class structure

Controls affect how the game feels and the player's way of interacting with the game significantly. If main actions, like jumping or attacking, feel cumbersome or challenging to perform, it can either frustrate, add unintentional difficulty, or make the player quit the game. *Ōkami* (Capcom, 2006) was originally released on PlayStation 2, and after two years, it was ported to Nintendo Wii, which meant notable change in controls. Originally, attacking is performed by pressing a button, but on Wii, the player needs to swing Wii Remote to attack. However, attacking is often done in combos, which is more difficult with the motion controller, because the player needs to swing the controller continuously, which is slower to perform but also less accurate to recognize compared to pressing a button repeatedly. Thus, inaccurate controls can make the game feel more difficult and frustrating to play, which was likely not the intention. One cause for this is likely that motion controls are more complex, because they require more data and sending more information back to the player to work [214].

Complexity of controls can also affect the difficulty curve, because the more complex the controls are, the more difficult the game is at the beginning, causing a difficulty spike at the beginning of the game. This is because it requires more from the player to learn the controls, which can also affect how many tutorials are needed to teach the player. [215] Similarly, if controls differ from usual standards, it can cause issues to the players, like pressing wrong buttons due to being used to a certain control scheme. Controls can be either dynamic or fixed in a way that dynamic means how hard a button is pressed affects, for example, how high the player character jumps and fixed that the jump is always the same with each press of the button. This kind of variety can affect how the gameplay feels and what kind of precision is required from the player but also level design of the game [216].

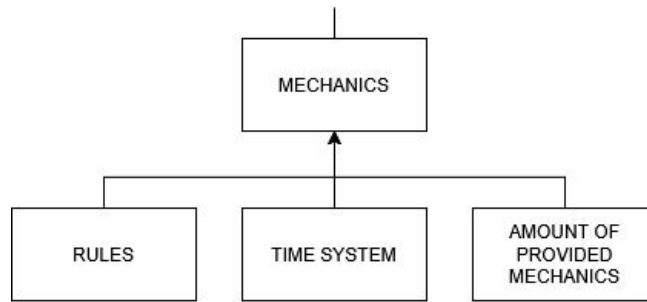


Figure 4.7: The mechanics class structure

4.3.3 Mechanics

Mechanics define the rules the game world follows but also what the player can do and thus they are important regarding learning and mastering the game. One example of them is how win condition is defined, which affects significantly how the player can progress in the game. In racing game called *Crash Nitro Kart* (Universal Interactive, 2003), when the player is playing a trophy race on “Adventure Mode”, the player wins if they or their computer-controlled team member completes the laps first. It can make winning the race easier, because the player does not necessarily need to win by themselves. If the player had to race to the first place, it would be more challenging.

How time functions in the game world can affect difficulty as it can give more or less time for decision making and reacting but also create tension. When a game is turn-based, the player can have all the time they need to make decisions, unless turns itself have a time limit. In a real-time game, the player needs to, for example, consider time frames when they can attack an enemy in real time and thus need to act immediately when the time is right. If the player can pause the game, they can take a break when they need it or utilize it in another way. But if the player has no way to stop the time of the game, it creates more tension and the player needs to plan when they can leave the game unattended safely enough.

Number of mechanics can increase complexity of a game and thus cause a difficulty spike at the beginning of the game, because the more mechanics there are, the more the player needs to learn to play and master the game.

4.3.4 Saving System

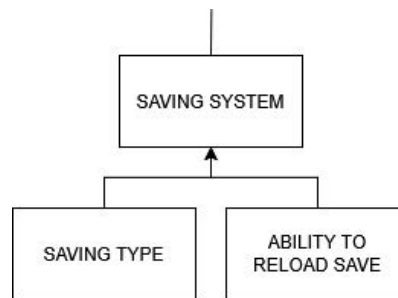


Figure 4.8: The saving system class structure

Saving a video game is one core elements in games, but during the early decades, there was no standardized way to save data [29] and not all games had a saving function to save one's progress [26–28]. As the discussion on change in video game difficulty revealed in Section 3.1, saving systems are seen as one major reasons why older games are more difficult than modern games. Even saving systems primally affect how the player can take breaks and repeated attempts, which are not a part of the challenge in a way, it is still a part of difficulty design [217]. A game can contain temporary and resident saves, where resident saves stay in memory after closing the game, while temporary do not.

There are diverse ways to design how and when the player can save their progress. One common way, especially in older games, is to let the player save only at or to certain spots in the game. In a platformer, it can mean that the player can save their game in the hub world, like in most classic *Crash Bandicoot* games. In survival horror game *Silent Hill* (Konami, 1999), there are specific safe areas, where the player can save the game. These examples show that saving feature can be tied into the gameplay, atmosphere or phasing. Save system can also create unintentional

difficulty, as the example of the first *Crash Bandicoot* game in Section 2.1 showed, because it was behind completing specific challenges.

Another way is to offer ability to save but also reload the save anytime, which is often called as quick save feature. It affects significantly how much the player needs to repeatedly attempt a difficult part in a game, because they can save immediately after making some progress or completing the part. *Oddworld: Abe's Oddysee* (GT Interactive, 1997) and *Oddworld: Abe's Exoddus* (GT Interactive, 1998) are similar games but *Abe's Oddysee* can be only saved to specific screens while *Abe's Exoddus* has a quick save feature. In this case, *Abe's Oddysee* can feel more difficult and punishing, because it requires precise playing for long sections and thus is also more frustrating due to repeated attempts. When older games are released to modern hardware either as remasters, remakes or originals, they tend to offer saving features, which were not in the original game. *Lion King* (Virgin Interactive Entertainment, 1994) was one example of it in Section 2.1, but *Abe's Oddysee* released on PlayStation 4 provides a similar rewind feature, but it is a part of PlayStation One emulator on the console. *Crash Bandicoot N. Sane Trilogy* (Activision, 2017-2018) is a remaster compilation of the first three *Crash Bandicoot* games and it has altered saving system in the games, which is the most noticeable in the first one, because the player can now save their progress similarly to the other two games. The trilogy also has an auto-save feature, which was not a part of the originals, but it is a common modern way to save the player's progress.

Even if saving is not a part of the challenges in the game, it can be used to create tension or require more mastery of the game from the player. *Baldur's Gate 3* (Larian Studios, 2023) features a difficulty mode called Honour mode, which is the most challenging one. It utilized limiting ability to save to only one save file, but more importantly, the player cannot reload their save file and the game auto-saves frequently. This is done to prevent so called "save scumming", which means

that the player repeatedly reloads save files to undo unpleasant outcomes. It can create unintentional difficulty as well, because if the player encounters a significant bug which hinders their playthrough, they cannot reload to a point where it is not present. But it is a part of the rules the player must accept on Honour mode.

The amount of freedom in saving can affect how likely the player is going to take a risk, because quick saving practically removes cost of taking the risk and failing. Thus, it can interfere with the risk-reward system by removing the cost or decreasing difficulty and so make the victory less rewarding. [218] In a way, saving too often can disturb the experience, but using the feature responsibly is the player's responsibility [219].

4.3.5 Characters

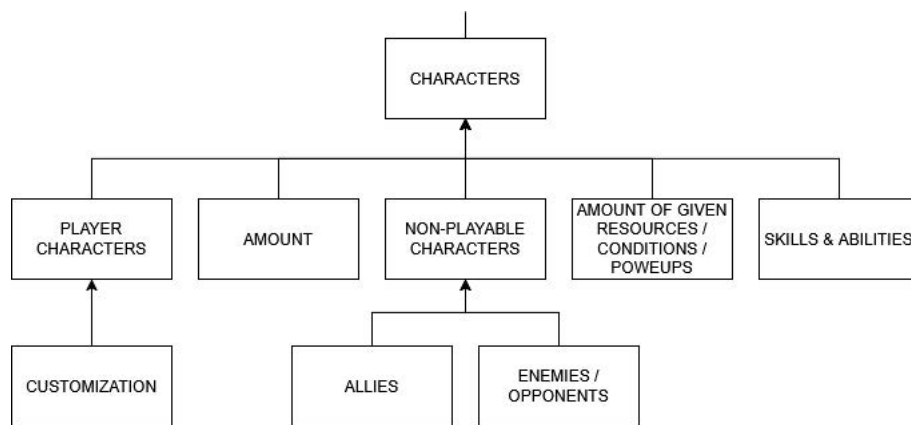


Figure 4.9: The characters class structure

Characters category contains all the characters of the game and difficulty affecting elements which explicitly relate to or are a part of characters. For example, characters can have different skills and abilities, like combat skills, stealth, resistance to certain damage types or special moves. It includes character related resources, like health, stamina, power, or movement speed. In enemy design, both behaviour and appearance are considered, as an enemy can be designed to look intimidating

and thus their appearance can signify how difficult they are to beat, where especially boss enemies tend to be bigger than other enemies to signal greater challenge. Allies can affect the difficulty in both ways because the player may need to protect them or they are helping the player. Thus, the player may also need to take care of the survival of their allies, especially if the mission requires it, like in an escort mission. In this model, an ally can mean all non-hostile NPCs toward the player in its broadest meaning.

Number of characters can affect difficulty, but the way depends on the game, as it can relate to, for instance, how many characters the player can or must control, how many enemies the player needs to fight at once or how many drivers they are racing against. Character customization can also affect the difficulty, especially in RPGs, and what kind of items the player's character or characters can use. It is because the player can affect the way they want to play the game, like if they want to use a ranged or melee character, which can make playing the game easier or harder. Examples of how character building can affect the difficulty are given in Section 5.1. Different items can affect characters in diverse ways, like giving a boost to stamina regeneration, more attack power or a disadvantage to the player character or enemies.

4.3.6 Environment or Level Design

Environment or level design can contain various difficulty affecting elements. There can be different terrain types, which can have different physics and be safe or damaging to step on. Ice physics make moving more slippery and thus make precise platforming harder, while lava terrain can damage or kill the player character. Shape of the terrain can affect the difficulty by affecting, for example, how high or long jump the player must perform or how the player can use it as a shelter against enemies. Pete Ellis explains in his post “How an Environment Layout Affects Difficulty” this

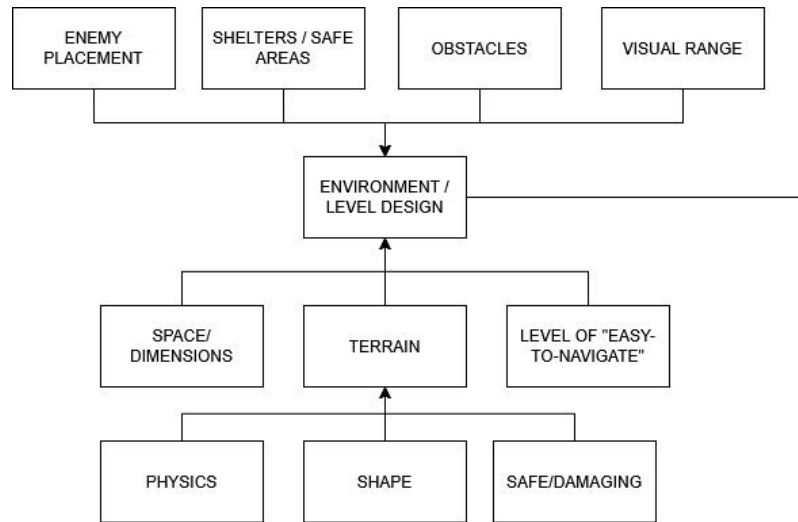


Figure 4.10: The environment or level design class structure

in an illustrative way regarding shooter combat encounters but the post also touches enemy placement in this context [220]. In its broadest meaning, the terrain class can contain every surface the player can step on.

Environment can support how easy it is to navigate in the game world, for instance, by having unique details or clear path which indicates the player where they should be going. Especially in platformer games, obstacles in a level affect how difficult it is to get through the level, like how precisely the player needs to time their jumps, especially when the obstacles are moving, or which mechanics the player needs to use to proceed.

Dimensional side of the game world can affect difficulty because it affects how many directions the player needs to take into account but also how the camera functions. In a 3D (three-dimensional) game, the player needs to be more precise when they are aiming due to additional orientations compared to a 2D (two-dimensional) game [221]. In addition, number of directions affect camera implementation and thus, the player may need to take care of controlling the camera in a 3D game whereas in a 2D game the camera would follow the player but also show their envi-

ronment more exactly. This refers to that a 3D camera tends to leave some direction obscured, but some camera styles also make estimating depth challenging. [222]

Visual range can affect how far or much the player can see but also atmosphere, and it can be determined, for example, by light or fog. A calm and light environment can make the player feel like there is no danger, whereas a dark environment makes the player behave more carefully, because they cannot see the environment well and therefore it is harder to proceed. Atmosphere itself only affects difficulty artificially, because it can affect how difficult the player estimates or feels something being. Besides light, music is another essential element of atmosphere, and it can, for example, amplify perceived difficulty of a boss fight. Therefore, atmosphere can give cues about the difficulty to the player, which can affect if the design of the whole level or environment feels balanced or consistent.

Even gameplay mechanics are not a part of level design, they can together affect the difficulty. If levels are designed with specific gameplay mechanics in mind, but the mechanics are changed later during the development, it can affect difficulty of the levels. For example, if levels of a platformer game were designed a double jump mechanic in mind, difficulty of the levels can become trivialized if triple jump is introduced later on. [223] Level design itself can also be utilized to provide the player a way to control the difficulty, like by having an easy main path but providing optional routes to more difficult challenges. Level design is also a part of pacing, as levels or areas tend to have easier and more challenging sections.

4.3.7 Difficulty System Implementation

How difficulty is designed and implemented explicitly affects difficulty of a game. Difficulty system types consider, for example, how a possible DDA system is designed, which affects how difficulty of the game is adjusted based on the player's performance. This category also contains the ways the player can adjust the dif-

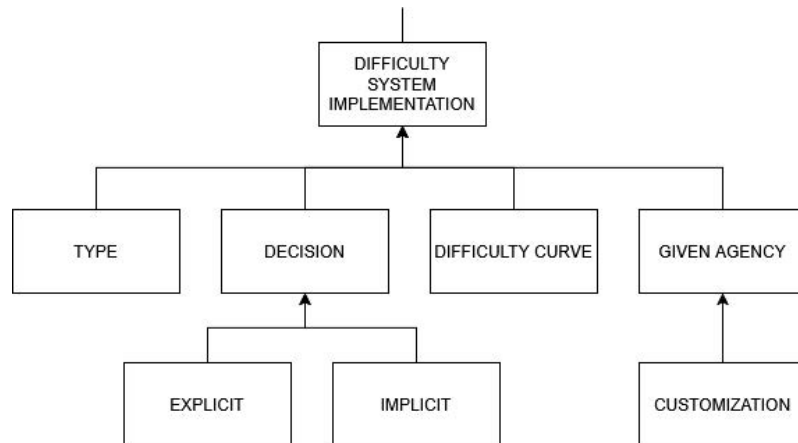


Figure 4.11: The difficulty system implementation class structure

difficulty by themselves, both explicitly and implicitly, which is explained in Section 5.1. In this class also lies difficulty curve of the game, which indicates how difficulty changes over time in the game. Difficulty curve and other relevant difficulty affecting elements in this class are explained in Section 2.3.

4.3.8 Story

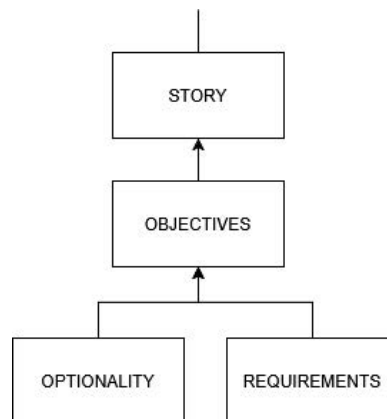


Figure 4.12: The story class structure

In this model, story is defined to mean what the game is about outside the mechanics, like through storytelling or events. Story can affect what kind of objectives or missions the game has. The objectives can have different requirements which affect the difficulty of the given task. For example, a task can require the player to

do something within a time limit, in a certain rhythm or for a certain period of time, like surviving enemies for five turns in a turn-based game. Some objectives can also be optional, which affects how the player can adjust difficulty of their playthrough, especially if the game contains optional harder challenges. In addition, difficulty can be used as a storytelling element, like to emphasize the player character's struggling.

4.3.9 Learnability and Memorability

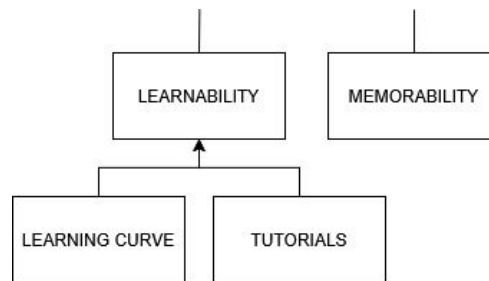


Figure 4.13: The learnability and memorability class structures

Learnability affects how easy it is to learn to play the game, and memorability to how well the player remembers how to play the game. If a game is difficult to learn, for example, due to complex mechanics or lack of onboarding or feedback, the game can feel difficult to play, because the player struggles with understanding what they are supposed to do and how. Memorability affects especially when the player has not played the game for a long time, because they may have forgotten how to play the game, which can make the game more difficult, especially if the player is in midgame or lategame.

5 Difficulty Levels

Difficulty level, also known as difficulty mode or tier, could be described as a state of difficulty affecting attributes. Therefore, it means something objective, even if how difficult the difficulty level feels is a subjective matter. Difficulty levels can be divided into two categories: predefined and dynamic. Predefined difficulty levels are predesigned difficulty levels, which can be chosen by the player. Predefined difficulty levels tend to have labels, which are presented to the player from difficulty selector interface. These labels or names aim to describe how difficult that difficulty setting is, like easy or hard, even nightmarish. Dynamic difficulty relates to difficulty levels set by DDA. This way the difficulty level is chosen by DDA system based on the player's performance. Traditionally, difficulty level states of DDA are not seen as difficulty levels but only predesigned player-selectable difficulty modes. However, in this thesis, state of difficulty affecting attributes set by DDA is also considered a difficulty level.

Already in 1981, Thomas W. Malone [23] stated that good computer games contain difficulty levels. Despite this, there does not seem to exist any comprehensive work which focuses on designing difficulty modes. There are also several ways to approach designing them, so the most suitable way to approach difficulty can depend on what kind of experience the designer wants the player to have and what kind of game it is.

Jesse Schell suggests in his book *The Art of Game Design: A Book of Lenses* (2014) that letting players choose their difficulty level is “[a] tried and true method” to match challenge level with player’s skill level. Schell’s approach to understanding difficulty modes seems to be traditional, as he mentions “easy, medium, or hard” modes and them having possibility to make the player question which mode is the “real” one. His main advice for designing difficulty is to increase it gradually. [2] Schell’s approach requires well-designed difficulty levels which can cater different player audiences. His book does not go deeper into difficulty in games and seems not to acknowledge that difficulty modes can be incorporated without difficulty selection menu.

Ernest Adams goes deeper into difficulty levels in his book *Fundamentals of Game Design* (2014). He suggests that game designers should offer multiple difficulty modes but is aware that they do not suit all genres and some designers do not want to use them. He mentions DDA as an alternative technique, but it requires resources not all teams have and is therefore an advanced way to adjust the difficulty of the game for players with different skills and abilities. However, he seems to be skeptical toward DDA in general, as it might be desirable “only in an ideal world”. According to him, players like to have selectable difficulty levels and are used to them, which are good reasons to provide them. Offering difficulty modes also increases the market for the game, because they broaden the player audience by making the game more accessible. Difficulty modes also give replay value for the game. But the first mentioned reason to offer difficulty modes is that they help to adapt the game for the player based on two factors the designer cannot know: the player’s experience with similar games and native talent. [3] But this approach would require that the player does know what kind of difficulty they want and has enough experience with difficulty levels to know what suits them.

This thesis aims to expand and clarify the concept of selecting difficulty and form best practices on designing difficulty levels by gathering and analyzing found insights and knowledge of the game developers.

5.1 Selecting Difficulty Level

Traditionally, selecting difficulty level means that the player selects the difficulty from available options in a menu. Often this menu is presented to the player before the player can proceed to the game itself. Some games start with default difficulty but let the player adjust difficulty from menu during gameplay. For example, *The Elder Scrolls V: Skyrim* (Bethesda Softworks, 2011) does not present difficulty selection to the player by default but when the player goes to the settings menu. Another example is racing game *Crash Nitro Kart* (Universal Interactive, 2003) where difficulty selection is baked into character selection, which happens before entering the track or from the menu on “Adventure Mode”. Difficulty of the characters is based on their stats, like how easy it is to turn the character’s kart, which define their driving style.

Common way to name difficulty settings is “Easy”, “Normal”, and “Hard”, but some games make the names describe what kind of experience the difficulty is meant to provide or use some kind of humor. For example, in *Baldur’s Gate 3* (Larian Studios, 2023) the player is presented with four pre-made difficulty levels: “Explorer”, “Balanced”, “Tactician”, and “Honour”. The player can also create their own custom difficulty level. These names describe to what kind of player they are targeted at. The difficulty levels also have a brief description of what kind of experience each difficulty level is going to give, but honour mode also provides a detailed description of it so that the player knows what to expect, because it is significantly different from the other pre-made difficulty levels. Thus, *Baldur’s Gate 3* has designed difficulty levels around two kinds of players: players who are more into the story and

players who are more into the strategic combat. Another example is *Wolfenstein: The New Order* (Bethesda Softworks, 2014), which does not call difficulty levels hard or easy but provides clauses which could be said to describe what the player could answer if the game asked how hard they want the game to be. Some can find its easiest difficulty level name, “Can I play, daddy?”, image of the player character dressed like a baby and its description, “Very easy difficulty setting for the spineless gamer.”, mocking, while some can find it humorous and criticism toward easy modes. However, it is worth noting that, in the sequel, *Wolfenstein II: The New Colossus* (Bethesda Softworks, 2017), this description was changed to “Easy difficulty setting for the novice gamer.”, but the presentation was otherwise kept the same. Nevertheless, presented difficulty levels can also describe the game’s tone or humour, what to expect and to whom the game is targeted at, especially when it is at the beginning of the game, affecting the first impression.

However, definition of what selecting a difficulty level means could be expanded further by considering factors that can make a game harder or easier, as difficulty levels differ from each other in variables, rules and other elements that affect difficulty. The main difference between predefined and dynamic difficulty levels is who chooses the difficulty level, as predefined difficulty levels are selected by the player and dynamic by DDA system. In addition, each difficulty level can be seen as a different version of the game, which enables different players being able to enjoy the same game title. This is because difficulty levels can tailor the game to suit better the player’s needs and preferences.

Back in 1996, when the concept of DDA was relatively new, developers of the first *Crash Bandicoot* game (Sony Computer Entertainment, 1996) added DDA system with similar thought. It was added so that both good and bad players can enjoy the game. And because the game uses DDA, the players does not know that they are playing a different version of the game. If the player keeps dying at the same

section repeatedly, the game gives the player some help with extra power-ups and checkpoints or slows down the boulder in boulder levels. [224] It could be said that this aid switches difficulty of the level from default to gradual easy mode. Therefore, difficulty level selection is done automatically by DDA system for the player based on their performance.

Furthermore, it could be argued that the player can choose difficulty *explicitly* or *implicitly*. Explicit difficulty selection happens when the player chooses difficulty consciously or makes decisions that affect difficulty on purpose. Implicit difficulty selection happens when the player does not know how their decisions affect the difficulty. For example, if a game has different playable characters and each have different strengths and weaknesses, which affect how difficult it is to play the game, in general or in different sections of the game, but the game does not tell player this. Therefore, the player might choose a character that is the most difficult to play for them and this way choose hardest difficulty without knowing it. This can happen, for example, in game *Crash Bash* (Sony Computer Entertainment, 2000). Each character has different abilities which make them better or worse in certain mini games. These abilities are not explained but the player can learn the differences between the characters while playing or reading about it outside the game. Even if it is subjective, which characters are easier or harder to play as, it can be argued that certain characters are harder or easier to play as for the majority of players.

Implicit difficulty selection can also happen when the player builds their character in a way that makes the game more difficult for them. This is likely to happen due to not knowing enough about the game. Character building is a common part of RPGs, and some character builds are perceived to make the game easier or harder to complete. When the player builds their character in a certain way on purpose and knows what they are doing, they are deciding their difficulty explicitly. The line between explicit and implicit decision can be fine, but the main difference is

that in explicit difficulty selection, the player knows that they are affecting the difficulty of the game with their decisions, while in implicit the effect is unknown for the player. This way, in games where there is no difficulty selector, but character-building mechanic, it could be said that the difficulty selection is incorporated into player character building. But even if the game featured difficulty selector, character building could be seen as another difficulty selector. In game communities for character building games, some players tend to make character build guides to make the game easier or harder. In *Dark Souls 2* (Bandai Namco Games, 2014), building a ranged character can be seen as an easy mode while a melee character stands for a hard mode [225].

Players can make various kinds of decisions which can affect the difficulty, like related to what kind of story or ending they want to get in the game. In *Oddworld: Abe's Oddysee* (GT Interactive, 1997) the player can decide whether they want to save the protagonist's, Abe's, people, Mudokons, or let them die or even kill them. If the player wants to get the good ending, they need to save enough Mudokons, or for the perfect ending all of them. This is harder than ignoring duty as their savior because the player needs to discover secret areas and solve puzzles to save them all. If the player neglects the Mudokons, they get the bad ending, or if the player decides to kill all the possible Mudokons, they get the black ending, which actually rewards the player. Players probably do not think that they are deciding their difficulty level here, because they more likely think about what they want to do in the game or just have fun.

Some games also let the player skip levels or sections of the game, which in a way lets the player choose what challenges they want to have. But it is likely to indicate that the game has some design problems, and the player can miss out on some contents of the game. If the player can skip levels, it raises a question of how they can complete the next level if it is more difficult. The player can also use

lowering the difficulty to get through some part faster, but it can indicate that they are not having fun [226]. In addition, some games are designed to have an easy main path and more challenging optional routes or areas where the player can test their skills. This way the player chooses more unconsciously the difficulty of the game, because harder challenges are integrated to the game world itself and not chosen through a difficulty selector.

In conclusion, when designing difficulty or considering what can make a game difficult, it can be beneficial to consider what kind of decisions the player can make that affect the difficulty. Some decisions are made on purpose or relate explicitly to difficulty, but the player can also make the game harder or easier for them without knowing it. These decisions can also be made to the player by DDA, but taking this control away from the player makes it feel different than compared to the player choosing their difficulty by themselves, which is discussed more in the next section.

5.2 Arguments For and Against Difficulty Selectors

One can say that being able to select difficulty is a good thing [227] but also a bad idea [199]. There are not many posts that are dedicated to justifying why to have or not to have player-selectable difficulty levels but mentions of it.

Ernest Adams covers both aspects in his post “The Designer’s Notebook: Difficulty Modes and Dynamic Difficulty Adjustment” (2008), where he responds to Andrew Glassner’s criticism on difficulty levels. Glassner’s opinions here are what Adams claims him to have said in his *Interactive Storytelling* book. Glassner thinks that games should have adaptive difficulty and not ask players to choose difficulty, while Adams attempts to justify why he thinks that selectable difficulty levels should be obligatory in most game genres. [24]

Glassner thinks that difficulty selection menus make the players choose too early, but Adams does not see this as a real argument against difficulty settings. Before

selecting the difficulty, a game could provide an optional training level at medium difficulty. Adams also seems to trust in players' judgement skills in knowing which difficulty suits them. Glassner sees difficulty options too coarse, as medium mode could be too easy but hard too difficult, but Adams responds that difficulty levels are not limited to a few options since difficulty could also be selected using a slider. Well-designed games offer varied pacing, hard and easy periods, in all difficulty settings. Difficulty settings only affect the maximum and minimum difficulty of the game at any given point in the game, not define the difficulty of every challenge. According to Glassner, difficulty settings are too broad, which means that difficulty settings affect every challenge type in the game and the player might not be equally good in them all. Adams sees this as Glassner's strongest point, but this depends on the genre. One way to tackle this is to offer own difficulty selectors for different challenge types. But as Adams mentioned earlier, difficulty settings affect the maximum difficulty and he trusts that players expect that when they, for instance, select a nightmare difficulty, it does not mean that all challenges are nightmarishly hard. Glassner finds difficulty levels too persistent as they do not adapt to player's performance. Adams agrees that this is a weakness in games without DDA, but it is not really an argument against selectable difficulty levels, because they are not guilty for this problem but more like help a bit with it. Glassner sees difficulty levels too general, which may make players regret their difficulty level decision later when the game requires new skills. Adams keeps trusting that players understand how difficulty settings affect the game. This is also why there are game reviews and strategy guides, where the players can look for more information about the game. [24]

Adams argues that it is not wise to "ban" difficulty levels from all games, because it is like "throwing the baby out with the bathwater". The key benefit from player-selectable difficulty is that it keeps the player at the center of the design, and players want to select the difficulty. Adams still finds DDA appealing but it is challenging

to make a good DDA system. According to him, DDA has some problems. Firstly, some players do not like it and therefore it should be added with caution, especially if DDA cannot be turned off. Secondly, players can exploit DDA by pretending to be worse in the game than they are. Thirdly, DDA is not suitable for all kinds of challenges. DDA works the best in challenges based on numeric entities, like speed or health points, but does not work well for symbolic entities. Fourthly, DDA can create absurdities, like rubber-band effect in racing games. Lastly, DDA disturbs pacing and good level design. Adams is not against DDA as it is suitable for simple, abstract casual games, but when challenges of the games get more heterogeneous, the more difficult is to create a good DDA system. [24] Therefore, Adams's main argument for player-selectable difficulty levels seems to be that they offer more control over the difficulty of the game, for both designers and players, and are easier to design well than DDA systems. He trusts that players understand how difficulty selection affects the game and their ability to choose the right difficulty for them. However, his approach requires well-designed difficulty modes.

This post can be found from Adams's book [3], as he mentions it to as read more material about difficulty. The following sections aim to expand the discussion outside the book by taking look at other posts found on Game Developer website to find other arguments and perspectives but also how similar or differing the arguments are. Here, difficulty level is viewed from its traditional view, which means that the player selects difficulty explicitly from a menu or other format. But in addition, some collected arguments concern difficulty levels set by DDA system as well, because DDA system can be seen as an automatic difficulty level selector which works in the background. DDA discussion also extends the discussion on Adams's post [24].

5.2.1 Arguments For Difficulty Selectors

The most common reason to provide difficulty levels in a game is to let people tailor their game experience [43, 75, 156, 180, 228–236]. Anders Hejdenberg mentions in his post “The Psychology Behind Games” (2005) that even if the game has DDA system, it is still good to have option to select difficulty. This is because some people find it more enjoyable if they must fail a couple of times before succeeding, while some other people prefer to succeed in their first attempt. Both kinds of people enjoy challenges but prefer different levels of challenge. [75] Therefore, someone choosing easy difficulty level does not mean that they do not want experience challenges but challenges they enjoy. Lars Doucet mentions in his post “RPGs, Challenge, and Grinding” (2011) how providing a way to adjust the difficulty can decrease player’s need to use hacks, cheat codes, and custom mods to tailor their experience for their liking. Player’s preferences should be handled with respect, so that they do not feel judged. [180] When the player is given possibility to adjust difficulty, they can choose preferred challenges or their focus on in the game, like story or combat [236].

Providing multiple difficulty levels can make the game enjoyable for different audiences, like casual and hardcore players, or new and experienced players [74, 162, 235, 237–240]. Ajari Wilson (2011) mentions that some people do not have much time for gaming, so they prefer to get through the game relatively easily and enjoy the contents of the game with minimal effort and frustration. These players are often casual players, which are not as into gaming as hardcore players who are willing to invest a lot of time into games they enjoy. [74] Ernest Adams mentions in his post “The Designer’s Notebook: Bad Game Designer, No Twinkie! IV” (2003) that if the game feels too easy, it can get bad reputation among hardcore players, and vice versa. Therefore, providing multiple skill levels can make the game appealing for both audiences. [237] John Mawhorter discusses in his post “Throw the Hardcore a Bone, Not Just Your Table Scraps” (2010) how hardcore players seemed to be

ignored when casual gaming as a phenomenon started to rise. He mentions that providing harder difficulty levels can be an easy way to serve hardcore gamers, and this way broadens the audience of people buying the game. [162] Josh Bycer gives a personal example of how he likes to play the games on the harder difficulty for challenge and to give his mind active [241]. Therefore, different difficulty levels can also serve different reasons to play.

In-game customization options to tailor one's game experience have been increasing in recent years. *Assassin's Creed Valhalla's* narrative director Darby McDevitt and game director Eric Baptizat mention such being the case in their game in an interview by Bryant Francis (2020), and difficulty is only one example of it. Players can, for example, adjust how much the game guides navigation in the game world, which tailors their exploration experience. [232] One reason for this can be that there are different generations of players, which have their own characteristics. This is why easy mode was added, for instance, to *Final Fantasy* games later on [242].

Another increasing theme has been accessibility, which is kind of ambiguous term in video game context, as discussed in Section 3.2. But letting the player to adjust the difficulty of the game can make it more accessible [180–182, 243–246]. Lars Doucet discusses in his post “RPGs, Challenge, and Grinding” (2011) how providing ways to adjust the difficulty can make the game more accessible. If the player has, for example, slow reflexes, accessibility options could let them slow the game down and this way make the game's difficulty more accessible for them. [180] Ernest Adams (2005) argues in his post “The Designer's Notebook: Bad Game Designer, No Twinkie! VI” that providing multiple difficulty levels makes a game more accessible, which seems to refer to providing balanced and appropriate difficulty. If the game has an easy mode, it is supposed to be easy. In addition, too high difficulty spikes can prevent the player progressing further. Therefore, accessibility refers to being able to progress in the game. [181] In another post “The Designer's Notebook: Why Action

Games Suck (And What To Do About It)” (2007), he argues how easy modes are not made easy enough in action games and are made with assumption that every player has good hand-eye coordination and quick reflexes. [182] Therefore, when accessibility is considered regards difficulty, it broadens the audience of the game, not just for casual or hardcore players, but for disabled players.

Providing difficulty settings can also help with keeping the players playing the game and help to get through difficult parts of the game [247, 248]. In interview “Designing dual-perspective puzzles for 2D-3D platformer Toodee and Topdee” by Game Developer staff, one of the developers of the game mentions how being able to adjust difficulty while playing can help with getting past difficult parts of the game. After the player manages to get through the part they were stuck at, the game can be continued as it was. [248] Therefore, being able to adjust difficulty when needed can make the players less frustrated and prevent too much difficulty ruining their experience [236, 247–249]. Tim Keenan mentions in his post “The Difficulty I Want” (2010) that there is still a risk of player forgetting that they lowered the difficulty, which affects their experience. It can be also argued that this is not the way the game was intended to play, because it can, for instance, break tension of the game. But the player can have freedom to play like they want, and there could be a way to remind the player that they can adjust the difficulty when they are struggling for instance. [247] Nevertheless, not all players are happy to be reminded of that they can lower the difficulty, since it can feel mocking, especially if the player is struggling for other reason than what lowering the difficulty affects [250]. But as Charlier Lister mentions in his post “Games Studies: A Cross Analysis of Realism in Games”, unnecessary difficulty can also ruin sense of realism of the game, not just frustrate [236].

Providing more difficulty levels can be also a reason to replay the game, as Taylor Bair mentions in his post “Motivate Me: Crafting Better Game Difficulties” (2015).

In his post, he also discusses motivation and difficulty. Difficulty selection affects “nature-of-self” motivators since it relates to how the players perceive themselves and it affects which difficulty level the player is going to choose. If the player perceives oneself as a completionist, they are likely to come back for more. Bair still seems to think that difficulty levels could be improved as they do not push the player to improve like games that do not have difficulty level selector. But difficulty levels serve a necessary function and can ease the development compared to making a game that uses improvement as a motivator to keep the player playing. [251]

Slaton White discusses in his post “Tools of a Game Designer: What I use and What is out There” (2011) DDA and applying flow in game design, referring to Jenova Chen’s work [252]. Jenova Chen mentions in his thesis (2006) that DDA data can be inaccurate, like due to misunderstanding the player’s playstyle [253]. From his thesis could be also found another argument against DDA, since he referred to Robin Hunicke and Vernell Chapman’s work (2004): DDA takes control away from the designer [254]. White himself mentions in his post that DDA system is not helpful for the player that struggles during the first levels and finds the last levels tiresome. Developing DDA system can also take too much time to develop. [252] Players can also enjoy the game more if they know the difficulty level and improve themselves to overcome the challenges, without DDA trying to tailor the experience for them [255]. Therefore, these arguments can be seen in a way arguments for developing various difficulty levels instead of using DDA. When the player can choose the way they want to play, there is no need to use DDA as attempt to read the player’s mind, conscious or unconscious parts. Nevertheless, both have their own pros and cons, and which one is better to use can be up to the designer.

Based on the previous arguments, following are main arguments for difficulty selectors:

- Players can tailor their game experience

- Catering different player audiences
- Accessibility
- Mitigating churning
- Replayability

5.2.2 Arguments Against Difficulty Selectors

The most common argument against difficulty levels is that they force players to make a crucial decision before getting into the game [48, 51, 199, 256, 257]. Selecting a difficulty can become an educated guess when the player considers their previous experiences with difficulty modes [48]. In an interview with *Spore* developer Soren Johnson (2008), the interviewer Brandon Sheffield mentions how idea of selecting difficulty can turn some players away. Johnson answers that they did not want to make selecting the difficulty challenging and made the easy mode default. Harder difficulty level was added as a late addition for hardcore players who desire more challenge. [256] Nick Halme (2012) argues that the most effective way to make games difficulty is to change basic design, which cannot be done using difficulty levels, because making each difficulty level different in design costs too much time for a real production schedule. In addition, he discusses how harder difficulty mode can feel less balanced and tense compared to normal difficulty mode but also make the player character's death less meaningful if it happens constantly. [258]

Lauren Poling mentions in her post “Opinion: Difficulty By Design” (2011) issues with difficulty levels. Changes in difficulty can affect the way the game is played, like use of mechanics and navigation in the game world. She explains how imbalanced difficulty levels can break the experience. Manipulating difficulty of challenges can also distort them. [52] Similarly, Keith Burgun (2013) argues that difficulty levels should be avoided, because they bring a problem of the player not knowing which

mode is the most balanced experience and risk the game becoming mediocre [259]. Josh Bycer (2010) mentions that difficulty levels do not fit all genres equally, like action games because balancing difficulty settings in them can be challenging [260]. Ernest Adams (2005) also thinks that multiple difficulty levels are not suitable for all genres, but in contrary, thinks that they are possible for action and strategy games [181]. Bycer mentions also in another post (2016) that difficulty settings are not meant for every game. If the designer can design the difficulty curve in a consistent way and prepare the player for harder challenges well, there is no need for difficulty levels. [261] Nick Halme (2012) argues that the most effective way to make games difficulty is to change basic design, which cannot be done using difficulty levels, because making each difficulty level different in design costs too much time for a real production schedule [258].

Alex Vu states in his post “A Different Approach to Difficulty” (2018) common criticism against difficulty modes. He mentions how games tend to force the player to select the difficulty level with scarce information which is critical for this major decision. Letting the player change the difficulty level later is not a promising idea either, because it can harm meaningfulness of risk and reward system. This way, progression can also feel meaningless and the player might feel judged for not choosing a harder difficulty mode. In addition, Vu criticizes DDA. When the player notices DDA, they can feel coddled and disrespected by the game. Players might also learn to exploit DDA by playing the game poorly. DDA systems often require time to adapt to player’s seeming skills, making this exploitation possible. When DDA tries to match the difficulty level with the player’s skills, there is a risk that players do not see the positive results of their improvement. DDA may also create unpleasant results, such as rubber-band effect in racing games. Lastly, DDA is not suitable for all challenge types, like symbolic, but for number-based challenges it can work well. [51] Richard Bartle mentions in interview by Aleksei Korogodin (2018)

that he is against using AI to do dynamic difficulty adjustment, because then the player is not playing the game but gaming the AI [262].

Peter Kjaer discusses the problems of difficulty levels in his post “Difficulty in Games” (2010). He starts with how a new player of the game cannot know what difficulty suits them the best. If the player realizes that they have selected the wrong difficulty level after playing one third or more of the game, they can be unwilling to start the game from the beginning with the right difficulty. Reason for this can be that their experience is starting to get ruined at this point. If the game feels too hard or too easy, the player is likely to quit the game and never see its ending. Being able to change the difficulty during the game is not a solution for this problem but only making it worse. If the player played the game on easy mode and decides to switch to hard mode, it is likely to make the previous accomplishments worthless because the difficulty can adjust some mechanics or rules. If the player played on hard mode and decides to play on easy mode, they can feel less satisfied because completing tasks requires less effort. Therefore, learned skills can feel worthless when the game requires less mastery for progression. According to him, the reason why the player wants to change the difficulty is that they like the game but would like to enjoy it more, and if the way to adjust the difficulty is an in-game difficulty meter, there is a risk for depreciating the value of player’s achievements. [257]

Mark Venturelli has written a dedicated post for this topic: “Difficulty Levels and Why You Should Never Use Them” (2016). Although the title sounds unconditional, he is not fully against difficulty levels but considers them a bad idea in general. His post contains similar reasons as the others [48, 51, 52, 256, 257, 260] mentioned. Players are asked to make a critical decision at the start of the game when they do not have any experience of playing the game itself yet. He also mentions how difficulty is subjective and therefore easy difficulty can be hard for someone else and vice versa. Players can have different learning curves that affect how quickly

they learn to play the game. Players can have a specific gamer identity, like casual or hardcore, which is likely to affect which difficulty they are going to select. If the selected difficulty does not meet their expectations or they feel like they not having fun with the game is their fault, they can feel insufficient. Therefore, if a hardcore player feels like hard mode is too difficult, they can be reluctant to lower the difficulty and instead stop playing, especially if changing the difficulty requires restarting the game. Casual players playing the easy mode can experience the same if the game feels too easy, because hard mode does not feel inviting for them. Players might also not enjoy selecting difficulty and would like to just get into the game and experience it. Giving them a way to adjust the difficulty can therefore break “the magic” for players. Providing various difficulty levels can also take responsibility away from the designer and make it more challenging to understand and respond to feedback. If someone says that the game feels too easy, the designer might tell them to play the game on hard mode. Due to complexity the difficulty levels give, it can be challenging to say what the actual issue is. Each difficulty level can be also seen as its own game, meaning that one game contains multiple games. This makes testing and tuning the game more challenging, especially if the developers lack resources. [199]

Caleb Compton discusses in his post “The Difficulty Dilemma Part 1” (2019) the question if a game should have player-selectable difficulty or not. He argues that it is a significant decision and there are several factors to consider when making that decision. Difficulty levels have potential pitfalls, and one example of such is presented through FromSoftware president Hidetaka Miyazaki. Miyazaki does not want to add difficulty levels to games, because this way the players are brought to same level of discussion and enjoyment. He wants that the players face the same challenges and overcome them in their own way, and thus feel the sense of accomplishment. Compton argues that not all games are about overcoming difficult

challenges, like some games are about exploring the game world or creating your own story. Therefore, players of such games are not going to have the same experience anyway. In addition, for some kinds of games difficulty levels can take too much time to develop, like games containing lots of puzzles, and therefore are not suitable for them. [26]

In conclusion, the decision to add difficulty levels is up to the designer, but that decision should be made with care and considering what are the benefits and drawbacks of difficulty modes in one's game.

Based on the previous arguments, following are main arguments against difficulty selectors:

- Forcing players to choose difficulty before playing the game itself
- Balancing issues
- Being not suitable for all genres or games
- Increasing players' expectations toward the game

5.3 Best Practices for Designing Difficulty Levels

In the game design book, *Fundamentals of Game Design* (2014), Ernest Adams provides some advice for designing difficulty levels but mainly related to DDA. His book has a design rule called "Easy Mode Means Easy!", which refers to that easy modes should be suitable for inexperienced players and be actually easy. To know suitable difficulty level for it, the game should be tested with such players, not assume what is "easy". Adams discourages using DDA to substitute traditional player-selectable difficulty levels, because players prefer to have a possibility to adjust the difficulty. Therefore, DDA should be an optional feature the player can toggle on or off. DDA should only be used to make the game more difficult, not easier, because it requires

less reasoning from the system and thus is simpler to implement. DDA system should not take anything away from the player arbitrary, especially what the player considers earned. Lastly, his most important advice is that DDA system should stay invisible to the player. [3] He also gives similar advice for designing DDA in his post “The Designer’s Notebook: Difficulty Modes and Dynamic Difficulty Adjustment” (2008) on Game Developer [24].

Thus, Adams gives only one design rule for implementing player-selectable difficulty modes: easy mode must be easy. However, as Adams approaches definition of difficulty through stress and skill, he also recommends considering them when designing difficulty levels. [3] This section aims to expand Adams’s design rule and his other difficulty design advice to form best practices for implementing difficulty levels from the collected and analyzed posts on Game Developer website.

Josh Bycer (2016) shares the same opinion as Ernest Adams [3] that not all games can or should have difficulty settings. He thinks that not all games are meant to be designed so that they can be beaten by anyone, because some games are designed around the baseline of performance the player must achieve. Such games are usually skill-based and challenge the player to improve or fail, where action games are one example of such games. In addition, multiplayer and competitive games belong to another kind of games that are not meant to have difficulty levels, because it would require a vast amount of work to balance the game and increase server load. He argues that the best way to design difficulty is to fully integrate it as a part of the design and not only alter stat values. For example, higher difficulty levels can give players better rewards than lower difficulty levels or players are not punished for not using advanced mechanics and rules on easy mode. This way, difficulty motivates the player to get better and difficulty modes are more interesting and rewarding. He argues that games can be designed so that there is no need for difficulty levels. To do so, the designer needs to figure out the baseline experience. When the designer

has a concept of what players need to know to beat the game, those things need to be put into the game in a way that makes difficulty curve consistent, and players are well-prepared for harder challenges. If this is done well, there is no need to have difficulty settings but if the designer wants to build them into mechanics and progression model itself. Bycer still agrees that there is no one best solution and it is up to the designer to decide the design choices for the game. [261]

Mark Venturelli also discusses ways to replace difficulty levels in his dedicated post “Difficulty Levels And Why You Should Never Use Them” (2016). Despite the title, he is not fully against difficulty levels, because they can be a good thing in some cases. He argues that fixed difficulty levels are often the best way to manage difficulty in zero-sum single player games, which are similar to a “classic” competitive game with human players but replaces by AI opponents. [199] Therefore, to expand Bycer’s [261] view on how multiplayer and competitive play-based games are not suitable for difficulty levels, competitive games can be a suitable genre for difficulty levels but if they are offline single-player games.

Venturelli argues that difficulty adjustment should happen through meaningful choices the players make continuously through the game. In practice, these choices should be discernible, integrated, and ambiguous. Discernible means that the player recognizes the choice, its possible consequences and later realized consequences. Integration means that the choice affects the game state, and ambiguous that there is no obvious “right” or “wrong” decision and end result is unpredictable though the immediate effects of the decision made are noticeable. Venturelli presents several ways how to turn difficulty modes into such meaningful decisions. One way is having optional challenges. In this design pattern, the game is designed to have a “critical path” which is as easy and accessible as possible while offering optional challenges for players who want to attempt to beat them. Therefore, the critical path means the shortest path to finish the game. In practice, these optional challenges can be,

for example, collectibles on harder optional routes, combo meters, streaks, grades, or achievements. Another way is using nonlinear challenges. This lets the player confront challenges when they are ready or if they feel like it. If the player feel like they are progressing by doing whatever they want, the design can be considered well-made. The third way is implementing negative feedback loop. When the player is playing well and without making mistakes the game gets harder and the player is put in a position with more disadvantages, but when the player makes mistakes or is doing poorly, advantages for the player increase. Thus, this dynamic system increases the difficulty for skilled players while helping struggling players to keep going. The fourth way is to implement progression and customization systems. When they are combined with non-linear challenges pattern, the game can be designed so that it can be as challenging as the designer wants while players have ways to adjust the difficulty of the game by utilizing the systems. For instance, the player can “grind” resources to level up and become more powerful or use items and abilities which were designed to make the game easier. However, using this pattern requires caution, because the designer might easily err to weight the game too heavily on artificial progression and lose focus on what really matters: the player’s own learning curve and ability to improve in the game and be rewarded for it. [199] Similarly, Tadhg Kelly thinks that it would be better if switches and selectors are not presented to the player to keep up the charm of the game [263].

When the game has a difficulty selection menu, there should be a small number of difficulty levels [259], because too much difficulty modes can overwhelm the player [199, 234]. The game should provide difficulty modes which are targeted toward novice, skilled, and in-between players [264, 265], and the modes should have understandable labels [259] and be explained clearly [266]. Difficulty modes could be better if they changed the game in meaningful ways and not just changed some values like player health and enemy damage [267], but more feasible option can be

providing one balanced difficulty mode, which is clearly indicated to the player [259]. For example, “normal” difficulty mode could present the intended balanced difficulty [268]. This normal difficulty mode could be set as default, because people tend to favor default options due to avoiding decision-making [269]. Josh Bycer suggests that there could be only one or two difficulty levels, because he thinks that the game is more balanced the fewer difficulty modes it has. For instance, there could be “normal” and easier, assisted difficulty mode. [270] Players should not be forced to play the game on easy mode on their first playthrough, because it affects how the game mechanics are seen in general [271]. Even if some regions may prefer easier or harder difficulty modes, difficulty levels should not depend on region, because it would make the game feel different [272]. It is recommended that players should not be shamed for choosing an easy mode or limit the amount of content based on the difficulty mode selection, because difficulty modes are to tailor the game for different kinds of players [26, 273]. When a difficulty mode selector is presented to the player before they have played the game, it is also a part of introduction to the game. Therefore, difficulty mode labels and descriptions can tell the player what the game is about or what to expect [274].

Venturelli suggests that difficulty levels could be used as an objective measurement of player skill, like a “challenge ladder” the player can climb. This way the player can see where they are at mastering the game. [199] This idea could work if multiple difficulty modes are available at the beginning of the game, because some players might find the easy mode too easy, especially if they are already familiar with similar games, and this way stop playing the game. Therefore, this idea is mainly about how to present difficult modes to the player, and this kind of approach could suit games which are challenge-centered. However, this challenge ladder could also be “hidden” inside the game system, like Venturelli himself suggests [199], as he finds it a better way to implement it.

Collected data and studies made on the players' preferences on difficulty levels suggest that most of the players prefer easy difficulty levels [9, 69–73]. This may be dependent on the genre as Allart et al. (2017) found out in their study that players prefer higher difficulty levels and they used games of different genres than the others [9, 69–73]. In addition, their study discovered that the way players experience the difficulty depends on what kind of options the player has to progress in the game. If it only depends on the player's skills, the experience is likely to suffer compared to games where the player can modify and build their character. [87] However, due to the studies [9, 69–73] using differing genres, they are not comparable and the results can depend on what kind of players the samples contained. Nevertheless, it can be concluded that it is important that the game fulfills Adams's design rule "Easy Mode Means Easy!", especially when it is estimated that only 10-30% of players of the game finish it [73]. It could make it more likely that the players see more of the contents of the game and get more out of the game.

One Game Developer staff member discusses in post "Difficulty Levels: Do they really represent how our players experience our games?" (2018) how players having limited time to play may make them select easy mode to complete the game faster. Therefore, they suggest that difficulty levels could be named based on length of the game. [73] However, designing difficulty levels based on the length is likely to conflict with recommendation of not locking content behind difficulty mode selection. Thus, to generalize this idea, the way the difficulty modes are named could indicate what kind of purpose they are serving. For instance, easy mode could be recommended for players who want to experience the story and game world but are not so into tough challenges and thus the game takes less time to complete, whereas hard mode could provide more challenge and require more mastering of the game and this way also bring more playtime for the game. Another way to approach this could be that the easy mode is a more compact version of the game, meaning that it supports getting

through the game faster without cutting essential content. This kind of easy mode could also be hidden into the game so that getting through the main game is easy but there are harder optional challenges. The game could also be designed so that they support shorter play sessions, so that the game can be enjoyed in convenient pieces.

Some games inform the player about possibility to adjust the difficulty of the game during gameplay. However, it mainly occurs when the player is struggling and the game asks the player if they want the game to be easier. Thus, games do not really ask if the player wants the game to be more challenging. [243] *God of War* games is one example of games which suggest easier difficulty, if the player keeps dying between checkpoints. How the player feels about it is subjective but also depends on why they are dying, because the difficulty modes only affect combat difficulty. Leanne Taylor (2012) and one Game Developer staff member (2010) write in their posts how this question feels mocking, because they both were struggling with jumping, not combat [250, 275]. The staff member also notes how that question harms the game's charm, because the player is supposed to be a God of War [275]. On the other hand, Tim Keenan (2010) writes in his post how this question made him realize how easy mode could make him enjoy the game more. However, he struggled with combat and enjoyed the story and atmosphere of the game more. [247] Therefore, asking the player if they want to adjust the difficulty should happen carefully and consider why the player is dying and if adjusting difficulty level can affect the reason why the player is struggling. Shelly Warmuth mentions how this question should not happen during endgame [276]. Likely reasons for this can be that when the player is close to the end of the game, it can ruin the sense of accomplishment for the player, hint how the game has not taught the player to master the game enough before that moment or does not trust in player's skills. The game can also tell the player that they can adjust the difficulty to inform about

such possibility in general. But when it happens, it should be communicated clearly to avoid misunderstandings [255].

Keith Stuart argues in his post “Is frustration an essential part of game design?” (2013) that games with a win state should provide challenges on easy mode to inexperienced players instead of “spoon-feeding them narrative sequences in between one-hit kills and dozens of lobotomised enemies”. His comment refers to how easy modes have become more common in video games after they become a mass entertainment medium. [277] Similarly, Tom Chatfield (2014) argues that “difficulty is the point, not the problem”, meaning that difficulty is something that separates games from other mediums. For example, one can watch a difficult movie, but seeing it fully requires only watching it. But seeing the ending of the game requires beating challenges of the game. [278] This could relate to that games are made from rules to the player must accept, which separates them from other forms of entertainment, as Josh Bycer (2012) mentions in his post [90]. Likewise, Steve Mellbye-Stolen (2013) discusses how games differ from the other mediums by demanding something to get full experience. A movie does not stop if one is not paying attention, but a game can punish the player for being careless. [27] Nick Halme touches this discussion in his post “An Argument for Difficulty” (2012). He thinks that modern game design should re-think itself, because more and more games seem to be “just difficult”, which seems to refer to how difficulty levels are often made by only changing numbers. According to him, “we value user-experience over challenging design”, which is at the heart of games. He argues that challenges are core elements of games, and we do not see “real” games like hockey too difficult, even they are difficult. Thus, he argues that games should be made more challenging and it is easier to make a hard game easier than vice versa. [258] Therefore, even easy mode is supposed to be easy, it should not be overly easy, because it can not only be boring for the player but also lose one of the core essences of video games: challenges. However, as Edward Mc-

Neill (2014) points out, caring about player experience should not be neglected and there are great difficult games with an aesthetic of indifference toward the player, but they were made with care and desire to give a positive experience [279]. In conclusion, game designers should not be worried about the easy mode being too difficult until further player feedback, especially when the game can be updated via Internet. It is still worth noting that making a game harder is easier than making a game easier [280], but players are more likely to have a better experience when the first released version of the game is too hard than too easy.

Matthew Codd argues in his post “On replayability: emotion, mechanics, and necessity” (2015) that there is no point in having different difficulty modes if players are not hooked on emotional level to play more. According to him, when people talk about replayability, they often mean mechanical replayability, while emotional replayability is something that engages the player on a deeper level and keeps them playing the game. He also points out that not every game must be replayable, even some games benefit from or are built around it. In addition, every playthrough does not need to be unique to meaningful and to demonstrate it, he mentions how people enjoy their favourite movies, series, and books even after seeing or reading them multiple times. [281] However, not all players are into replaying the game and thus it is important to ensure the best experience for the first playthrough [282]. Christopher Gile argues in his post “Difficulty” (2013) that giving the player more rewards on higher difficulty can make the player play more. A game can, for example, have missions which difficulty the player can choose but the higher the difficulty is, the better the rewards are. Here, the developers also benefit from this because they can get most out of their assets. [243] Therefore, when the player beats a harder challenge, it should feel more rewarding compared to beating an easier challenge or the same challenge on easier difficulty mode. But to get the player into replaying the game, emotional side of the game should be robust [281].

Jordan Georgiev (2013) argues how difficulty scaling can give games replay value. He gives *Dark Souls* (Bandai Namco Entertainment / FromSoftware, 2011) as a good example of it, where he may refer to NG+ (New Game Plus) mechanic in the game. [283] When the player beats *Dark Souls*, the game starts immediately again from the beginning with some changes, like the player keeps their upgrades and most of the items, but enemies have more health and deal more damage. Due to increased difficulty, killed enemies bestow more souls, which are both currency and experience points in the game. This loop continues for eight playthroughs in total. This kind of loop could be seen as hidden difficulty levels, or “challenge ladder” if beating the game itself is the challenge, where the player keeps beating the game with increased difficulty and soul rewards.

Michal Mycka (2015) mentions that there are two basic ways to differentiate or create difficulty levels: quantitative and qualitative. Quantitative refers to changing values and thus does not affect the process of beating challenges, like increasing enemy damage. Qualitative causes changes to the process, like adding new variables, like durability to the weapons. Quantitative changes can seem artificial to the player but also be easier to make, while qualitative changes often increase production costs significantly. [44] This is likely one reason why quantitative changes are usual way to create hard modes in games, especially when considering that difficulty modes are mostly designed and implemented at the end of the project [213]. Therefore, to create balanced difficulty levels, they should be taken into account earlier during the development, because they require significant time and effort to be implemented well [213]. When the game is made difficult by only changing values, it is likely not as interesting as qualitative changes, because they do not change the game. Qualitative changes may also make the game feel more intrinsically rewarding, when the game introduces new elements to take into account in the game. However, the game should also feel fair so that it is not needlessly difficult and there are no restricting

options. If there is only one or two ways to win the game on hard mode, it is not good design. [116]

Daniel Boutros has written a post dedicated to designing hard modes: “Difficulty is Difficult: Designing for Hard Modes in Games” (2008). One reason why he wrote the post was that difficulty modes in games are rarely discussed as an important element in the business. Because difficulty is subjective, his arguments are written around ideas of that the player must feel like failing the challenge is their own fault, not the poor design’s, and the player must understand why and how they failed to learn from the mistake. When the player selects a high difficulty, it indicates that the player wants to be tested and to make the test enjoyable requires it being challenging yet achievable. If the hard mode is made using usual formula where enemies make more damage and thus the player can be killed with one hit, the game becomes “very classically rooted in trial and error, using memory play as the core consistent play type”. Such can often result in frustration and likely make the game feel dissatisfying. [213]

Boutros gives seven elements as an example of elements in the game that are worth adjusting to harder difficulty levels. The first one is time limit, which is a classical difficulty tuner, especially for racing games. The second one is damage dynamics, which is the easiest element to adjust to make a game harder. But it alone can lead to “one-hit kill syndrome” and thus other elements, like enemy placement and resources, should be carefully tuned along with damage. Another danger is that the feel of the game changes “from an evaluate/solve game to a predominantly memory-play based affair”. The third one is “Simon says”, which refers to games that are dependent on button presses, like rhythm games, could demand more presses per time unit to increase difficulty. The fourth one is to increase AI aggression, which makes the enemies behave more aggressively. It can make them take more risks, but it can feel unfair if the enemy can see the player from unrealistic distance or kill the

player with an off-screen projectile. The fifth one is reduced neutral zones, where safe and unused areas are taken away or changed to hazardous areas. The sixth one is restricting HUD (Head-Up Display), which alters the interface. It suits the best games with multiple feedback systems and thus it can be used to reduce in-game information the player can get. The seventh and last one is reducing resources. [213]

Alex Kubodera suggests in his post “Designing for Difficulty: Readability in ARPGs” (2022) some ways to increase difficulty. His suggestions do not relate explicitly to difficulty modes, but could be considered when designing differences between them, and some of his suggestions are similar to Boutros’s [213]. The first one is to challenge learned behaviour, like a boss fight having multiple phases where used patterns are different. The second one is to shorten windows of opportunity, where the moments when the player can attack are shorter. The third one is to add modifiers, and the fourth is to increase the speed. The fifth one is to make, for example, a boss enemy to have a partner to fight with them, or alternatively, the sixth one is to clone the boss. The seventh one is to add a timer, and the eight and the last one is to have resource management. [284]

Brandon Kidwell mentions in his post “GDotD - CONTEXT & DIFFICULTY” (2014) some tips to make games entertaining for both casual and (hard)core players. One tip relates to difficulty settings, which would make them provide more or less help. [174] What it means in practice depends on the game. In *Shadow of the Tomb Raider* (Square Enix Europe, 2018), the player can adjust exploration difficulty, which affects, for example, highlighting the critical path: on easy, the path is highlighted with distinct white paint, while on hard, there is none [285]. Which elements a game should adjust on hard mode depends on the game, but it is important to keep the game seem fair. Boutros points out that fairness in games is in fact an illusion, because barely any game is truly “fair”. The illusion of fairness means from the player’s perspective what’s important and it “comes in the form of

convenience mechanics”, which refers to things such as good checkpoint system and placing healing supplies before and after harder battles. However, communicating and giving feedback to the player is necessary. [213]

The question of whether the player should be able to change difficulty mode during the playthrough is a design question and can depend on how it affects the intended experience. Director and producer of game *Furi* (The Game Bakers, 2016), Emeric Thoa, explains in his post why they did not allow the player to switch their difficulty. It was not done to punish the player but prevent the player from having temptation to switch difficulty mode when a difficulty spike hits, because it would make the player lose the feeling of satisfaction when overcoming a tough challenge. [286] In contrary, Bethesda and LucasArts veteran, Brett Douville, gives in his post “Opinion: Ten Tips For Managing Difficulty In Games” (2009) as the first tip that players should not be forced to start the game from the beginning to change the difficulty. This likely relates to that if the player makes a wrong choice with the difficulty, they can change it to make it suit their needs better. [266]

In conclusion, how difficulty modes “should” be designed is at the end up to the designer, but the most important thing is that they should support the intended experience the designer has crafted. As Ernest Adams said as an counterargument to that difficulty mode selectors being often at the beginning of the game force the player to select their difficulty level before playing the game itself is not really an argument against them, because difficulty mode selectors can be designer or presented in another way [24]. Thus, expanding the understanding of the ways difficulty mode selection can be designed and implemented beyond the traditional way can be beneficial to make the way the player can adjust the difficulty support the game better. But even there is not true “right” or “wrong” way to offer difficulty selection for the player, because games are different, there can be some best practices that can be used to guide the design.

Based on the introduced arguments in this Section and in Section 5.2, following best practices can be concluded for designing difficulty modes, mainly regarding difficulty selector menus:

- Consider adding player-selectable difficulty modes only if it fits the game or it is beneficial, as they may not be suitable for all games or genres. In addition, difficulty modes have cons that can affect the game, for example, by bringing some challenges, like expectations toward the game. Thus, consider how difficulty mode selector and the way it can be accessed affects the game.
- Difficulty mode should correspond its name or label, like easy mode is supposed to be easy, but it should still offer challenge. The names or labels should also be understandable and support the player's decision-making between difficulty modes, like through defining the labels utilizing the target audience. This way the player may approach the selection through what kind of experience they want instead of thinking how difficult they want the game to be. Regarding easy modes, caution is recommended not to mock or shame the player.
- When difficulty mode selector is presented before starting the game itself, consider what kind introduction to the game it can give to the player.
- Consider difficulty affecting elements to make difficulty modes support the intended experience, like considering all challenge types in the game. This does not necessarily mean adding a difficulty selector for each challenge type but that the difficulty modes take them into account to ensure balanced experience. Therefore, prefer qualitative changes over quantitative or artificial difficulty adjustment.
- Offer a few difficulty modes for novice, skilled, and in-between players or alternatively one most balanced difficulty mode and then another easier or harder

one but not only extreme options. The most balanced difficulty mode should be clearly indicated and be pre-selected as the default difficulty mode to make the decision easier. These core difficulty mode options should not be locked by requiring completing, for example, the easy mode first. In addition, difficulty modes should not depend on the region, even if there were different preferences.

- Difficulty modes are to tailor the game for different players and thus they should have fair difficulty, no restricting options and not limit the amount of content.
- Possibility to adjust the difficulty should be communicated clearly. When it is done by asking the player if they want to lower the difficulty when they are struggling, it should be done with care and not during endgame.
- Take difficulty modes into account earlier than at the late stage of the development to have more time to design, adjust and balance them.

6 Discussion

This chapter expands the discussion from the presented findings by bringing out relevance of the study and suggesting how this research could be taken further or expanded. In the first section, significance of the study is discussed to emphasize meaningfulness of the work for game design and research. The second section presents limitations of the study, which may have affected the results and the discussions in this thesis. The last and third section proposes suggestions for future work based on the findings.

6.1 Significance of the Study

This thesis research aimed to mend scarcity of written works related to video game difficulty, as there seems to be no other work that considers difficulty as deeply and versatily as this thesis. In addition, there seems to be no difficulty model or taxonomy which takes into account various difficulty affecting elements both inside and outside a game and elements which do not explicitly relate to difficulty. Furthermore, there has been no other work which introduces best practices for difficulty modes but scarcely. This may be the case because difficulty is a complex topic and thus requires taking a wide-ranging view on it. Therefore, addressing video game difficulty comprehensively requires an extensive dedicated work solely for it. However, this thesis has only been laying groundwork for this topic by gathering

information from different sources and analyzing them, because different elements and aspects of difficulty could be expanded further.

Difficulty itself has been argued to be a significant part of video games, yet it is not much researched regarding player experience, as how the player feels the difficulty plays a significant role in if the difficulty is “right”. As this research focused on premium commercial video games, importance of player experience is emphasized. Therefore, to address found issues with difficulty and to design it well, it is beneficial to know from which elements the difficulty consists of where the presented difficulty model can be used as a tool or framework.

Even designing difficulty and difficulty levels are at the end up to the designer, there can be some best practices, which can guide the design. In practice, they can help the designer with thinking process and exposing tacit knowledge. Thus, although this research is not a game design guide, the findings could be elevated further to produce difficulty-focused game design guide. This also includes presented arguments for and against difficulty selectors, as they may help with evaluating pros and cons of ways to implement difficulty to one’s game.

This study also aimed to expand how selecting difficulty is viewed, as during the research it was discovered that it is assumed to mean selecting difficulty level from a difficulty selector. However, in this study concept of selecting difficulty included all the decisions the player can make to affect the difficulty, both explicitly and implicitly. In addition, difficulty adjustment by DDA was included in the concept, as it can be seen as an automatic difficulty selector. This was done to bring out that the player does not select their difficulty only when they select it from difficulty settings and the player can select easier or harder way to play the game even when the game has no explicit difficulty selector. Furthermore, this expansion can make difficulty affecting elements more exposed.

6.2 Limitations of the Study

This research was focused on Game Developer website and collected material using only “difficulty” as the search term. Thus, more relevant material could be found elsewhere but also utilizing “challenge” or “complexity” as search terms, because difficulty can be hidden under them as was introduced in Chapter 1. Most of the used posts were from 2010s and thus current views on difficulty may be underrepresented, as discussion related to accessibility in Section 3.2 revealed that the tone on discussing difficulty has changed in 2020s. Therefore, some views presented on this thesis may not present how the difficulty is viewed or discussed currently and thus they had time context attached to them when it may have had influence on the presented views. This research did not often distinguish the authors based on their experience, as some of the authors on Game Developer website are students and some experienced in the field.

Due to complexity of difficulty, this work does not still cover difficulty affecting elements in detail but with explaining examples. Some potentially worth mentioning things may have been left out to keep the text solid and coherent, as this topic could be expanded further, but it would have been out of scope. In addition, as there is no similar difficulty model as in this thesis, there was no basis for constructing it, which made it more challenging. But categorization was done based on what some common general concepts, like level design or mechanics, tend to include and what appeared sound. This research did not also cover all ways to present difficulty modes, such as how some games bake difficulty selection into different storytellers. One reason for it was that no material mentioned them, while another reason was to keep the thesis coherent and focused on certain ways to select difficulty. Moreover, how different methods to help the player affect difficulty were excluded from this study for similar reasons.

6.3 Future Work

As difficulty and difficulty levels are not much researched topics, there is lots of potential research work to be done. Within this study, there is only one research [8] which has studied how difficulty modes should be presented to the player, where it was studied regarding a casual and a life simulation game. However, the study only compared difficulty selection being done through a traditional menu, embedded in-game selection or automatically. Therefore, it did not study, for example, different labeling of difficulty modes or how more detailed difficulty selection screens, where the player can adjust different difficulty affecting elements or difficulty of each challenge type in the game, affect player experience. Thus, different ways to present difficulty modes and selectors could be researched further. In addition, the best practices for difficulty levels could be expanded considering best practices on user experience in software in general.

Proposed difficulty model in Chapter 4 could be used as a basis for studying difficulty in games further, like using it to analyze how difficulty affecting elements differ between different genres or use it to analyze difficulty of a certain game or genre. There is not much research on what kind of difficulty players tend to prefer and there is a clear lack of comparable studies, as there is mainly one study per genre [8, 9, 69–72, 87, 287]. Therefore, the model could be used to support research on this topic to explain the differences between genres or different players.

Section 3.2 revealed that accessibility features in games and how difficulty is connected to accessibility could be investigated further, as it seems that there are some misconceptions or differing views on how difficulty relates to accessibility. But what accessibility in games also means appears to have differing views, as some think that easy difficulty means accessibility, which can cause games to have ineffective accessibility features. Therefore, studying this topic could help with improving

accessibility in games but also make the line or connection between difficulty and accessibility settings clearer.

Presented views on difficulty on this thesis were mainly from game developers, who both represented developers and players, as some provided second-hand knowledge about players and some expressed their own experiences as a player. Therefore, this research could be expanded by studying and gathering information directly from players who are not in the industry. However, as the developer views were mainly from 2010s, gathering more of them from 2020s could be beneficial for the research as well.

7 Conclusion

This research aimed to mend absence of comprehensive written works on difficulty in video games, especially regarding difficulty levels. Therefore, posts from Game Developer website were collected to gather more material than what game design books contain, but also some other sources were used as material. Done research in this thesis conducts following answers to the research questions:

RQ 1: *What difficulty means in the context of video games?* Due to complexity of difficulty, it is challenging to make a thorough definition for difficulty, and such would contain a risk of narrowing discussion on difficulty in general, when considering the elements of the proposed difficulty model in Chapter 4. Therefore, such definition is not proposed, but it does not mean that there could not be any definition for difficulty but that there can co-exist different definitions and terms for it, which look at it in a certain context or perspective. But difficulty could be seen as an abstract force which is like an opposing force to the player affecting how much effort they need to put into something. What that “something” is depends on the context, such as getting through a level, understanding what they should be doing in the game or controlling the player character. This way of viewing includes subjective side of difficulty as needed effort also depends on the player’s skills, not only what the game requires from them. How the player feels the difficulty does not directly relate to what difficulty means but stems from it, especially when considering that difficulty as an opposing force can have different natures but definition of the nature

may be subjective. This refers to difficulty feeling, for instance, fair or unfair and thus it can be seen through difficulty terminology, which was introduced in Section 2.2. But this opposing force can also be seen as the element which affects difficulty, like controls, time limit or aggressiveness of the enemies. Thus, leaving meaning of difficulty as an ambiguous form may be the most fruitful way to approach it so that it can adapt to the context it is used in.

RQ 2: *Should video games have selectable difficulty or not and why?* There is no “right” or “wrong” answer to this question, as this is up to the designer. However, there are multiple ways to let the player select their difficulty, but difficulty can also be selected by DDA. But this question relates to providing a difficulty mode selector to the player. Both providing a difficulty mode selection menu and not doing so have their own pros and cons, as introduced in Section 5.2. When the player can select their difficulty mode, it can provide an explicit way to tailor their game experience and be a way to cater different player audiences, but they are also argued to make a game more accessible. But difficulty modes are also argued not to suit every game or genre. They can also bring balancing issues, as every difficulty mode can be seen as a different version of the game, which is adjusted around a certain level of difficulty. Difficulty modes can also increase the player’s expectations toward the game, because when the player selects a certain difficulty mode, they expect the game to have that level of difficulty. Thus, to answer this question, it depends on how difficulty mode selector supports the intended experience and gameplay. However, as difficulty modes have been a part of commercial video games since the 1970s, it is not about if they “should” be in games, but if they “should” be implemented this way.

RQ 3: *What is the best way to implement difficulty levels?* Strictly speaking, there is no absolute “best way” to implement difficulty levels as successful difficulty modes should support the design and intended experience. Thus, it is up to the

designer, like should the player be able to adjust their difficulty level through a traditional difficulty mode selector menu or in a more implicit way, like by having harder optional challenges alongside the easy main path or character-building mechanic. However, there can be some best practices that can be utilized to guide the design, as introduced in Section 5.3. The most important thing is to consider what kind of difficulty level implementation suits the game the best, as they have their own pros and cons. No matter what kind of implementation way is decided, difficulty modes should feel balanced, fair, exist to let the player tailor their experience and have not only extreme levels of difficulty. Thus, difficulty modes should not limit the amount of content the player can access. It is recommended to prefer qualitative changes to differentiate or create difficulty modes over quantitative or artificial difficulty adjustment. Lastly, it would be beneficial to consider difficulty modes earlier in the development than at the late stage to have more time to design and balance them.

Done research concluded also other findings. Based on the found discussions in Section 3.1, it appears that older players may have misunderstood why older games are more difficult than modern games. Even though arcade games shaped game design of the early decades of commercial video games, older games were not necessarily meant to be difficult on purpose, but because of technical limitations. From the discussions in Section 3.2, it appears that both difficulty settings and accessibility setting have some similar issues and distinction between them is not established. For example, when a game offers invincibility as an accessibility option, it only helps with challenges where the player may take damage. Thus, it does not help with platforming challenges of the game. Similar issues may arise when difficulty levels of a game only consider combat challenges while the game has also platforming challenges. If the player is struggling with platforming, changing difficulty is not an option to make it easier. This can cause more issues when the game attempts

to help the player by asking if they want the game to be easier, when the game detects the struggle. Therefore, the discussions revealed that both difficulty levels and accessibility settings have issues of being ineffective. In addition, the discussion in Section 3.2 revealed that there is a misconception of accessibility meaning easy difficulty, while having a disability does not remove desire to be challenged in a video game.

During this study, it was also found out that when selecting difficulty levels is being discussed, it is assumed to mean selecting difficulty from a traditional difficulty selection menu. In Section 5.1, it was discussed that selecting difficulty can also be done through other difficulty affecting decisions that the player can make or DDA can make for the player. It could be beneficial to expand the concept of selecting difficulty level both when designing difficulty or considering what can make a game difficulty. For example, the player might have made the game more difficult for them by building their character in a certain way, on purpose or without knowing it. However, player-selected difficulty and selections done by DDA affect the player differently, as it takes control away from the player and thus if DDA helped the player to win, it can feel less satisfying.

This thesis laid groundwork for researching video game difficulty, as this topic could be expanded further. Therefore, there is lots of potential research work to be done around this topic in the future, as expressed in Section 6.3.

References

- [1] M.-V. Aponte, G. Levieux, and S. Natkin, “Measuring the level of difficulty in single player video games”, *Entertainment Computing*, vol. 2, no. 4, pp. 205–213, 2011, Publisher: Elsevier Ireland Ltd, ISSN: 1875-9521. DOI: 10.1016/j.entcom.2011.04.001.
- [2] J. Schell, *The Art of Game Design: A Book of Lenses*, Second edition. CRC Press, 2014, ISBN: 1466598646.
- [3] E. Adams, *Fundamentals of Game Design*. New Riders Publishing, 2014, ISBN: 0321929675.
- [4] T. W. Malone, “Heuristics for designing enjoyable user interfaces: Lessons from computer games”, in *Proceedings of the 1982 Conference on Human Factors in Computing Systems*, ser. CHI '82, Gaithersburg, Maryland, USA: Association for Computing Machinery, 1982, pp. 63–68, ISBN: 9781450373890. DOI: 10.1145/800049.801756.
- [5] N. Lazzaro, “Why we play games: Four keys to more emotion without story”, Game Developers Conference, Mar. 2004.
- [6] J. Juul, “The game, the player, the world: Looking for a heart of gameness”, ser. Level Up: Digital Games Research Conference Proceedings, vol. 1, 2003, pp. 30–45.

-
- [7] C. Crawford, *The Art of Computer Game Design*. Berkley, CA, USA: Osborne/McGraw-Hill, 1984, ISBN: 0881341177.
- [8] J. D. Smeddinck, R. L. Mandryk, M. V. Birk, K. M. Gerling, D. Barsilowski, and R. Malaka, “How to present game difficulty choices? Exploring the impact on player experience”, in *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, ser. CHI ’16, event-place: San Jose, California, USA, New York, NY, USA: Association for Computing Machinery, 2016, pp. 5595–5607, ISBN: 978-1-4503-3362-7. DOI: 10.1145/2858036.2858574.
- [9] J. D. Lomas, K. Koedinger, N. Patel, S. Shodhan, N. Poonwala, and J. L. Forlizzi, “Is difficulty overrated? The effects of choice, novelty and suspense on intrinsic motivation in educational games”, in *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, ser. CHI ’17, Denver, Colorado, USA: Association for Computing Machinery, 2017, pp. 1028–1039, ISBN: 9781450346559. DOI: 10.1145/3025453.3025638.
- [10] D. Bress, *Player types: The challenge model*, Game Developer, Dec. 8, 2009. Accessed: Dec. 28, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/player-types-the-challenge-model>.
- [11] T. Ryan, *Beginning level design, part 1*, Game Developer, Apr. 16, 1999. Accessed: Dec. 28, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/beginning-level-design-part-1>.
- [12] D. Dziedzic and W. Włodarczyk, “Approaches to measuring the difficulty of games in dynamic difficulty adjustment systems”, *International Journal of Human-Computer Interaction*, vol. 34, no. 8, pp. 707–715, 2018, Place: Philadelphia, Publisher: Taylor & Francis, ISSN: 1044-7318. DOI: 10.1080/10447318.2018.1461764.

- [13] T. Ventrice, *Gamification: Framing the discussion*, Game Developer, Nov. 2, 2011. Accessed: Mar. 19, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/gamification-framing-the-discussion>.
- [14] M. Csikszentmihalyi, *Flow: The Psychology of Optimal Experience*. Harper-Collins, 2008, ISBN: 978-0-06-154812-3.
- [15] J. Juul, “In search of lost time: On game goals and failure costs”, in *Proceedings of the Fifth International Conference on the Foundations of Digital Games*, ser. FDG '10, Monterey, California: Association for Computing Machinery, 2010, pp. 86–91, ISBN: 9781605589374. DOI: 10.1145/1822348.1822360.
- [16] K. Tekinbaş, “Game development”, in *Debugging Game History: A Critical Lexicon* (Game histories), H. Lowood and R. Guins, Eds., Game histories. Cambridge, Massachusetts: The MIT Press, 2016, ISBN: 978-0-262-33194-4. DOI: 10.7551/mitpress/10087.001.0001.
- [17] M. Nitsche, “Demo”, in *Debugging Game History: A Critical Lexicon* (Game histories), H. Lowood and R. Guins, Eds., Game histories. Cambridge, Massachusetts: The MIT Press, 2016, ISBN: 978-0-262-33194-4. DOI: 10.7551/mitpress/10087.001.0001.
- [18] C. Crawford, *The Computer Game Developers' Conference*, Erasmatazz, Aug. 14, 2010. Accessed: Feb. 21, 2026. [Online]. Available: <https://www.erasmatazz.com/personal/experiences/the-computer-game-developer.html>.
- [19] S. Adams, *The top colleges and grad schools to study game design*, Mar. 25, 2015. Accessed: Feb. 21, 2026. [Online]. Available: <https://www.forbes.com/sites/susanadams/2015/03/25/the-top-colleges-and-grad-schools-to-study-game-design/>.

- [20] B. Schweizer, “Difficulty”, in *Debugging Game History: A Critical Lexicon* (Game histories), H. Lowood and R. Guins, Eds., Game histories. Cambridge, Massachusetts: The MIT Press, 2016, ISBN: 978-0-262-33194-4. DOI: 10.7551/mitpress/10087.001.0001.
- [21] C. Therrien, “‘To get help, please press X’ – The rise of the assistance paradigm in video game design”, in *DiGRA ’11 - Proceedings of the 2011 DiGRA International Conference: Think Design Play*, DiGRA/Utrecht School of the Arts, Jan. 2011, ISBN: ISSN 2342-9666.
- [22] Atarimania, *Atari 2600 VCS catalog - Atari - 1978*. Accessed: Jan. 18, 2026. [Online]. Available: https://www.atarimania.com/catalog-atari-atari-usaco12737_65_2.html.
- [23] T. W. Malone, “Toward a theory of intrinsically motivating instruction”, *Cognitive Science*, vol. 5, no. 4, pp. 333–369, 1981, ISSN: 0364-0213.
- [24] E. Adams, *The designer’s notebook: Difficulty modes and dynamic difficulty adjustment*, Game Developer, May 14, 2008. Accessed: Feb. 3, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-designer-s-notebook-difficulty-modes-and-dynamic-difficulty-adjustment>.
- [25] Game Informer, *The absurd reason the Lion King game was so hard*, YouTube, Mar. 2, 2019. Accessed: Jan. 15, 2026. [Online]. Available: <https://www.youtube.com/watch?v=csDgDui2yk>.
- [26] C. Compton, *The difficulty dilemma part 1*, Game Developer, Jun. 27, 2019. Accessed: Jan. 13, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-difficulty-dilemma-part-1>.
- [27] S. Mellbye-Stolen, *The demanding art form that is games*, Game Developer, Mar. 9, 2013. Accessed: Mar. 2, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-demanding-art-form-that-is-games>.

-
- [28] J. Bycer, *Debating old school design*, Game Developer, Feb. 25, 2015. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/debating-old-school-design>.
- [29] Modern Vintage Gamer, *How retro consoles and computers saved your games*, Oct. 27, 2025. Accessed: Jan. 15, 2026. [Online]. Available: <https://www.youtube.com/watch?v=pGkcRjfNA00>.
- [30] Ars Technica, *Crash Bandicoot co-creator Andy Gavin: Extended interview / Ars Technica*, Mar. 26, 2020. Accessed: Jan. 15, 2026. [Online]. Available: <https://www.youtube.com/watch?v=pSHj5UKSylk>.
- [31] N. McDavid, *Every Crash Bandicoot game, ranked by difficulty*, Game Rant, Jul. 16, 2022. Accessed: Jan. 15, 2026. [Online]. Available: <https://gamerant.com/hardest-most-difficult-crash-bandicoot-games/>.
- [32] J. Bycer, *Examining difficulty in videogames today*, Game Developer, Oct. 2, 2020. Accessed: Mar. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/game-platforms/examining-difficulty-in-videogames-today>.
- [33] J. Bycer, *How difficulty design affects the experience*, Game Developer, Oct. 11, 2017. Accessed: Mar. 21, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/how-difficulty-design-affects-the-experience>.
- [34] B. Morrison, *Meet Facebook games' ancestor: Coin-op arcades*, Game Developer, Jan. 26, 2011. Accessed: Jan. 24, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/meet-facebook-games-ancestor-coin-op-arcades>.
- [35] S. Laframboise, *Candy Crush Saga: A sweet journey into monetization*, Game Developer, Jun. 22, 2013. Accessed: Mar. 2, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/candy-crush-saga-a-sweet-journey-into-monetization>.

- //www.gamedeveloper.com/design/candy-crush-saga-a-sweet-journey-into-monetization.
- [36] R. Terrell, *Depth from complexity pt.2*, Game Developer, Jul. 10, 2012. Accessed: Apr. 22, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/depth-from-complexity-pt-2>.
- [37] S. Samson, *Compulsion loops & dopamine in games and gamification*, Game Developer, Nov. 13, 2017. Accessed: Apr. 22, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/compulsion-loops-dopamine-in-games-and-gamification>.
- [38] S. Costiuc, *Why Dark Souls should have an easy mode*, Game Developer, video, Jul. 7, 2017. Accessed: Mar. 23, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/-video-why-dark-souls-should-have-an-easy-mode>.
- [39] R. Valerio, *Make it difficult, not punishing*, Game Developer, Jul. 11, 2017. Accessed: Mar. 9, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/make-it-difficult-not-punishing>.
- [40] B. Sheffield, *How do you get players to finish your game? D4 director Swery explains*, Game Developer, Nov. 17, 2016. Accessed: Mar. 8, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/how-do-you-get-players-to-finish-your-game-i-d4-i-director-swery-explains>.
- [41] K. Eberhart, *Development of difficulty in games*, Game Developer, Feb. 26, 2019. Accessed: Apr. 22, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/development-of-difficulty-in-games>.
- [42] S. Ravencroft, *Darks Souls 2: 'Accessibility' isn't a dirty word*, Game Developer, Jul. 29, 2013. Accessed: Mar. 3, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/darks-souls-2-accessibility-isnt-a-dirty-word>.

- [//www.gamedeveloper.com/design/darks-souls-2-accessibility-isn-t-a-dirty-word](https://www.gamedeveloper.com/design/darks-souls-2-accessibility-isn-t-a-dirty-word).
- [43] J. N. Rose, *Addressing conflict: Tension and release in games*, Game Developer, Jul. 29, 2010. Accessed: Jan. 24, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/addressing-conflict-tension-and-release-in-games>.
- [44] M. Mycka, *Man and games: Adding wings or clipping them?*, Game Developer, Jan. 19, 2015. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/man-and-games-adding-wings-or-clipping-them->.
- [45] J. Bycer, *How difficulty impacts motivation in game design*, Game Developer, Aug. 10, 2021. Accessed: Mar. 23, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/how-difficulty-impacts-motivation-in-game-design>.
- [46] Q. Meteau, *Terminology issues: From casual to hardcore*, Game Developer, Apr. 16, 2020. Accessed: Mar. 22, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/terminology-issues-from-casual-to-hardcore>.
- [47] C. Gile, *Different kinds of difficulty: Continuous and aspirational*, Game Developer, Dec. 5, 2017. Accessed: Apr. 22, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/different-kinds-of-difficulty-continuous-and-aspirational>.
- [48] C. Gile, *Difficulty: Self selecting vs self defeating*, Game Developer, Jun. 7, 2013. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/difficulty-self-selecting-vs-self-defeating>.

- [49] J. Bycer, *How to craft challenges with sculptable difficulty*, Game Developer, Dec. 6, 2016. Accessed: Mar. 8, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/how-to-craft-challenges-with-sculptable-difficulty>.
- [50] B. Francis, *The survival roguelike design fundamentals that fuel Pacific Drive*, Game Developer, Feb. 9, 2023. Accessed: Mar. 23, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-survival-rogue-like-design-fundamentals-that-fuel-pacific-drive>.
- [51] A. Vu, *A different approach to difficulty*, Game Developer, Oct. 23, 2018. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/a-different-approach-to-difficulty>.
- [52] L. Poling, *Opinion: Difficulty by design*, Game Developer, Aug. 12, 2011. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/opinion-difficulty-by-design>.
- [53] C. Pyle, *Don't make games with "cheap difficulty"*, Game Developer, Feb. 3, 2010. Accessed: Apr. 24, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/don-t-make-games-with-cheap-difficulty->.
- [54] C. Pyle, *Cheap difficulty 2 – timing*, Game Developer, Apr. 20, 2010. Accessed: Apr. 24, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/cheap-difficulty-2-timing>.
- [55] D. Hastings, *At what point does difficulty level become cheap*, Game Developer, Feb. 13, 2018. Accessed: Apr. 24, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/at-what-point-does-difficulty-level-become-cheap>.

-
- [56] J. Youngman, *Playing fair*, Game Developer, Feb. 10, 2011. Accessed: Jan. 24, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/playing-fair>.
- [57] J. Bycer, *Darwinian difficulty: How throwing players in headfirst can work*, Game Developer, Nov. 3, 2011. Accessed: Apr. 24, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/darwinian-difficulty-how-throwing-players-in-headfirst-can-work>.
- [58] J. Bycer, *Examining subjective difficulty: How plumbers can fight demons*, Game Developer, Jan. 4, 2012. Accessed: Apr. 24, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/examining-subjective-difficulty-how-plumbers-can-fight-demons>.
- [59] R. Sehgal, *The difficulty of creating difficulty*, Game Developer, Jun. 16, 2015. Accessed: Apr. 24, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-difficulty-of-creating-difficulty>.
- [60] T. Constant et al., “From objective to subjective difficulty evaluation in video games”, in *Human-Computer Interaction - INTERACT 2017, PT II*, ser. Lecture Notes in Computer Science Part II, vol. 10514, Switzerland: Springer International Publishing AG, 2017, pp. 107–127, ISBN: 978-3-319-67683-8.
- [61] M.-V. Aponte, G. Levieux, and S. Natkin, “Difficulty in videogames: An experimental validation of a formal definition”, in *Proceedings of the 8th International Conference on Advances in Computer Entertainment Technology*, ser. ACE ’11, Lisbon, Portugal: Association for Computing Machinery, 2011, ISBN: 9781450308274. DOI: 10.1145/2071423.2071484.
- [62] R. Frampton, *A new taxonomy of difficulty*, Game Developer, Sep. 23, 2021. Accessed: Mar. 24, 2026. [Online]. Available: <https://www.gamedeveloper.com/game-platforms/a-new-taxonomy-of-difficulty>.

- [63] K. Orland, *Is Elden Ring really that hard? Well, it depends what you mean by “hard”*, Ars Technica, Mar. 9, 2022. Accessed: Mar. 24, 2026. [Online]. Available: <https://arstechnica.com/gaming/2022/03/is-elden-ring-really-that-hard-well-it-depends-what-you-mean-by-hard/>.
- [64] K. Karlsson, *Balancing the sh#& out of our shmup*, Game Developer, Nov. 8, 2016. Accessed: Mar. 8, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/balancing-the-sh-out-of-our-shmup>.
- [65] E. Gurrera, *Designing invisible walls: Thoughts on level design part 2*, Game Developer, Nov. 12, 2010. Accessed: Jan. 24, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/designing-invisible-walls-thoughts-on-level-design-part-2>.
- [66] J. Cluff, *Opinion: Encounter-led game development*, Game Developer, Aug. 15, 2011. Accessed: Jan. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/opinion-encounter-led-game-development>.
- [67] J. Johnson, *Why I drink the purple rain*, Kill Screen, Jan. 17, 2012. Accessed: Jan. 25, 2026. [Online]. Available: <https://web.archive.org/web/20120321124356/http://killscreendaily.com/articles/why-i-drink-purple-rain/>.
- [68] P. Cameron, *Best of 2014: Gamasutra’s top games of the year*, Game Developer, Dec. 22, 2014. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/best-of-2014-gamasutra-s-top-games-of-the-year>.
- [69] W. R. Fernandes, G. Levieux, J. Baalsrud Hauge, E. van der Spek, B. Göbl, and R. McCall, “Difficulty pacing impact on player motivation”, in *Entertainment Computing, ICEC 2022*, ser. Lecture Notes in Computer Science,

- vol. 13477, Switzerland: Springer International Publishing AG, 2022, pp. 140–153, ISBN: 3031202112.
- [70] C. Klimmt et al., “Player performance, satisfaction, and video game enjoyment”, in *Entertainment Computing - ICEC 2009*, vol. 5709, Berlin: Springer Nature, 2009, pp. 1–12, ISBN: 3642040519.
- [71] J. T. Alexander, J. Sear, and A. Oikonomou, “An investigation of the effects of game difficulty on player enjoyment”, *Entertainment Computing*, vol. 4, no. 1, pp. 53–62, 2013, Publisher: Elsevier B.V, ISSN: 1875-9521. DOI: 10.1016/j.entcom.2012.09.001.
- [72] M. Schmierbach, M.-Y. Chung, M. Wu, and K. Kim, “No one likes to lose: The effect of game difficulty on competency, flow, and enjoyment”, *Journal of Media Psychology*, vol. 26, no. 3, pp. 105–110, 2014, Place: Gottingen, Publisher: Hogrefe Publishing, ISSN: 1864-1105. DOI: 10.1027/1864-1105/a000120.
- [73] Staff, *Difficulty levels: Do they really represent how our players experience our games?*, Game Developer, Feb. 5, 2018. Accessed: Jan. 13, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/difficulty-levels-do-they-really-represent-how-our-players-experience-our-games->.
- [74] A. Wilson, *Opinion: Gaming ain’t easy*, Game Developer, Apr. 25, 2011. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/opinion-gaming-ain-t-easy>.
- [75] A. Hejdenberg, *The psychology behind games*, Game Developer, Apr. 26, 2005. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/the-psychology-behind-games>.

-
- [76] T. Ventrice, *Gamification dynamics: Growth and emotion*, Game Developer, Nov. 16, 2011. Accessed: Jan. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/gamification-dynamics-growth-and-emotion>.
- [77] M. Katkoff, *Why Plants vs. Zombies 2 can't make it to the top*, Game Developer, Oct. 11, 2013. Accessed: Mar. 3, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/why-plants-vs-zombies-2-can-t-make-it-to-the-top>.
- [78] Nielsen Games, *Video games in Europe 2008*, 2008.
- [79] N. Lovato, *16 reasons why players are leaving your game*, Game Developer, Apr. 8, 2015. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/16-reasons-why-players-are-leaving-your-game>.
- [80] T. Kim, *The user is the message*, Game Developer, Oct. 15, 2010. Accessed: Jan. 24, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-user-is-the-message>.
- [81] C. Chichester, *The problem with easy games*, Game Developer, Oct. 6, 2011. Accessed: Jan. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-problem-with-easy-games>.
- [82] G. Myers, *Types of fun in video games*, Game Developer, Jul. 9, 2013. Accessed: Mar. 2, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/types-of-fun-in-video-games>.
- [83] J. Bycer, *Losing control of difficulty in game design*, Game Developer, Oct. 5, 2015. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/losing-control-of-difficulty-in-game-design>.

- [84] N. Creamer, *Absolute entrapment: The soul-stealing genius of Demon's Souls*, Game Developer, Oct. 19, 2010. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/absolute-entrapment-the-soul-stealing-genius-of-demon-s-souls>.
- [85] N. Paolasso, *'Difficulty' in gaming*, Game Developer, Jan. 8, 2013. Accessed: Jan. 31, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/-difficulty-in-gaming>.
- [86] J. Rose, *The atmosphere of defeat in Dark Souls*, Game Developer, Oct. 18, 2011. Accessed: Jan. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-atmosphere-of-defeat-in-dark-souls>.
- [87] T. Allart, G. Levieux, M. Pierfitte, A. Guilloux, and S. Natkin, "Difficulty influence on motivation over time in video games using survival analysis", in *Proceedings of the 12th International Conference on the Foundations of Digital Games*, ser. FDG '17, Hyannis, Massachusetts: Association for Computing Machinery, 2017, ISBN: 9781450353199. DOI: 10.1145/3102071.3102085.
- [88] J. W. Nijman, *Postmortem: Vlambeer's Gun Godz*, Game Developer, May 9, 2012. Accessed: Jan. 24, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/postmortem-vlambeer-s-i-gun-godz-i->.
- [89] A. Temba, *Keep your game consistent at all times*. Game Developer, Apr. 7, 2013. Accessed: Mar. 2, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/keep-your-game-consistent-at-all-times->.
- [90] J. Bycer, *The anatomy of a bad game*, Game Developer, May 31, 2012. Accessed: Jan. 29, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-anatomy-of-a-bad-game>.

- [91] J. Wolters, *Design rant: In-game logic*, Game Developer, Dec. 9, 2014. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/design-rant-in-game-logic>.
- [92] J. Larsen, *Difficulty curves*, Game Developer, May 24, 2010. Accessed: Feb. 26, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/difficulty-curves>.
- [93] G. Agiv, *Difficulty curves: How to get the right balance*, Game Developer, Jan. 24, 2024. Accessed: Feb. 26, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/difficulty-curves-how-to-get-the-right-balance->.
- [94] S. Burfield, *Reflections on difficulty pacing in Puzzledorf*, Game Developer, Sep. 27, 2021. Accessed: Mar. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/game-platforms/reflections-on-difficulty-pacing-in-i-puzzledorf-i->.
- [95] J. Bycer, *Reversing the difficulty curve in game design*. Game Developer, Jun. 1, 2011. Accessed: Feb. 1, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/reversing-the-difficulty-curve-in-game-design->.
- [96] J. Bycer, *Balancing inverse difficulty curves in game design*, Game Developer, Dec. 8, 2015. Accessed: Feb. 26, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/balancing-inverse-difficulty-curves-in-game-design>.
- [97] D. Felder, *Design 101: Playtesting*, Game Developer, Nov. 5, 2015. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/design-101-playtesting>.

- [98] D. Canela, *Menus, a tutorial & a swear-word filter; unusual priorities explained*, Game Developer, Apr. 18, 2016. Accessed: Mar. 8, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/menus-a-tutorial-a-swear-word-filter-unusual-priorities-explained>.
- [99] D. Baker, *Knocking down trees: Destructable environments in FPS should be standard*. Game Developer, Jan. 6, 2011. Accessed: Jan. 6, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/knocking-down-trees-destructable-environments-in-fps-should-be-standard->.
- [100] J. Bycer, *Different states of game and pacing in game design*, Game Developer, Jun. 30, 2015. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/different-states-of-game-and-pacing-in-game-design>.
- [101] J. Bycer, *Ending on a high note – the 3 forms of endgame design*, Game Developer, Aug. 10, 2017. Accessed: Mar. 9, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/ending-on-a-high-note----the-3-forms-of-endgame-design>.
- [102] K. T. Jensen, *How much friction?*, Game Developer, Oct. 29, 2014. Accessed: Mar. 4, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/how-much-friction->.
- [103] J. Marsden, *Designing an awesome video game*, Game Developer, Jun. 29, 2013. Accessed: Mar. 2, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/designing-an-awesome-video-game>.
- [104] A. Areliusarson, *Designing computer-games preemptively for emotions and player types*, Game Developer, Jun. 19, 2013. Accessed: Mar. 2, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/designing-computer-games-preemptively-for-emotions-and-player-types>.

-
- [105] E. Jones, *Ruminations on leveling*, Game Developer, Jan. 18, 2012. Accessed: Jan. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/ruminations-on-leveling>.
- [106] J. Bycer, *Action vs. abstraction in teaching game mastery*, Game Developer, Jun. 12, 2015. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/action-vs-abstraction-in-teaching-game-mastery>.
- [107] B. Lewis-Evans, *Human error and games – reducing, and taking advantage of, slips and lapses*, Game Developer, Aug. 2, 2013. Accessed: Mar. 14, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/human-error-and-games-reducing-and-taking-advantage-of-slips-and-lapses>.
- [108] C. Waldron, *Failure - I choose you!: The rise of self-enforced hardcore modes*, Game Developer, May 18, 2012. Accessed: Jan. 29, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/failure---i-choose-you-the-rise-of-self-enforced-hardcore-modes>.
- [109] P. Chu, *Work hard, play hard*, Game Developer, Jan. 31, 2013. Accessed: Jan. 31, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/work-hard-play-hard>.
- [110] C. Grey, *Ammo systems and Bioshock*, Game Developer, May 2, 2016. Accessed: Mar. 8, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/ammo-systems-and-bioshock>.
- [111] N. Murthy, *Designing for self-expression*, Game Developer, Mar. 2, 2016. Accessed: Mar. 8, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/designing-for-self-expression>.

- [112] E. McNeill, *Making the Darknet tutorial*, Game Developer, Aug. 25, 2014. Accessed: Mar. 4, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/making-the-darknet-tutorial>.
- [113] J. Bycer, *Design debate: Risky rewards or rewarding risk?*, Game Developer, Apr. 10, 2013. Accessed: Mar. 2, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/design-debate-risky-rewards-or-rewarding-risk->.
- [114] S. Singh, *Why Ninja Gaiden 3 doesn't feel ninja enough & the case of making super hard games*, Game Developer, Jul. 9, 2013. Accessed: Mar. 2, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/why-ninja-gaiden-3-doesn-t-feel-ninja-enough-the-case-of-making-super-hard-games>.
- [115] C. McKellar, *Power progression in games: Crafting rewarding player experiences*, Game Developer, Sep. 6, 2024. Accessed: Mar. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/power-progression-in-games-crafting-rewarding-player-experiences>.
- [116] J. Bycer, *Rewarding difficulty in game design: Intrinsic vs. extrinsic*, Game Developer, Sep. 9, 2014. Accessed: Mar. 4, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/rewarding-difficulty-in-game-design-intrinsic-vs-extrinsic>.
- [117] R. Vazquez, *How tough is your game? Creating difficulty graphs*, Game Developer, Nov. 17, 2011. Accessed: Feb. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/how-tough-is-your-game-creating-difficulty-graphs>.
- [118] N. Murthy, *Gods Will Be Watching and the question of fun*, Game Developer, Aug. 24, 2014. Accessed: Mar. 4, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/gods-will-be-watching-and-the-question-of-fun>.

- [//www.gamedeveloper.com/design/gods-will-be-watching-and-the-question-of-fun](https://www.gamedeveloper.com/design/gods-will-be-watching-and-the-question-of-fun).
- [119] C. Priestman, *Crafting the complex, chaotic ecosystem of Rain World*, Game Developer, Mar. 28, 2017. Accessed: Mar. 8, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/crafting-the-complex-chaotic-ecosystem-of-i-rain-world-i->.
- [120] J. Bycer, *Min/max mastery in game design*, Game Developer, Jul. 29, 2014. Accessed: Mar. 3, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/min-max-mastery-in-game-design>.
- [121] C. Grey, *Emotions and randomness - loot drops*, Game Developer, Apr. 3, 2013. Accessed: Mar. 2, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/emotions-and-randomness---loot-drops>.
- [122] J. Bycer, *How to fight RNG in game design*, Game Developer, Mar. 14, 2017. Accessed: Mar. 8, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/how-to-fight-rng-in-game-design>.
- [123] J. Bycer, *Avoiding the hoarder trap in game design*, Game Developer, Apr. 26, 2016. Accessed: Mar. 8, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/avoiding-the-hoarder-trap-in-game-design>.
- [124] E. McNeill, *Grinding and the burden of optimal play*, Game Developer, Jul. 21, 2014. Accessed: Mar. 3, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/grinding-and-the-burden-of-optimal-play>.
- [125] C. Randall, *Super Metroid and the exclusion of control mastery*, Game Developer, May 1, 2013. Accessed: Mar. 2, 2026. [Online]. Available: <https://>

- www.gamedeveloper.com/design/super-metroid-and-the-exclusion-of-control-mastery.
- [126] M. Freeland, *Designing difficulty*, Game Developer, Jul. 23, 2013. Accessed: Mar. 2, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/designing-difficulty>.
- [127] L. LeRay, *Destruction and growth in gameplay: Creating Mushroom 11*, Game Developer, Oct. 15, 2015. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/destruction-and-growth-in-gameplay-creating-i-mushroom-11-i->.
- [128] D. Mascagna, *A three-level short story - the level design of Die Young: Prologue*, Game Developer, Oct. 27, 2020. Accessed: Mar. 23, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/a-three-level-short-story---the-level-design-of-die-young-prologue>.
- [129] L. Perry, *There's good in you yet, F2P games, I can sense it!*, Game Developer, May 10, 2013. Accessed: Mar. 2, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/there-s-good-in-you-yet-f2p-games-i-can-sense-it->.
- [130] No Moss Studios, *How hard is too hard?*, Game Developer, May 22, 2018. Accessed: Mar. 21, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/how-hard-is-too-hard->.
- [131] P. Schnepf, *Postmortem: The Ramp*, Game Developer, Sep. 23, 2021. Accessed: Mar. 23, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/postmortem-i-the-ramp-i->.
- [132] L. Deszczulka, *How a closed beta helped improving Earthcore - findings and tips*, Game Developer, Apr. 22, 2015. Accessed: Mar. 7, 2026. [Online]. Avail-

- able: <https://www.gamedeveloper.com/design/how-a-closed-beta-helped-improving-earthcore---findings-and-tips>.
- [133] D. Evans, *Postmortem: Pinball-RPG hybrid rollers of the realm*, Game Developer, Dec. 31, 2014. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/postmortem-pinball-rpg-hybrid-i-rollers-of-the-realm-i->.
- [134] K. Allen, *Failure of a game: Lavacat*, Game Developer, Oct. 14, 2015. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/failure-of-a-game-lavacat>.
- [135] J. van Dongen, *The challenge of finding enough playtesters*, Game Developer, Sep. 4, 2018. Accessed: Mar. 21, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-challenge-of-finding-enough-playtesters>.
- [136] D. Felder, *Design 101: Balancing games*, Game Developer, Oct. 12, 2015. Accessed: Feb. 28, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/design-101-balancing-games>.
- [137] K. Burgun, *Understanding balance in video games*, Game Developer, Jun. 8, 2011. Accessed: Jan. 24, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/understanding-balance-in-video-games>.
- [138] A. Pierce, *Difficult curve...* Game Developer, Apr. 7, 2009. Accessed: Feb. 26, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/difficult-curve->.
- [139] L. McMillan, *The rational design handbook: An intro to RLD*, Game Developer, Aug. 6, 2013. Accessed: Mar. 3, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-rational-design-handbook-an-intro-to-rld>.

- [140] A. J. Desautels, *Initial thoughts on rational design*, Game Developer, Jul. 8, 2021. Accessed: Mar. 15, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/initial-thoughts-on-rational-design>.
- [141] R. Terrell, *Game/mental state pt.5*, Game Developer, Sep. 28, 2011. Accessed: Jan. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/game-mental-state-pt-5>.
- [142] J. Bycer, *The philosophy of puzzle design*, Game Developer, Sep. 24, 2020. Accessed: Mar. 23, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-philosophy-of-puzzle-design>.
- [143] C. Nutt, *Even Miyamoto feels the struggle for game balance*, Game Developer, Oct. 5, 2015. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/even-miyamoto-feels-the-struggle-for-game-balance>.
- [144] R. Romero, *Tracking attitudes and behaviors to improve games successful instrumentation*, 2008. Accessed: Jan. 22, 2026. [Online]. Available: <https://www.slideserve.com/trella/successful-instrumentation>.
- [145] Larian Studios, *Community update #23: Here's to you*, Steam, Aug. 11, 2023. Accessed: Jan. 22, 2026. [Online]. Available: <https://store.steampowered.com/news/app/1086940/view/6199820457241938859>.
- [146] J. Polson, *Road to the Student IGF: Jake Muehle on Cyber Heist*, Game Developer, Mar. 7, 2014. Accessed: Mar. 3, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/road-to-the-student-igf-jake-muehle-on-i-cyber-heist-i->.
- [147] D. Kolakowski, *Data is not fun*, Game Developer, Feb. 16, 2014. Accessed: Mar. 3, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/data-is-not-fun>.

- [148] N. Lovato, *Game analytics from a game designer's perspective*, Game Developer, Mar. 20, 2015. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/game-analytics-from-a-game-designer-s-perspective>.
- [149] V. Dorn, C. Bean, E. Celeste, K. Ramirez, S. Karimi, and M. Azmandian, "Adaptive difficulty calibration for skills-based activities in virtual environments", U.S. Patent 20 230 381 662, Nov. 30, 2023.
- [150] N. Aghdaie et al., "Systems and methods for automatically measuring a video game difficulty", U.S. Patent 11458399B2, Oct. 4, 2022.
- [151] N. Aghdaie et al., "Dynamic difficulty adjustment", U.S. Patent 9919217B2, Mar. 20, 2018.
- [152] R. Valentine, *EA faces yet another class-action lawsuit connected to loot boxes*, GamesIndustry.biz, Nov. 11, 2020. Accessed: Feb. 26, 2026. [Online]. Available: <https://www.gamesindustry.biz/ea-faces-yet-another-class-action-lawsuit-over-alleged-use-of-dynamic-difficulty-adjustment>.
- [153] Electronic Arts. "Fair play & dynamic difficulty adjustment", Accessed: Feb. 26, 2026. [Online]. Available: <https://www.ea.com/en-gb/news/fair-play-and-dynamic-difficulty-adjustment>.
- [154] M. Clarkson, *Two (too?) easy games*, Discount Thoughts, Mar. 30, 2011. Accessed: Jan. 24, 2026. [Online]. Available: <https://mwclarkson.blogspot.com/2011/03/two-too-easy-games.html>.
- [155] J. Harris, *'BARF!': Designing River City Girls' approachable, challenging brawling*, Game Developer, Oct. 11, 2019. Accessed: May 4, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/-barf-designing-i-river-city-girls-i-approachable-challenging-brawling>.

-
- [156] J. Couture, *Sailor Moon meets Shakespeare: The design philosophies of magic girl RPG This Way Madness Lies*, Game Developer, Nov. 10, 2022. Accessed: Mar. 23, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/sailor-moon-meets-shakespeare-the-design-philosophies-behind-magic-girl-rpg-i-this-way-madness-lies-i->.
- [157] C. Moore, *Game difficulty*, Game Developer, Jul. 9, 2012. Accessed: Jan. 29, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/game-difficulty>.
- [158] C. Compton, *Avoiding helplessness – the worst feeling in games*, Game Developer, Aug. 7, 2019. Accessed: Mar. 21, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/avoiding-helplessness-the-worst-feeling-in-games>.
- [159] J. Bycer, *The fine line between challenge and masochism*. Game Developer, Jul. 17, 2012. Accessed: Jan. 31, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-fine-line-between-challenge-and-masochism->.
- [160] S. Parkin, *Analysis: Video games - downgrade complete?*, Game Developer, Jul. 8, 2009. Accessed: Mar. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/game-platforms/analysis-video-games---downgrade-complete->.
- [161] L. de Gracia, *Nostalgia: When RPGs were a pain, yet several times more rewarding*, Game Developer, Mar. 29, 2010. Accessed: Jan. 24, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/nostalgia-when-rpgs-were-a-pain-yet-several-times-more-rewarding>.
- [162] J. Mawhorter, *Throw the hardcore a bone, not just your table scraps*, Game Developer, Sep. 9, 2010. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/throw-the-hardcore-a-bone-not-just-your-table-scraps>.

- `//www.gamedeveloper.com/design/throw-the-hardcore-a-bone-not-just-your-table-scraps.`
- [163] R. Terrell, *A defense of gameplay part.3*, Game Developer, Apr. 25, 2012. Accessed: Jan. 29, 2026. [Online]. Available: `https://www.gamedeveloper.com/design/a-defense-of-gameplay-part-3.`
- [164] G. Joyner Jr, *Is the video game industry “dumbing down” for the casual?*, Game Developer, Jan. 28, 2013. Accessed: Jan. 31, 2026. [Online]. Available: `https://www.gamedeveloper.com/design/is-the-video-game-industry-quot-dumbing-down-quot-for-the-casual-.`
- [165] J. Bycer, *Smoothing out the wrinkles of game design*. Game Developer, Dec. 31, 2010. Accessed: Jan. 24, 2026. [Online]. Available: `https://www.gamedeveloper.com/design/smoothing-out-the-wrinkles-of-game-design-.`
- [166] M. Abbott, *Easy does it harder*, Brainy Gamer, Feb. 13, 2012. Accessed: Jan. 25, 2026. [Online]. Available: `https://web.archive.org/web/20120316003510/http://www.brainygamer.com/the_brainy_gamer/2012/02/easy-does-it-harder.html.`
- [167] B. Sheffield, *The design challenges of Resistance 3*, Game Developer, Jul. 4, 2011. Accessed: Jan. 25, 2026. [Online]. Available: `https://www.gamedeveloper.com/design/the-design-challenges-of-i-resistance-3-i-.`
- [168] C. Nutt, *Dean Hall discusses DayZ’s development process*, Game Developer, May 24, 2013. Accessed: Mar. 2, 2026. [Online]. Available: `https://www.gamedeveloper.com/design/dean-hall-discusses-i-dayz-i-s-development-process.`

-
- [169] S. Ryan, *Are modern video games too easy?*, Game Developer, Apr. 24, 2015. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/are-modern-video-games-too-easy->.
- [170] R. Keena, *Learning to teach*, Game Developer, Apr. 28, 2015. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/learning-to-teach>.
- [171] J. Foreman, *Rogue-lite life lessons*, Game Developer, Jul. 27, 2016. Accessed: Mar. 8, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/rogue-lite-life-lessons>.
- [172] J. Bycer, *Lessons of game design learned from Super Mario Maker*, Game Developer, Nov. 4, 2015. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/lessons-of-game-design-learned-from-super-mario-maker>.
- [173] X. Markham, *Do we really want difficult games?*, Game Developer, Mar. 27, 2010. Accessed: Jan. 24, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/do-we-really-want-difficult-games->.
- [174] B. Kidwell, *GDotD - context & difficulty*, Game Developer, Aug. 4, 2014. Accessed: Mar. 4, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/gdotd---context-difficulty>.
- [175] M. DeLucas, *Thoughts on fighting game difficulty and casual*, Game Developer, Oct. 24, 2016. Accessed: Mar. 8, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/thoughts-on-fighting-game-difficulty-and-casual>.
- [176] M. Azar, *Making hardcore levels for casual*, Game Developer, Jun. 1, 2014. Accessed: Mar. 3, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/making-hardcore-levels-for-casual>.

-
- [177] J. Juul, *A Casual Revolution*, First edition. The MIT Press, 2010, ISBN: 978-0-262-01337-6.
- [178] M. Sabbagh, *10 years later, F.E.A.R. is still the ultimate shooter experience*, Game Developer, Sep. 10, 2015. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/10-years-later-f-e-a-r-is-still-the-ultimate-shooter-experience>.
- [179] Staff, *The value of repetition*, Game Developer, Jul. 31, 2012. Accessed: Mar. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-value-of-repetition>.
- [180] L. Doucet, *RPGs, challenge, and grinding*, Game Developer, Aug. 22, 2011. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/rpgs-challenge-and-grinding>.
- [181] E. Adams, *The designer's notebook: Bad game designer, no Twinkie! VI*, Game Developer, Jun. 3, 2005. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/the-designer-s-notebook-bad-game-designer-no-twinkie-vi>.
- [182] E. Adams, *The designer's notebook: Why action games suck (and what to do about it)*, Game Developer, May 1, 2007. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/the-designer-s-notebook-why-action-games-suck-and-what-to-do-about-it->.
- [183] H. Ewins, *Rewriting the horrors of mental health representation in games*, Game Developer, Nov. 4, 2022. Accessed: Mar. 23, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/rewriting-the-horrors-of-mental-health-representation-in-games>.
- [184] M. Brice, *Mass appeal vs. accessibility in video games*, Game Developer, Jan. 17, 2012. Accessed: Jan. 25, 2026. [Online]. Available: <https://web>.

- archive.org/web/20120413092309/https://www.popmatters.com/pm/post/153338-mass-appeal-vs.-accessibility/.
- [185] A. Al-Aaser, *Permission to fail*, Medium, Jun. 30, 2015. Accessed: Mar. 7, 2026. [Online]. Available: <https://siegarettes.medium.com/permission-to-fail-6c4955dd4f24>.
- [186] J. Rossignol, *Blogged out: 'Difficulty setting'*, Game Developer, Jul. 16, 2007. Accessed: Mar. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/game-platforms/blogged-out-difficulty-setting->.
- [187] L. Denby, *Analysis: Video games – don't be so difficult*, Game Developer, Oct. 2, 2009. Accessed: Mar. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/game-platforms/analysis-video-games----don-t-be-so-difficult>.
- [188] L. Alexander, *Opinion: If you're not having fun, play something else*, Game Developer, Oct. 8, 2009. Accessed: Mar. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/game-platforms/opinion-if-you-re-not-having-fun-play-something-else>.
- [189] A. McAloon, *God of War director: Accessibility isn't at odds with creative vision*, Game Developer, Apr. 8, 2019. Accessed: Mar. 21, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/-i-god-of-war-i-director-accessibility-isn-t-at-odds-with-creative-vision>.
- [190] K. Burgun, *My thoughts on difficulty in games*, Game Developer, Apr. 15, 2019. Accessed: Mar. 21, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/my-thoughts-on-difficulty-in-games>.
- [191] C. Compton, *The difficulty dilemma part 2*, Game Developer, Jun. 24, 2019. Accessed: Mar. 21, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-difficulty-dilemma-part-2>.

- [192] B. Francis, *Q&A: Evolving the combat design of id Software's Doom Eternal*, Game Developer, Jan. 21, 2020. Accessed: Mar. 22, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/q-a-evolving-the-combat-design-of-id-software-s-i-doom-eternal-i->.
- [193] J. Bycer, *What does accessibility mean in game design*, Game Developer, Apr. 30, 2021. Accessed: Mar. 23, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/what-does-accessibility-mean-in-game-design>.
- [194] J. Bycer, *Debating difficulty in game design*, Game Developer, Jul. 21, 2021. Accessed: Mar. 23, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/debating-difficulty-in-game-design>.
- [195] J. Bycer, *Why accessible design can't save inaccessible gameplay*, Game Developer, Aug. 20, 2021. Accessed: Mar. 23, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/why-accessible-design-can-t-save-inaccessible-gameplay>.
- [196] J. Bycer, *Prince of Persia's accessibility is inaccessible to some*, Game Developer, Jan. 8, 2025. Accessed: Mar. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/prince-of-persia-s-accessibility-is-inaccessible-to-some>.
- [197] G. Haynes and K. Graft, *Accessibility in games with AbleGamers' Greg Haynes - GDC podcast ep. 12*, Game Developer, Aug. 27, 2020. Accessed: Apr. 22, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/accessibility-in-games-with-ablegamers-greg-haynes---gdc-podcast-ep-12>.
- [198] J. Bycer, *The problems with strategy guide game design*. Game Developer, Oct. 24, 2011. Accessed: Jan. 25, 2026. [Online]. Available: <https://www>.

- gamedeveloper.com/design/the-problems-with-strategy-guide-game-design-.
- [199] M. Venturelli, *Difficulty levels and why you should never use them*, Game Developer, Jun. 24, 2016. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/difficulty-levels-and-why-you-should-never-use-them>.
- [200] Crash Mania, *Crash bandicoot: Warped - PAL*, Oct. 12, 2015. Accessed: Feb. 1, 2026. [Online]. Available: <https://www.crashmania.net/en/games/crash-bandicoot-warped/regional-differences/pal/>.
- [201] BSkullX, *Time trials in NTSC-USA and PAL*, GameFAQs, Jun. 27, 2021. Accessed: Feb. 1, 2026. [Online]. Available: <https://gamefaqs.gamespot.com/boards/196988-crash-bandicoot-warped/79536803>.
- [202] Bandipedia, *Developer time*. Accessed: Apr. 29, 2026. [Online]. Available: https://crashbandicoot.fandom.com/wiki/Developer_time.
- [203] J. Bycer, *The varying degrees of death in games*, Game Developer, Mar. 7, 2013. Accessed: Mar. 2, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-varying-degrees-of-death-in-games>.
- [204] A. Coates, *180. Space Invaders versus the Japanese Mint*, Mostly Odd, Aug. 19, 2011. Accessed: Mar. 8, 2026. [Online]. Available: <https://mostodd.wordpress.com/2011/08/19/space-invaders-versus-the-japanese-mint/>.
- [205] GameHut, *Rascal prototype shows incredible technology - so what went wrong?*, YouTube, Sep. 14, 2018. Accessed: Feb. 1, 2026. [Online]. Available: <https://www.youtube.com/watch?v=aHCFMQIzzwo>.

- [206] Ubisoft, *10 ways to... die*, Rayman Origin's blog, Nov. 3, 2011. Accessed: Feb. 2, 2026. [Online]. Available: <https://web.archive.org/web/20160814000823/http://raymanorigins.uk.ubi.com/blog/2011/11/03/10-ways-to-die/>.
- [207] A. Doree, *Team Ninja interview: Tomonobu Itagaki*, Kikizo, May 27, 2004. Accessed: Feb. 2, 2026. [Online]. Available: https://games.kikizo.com/features/itagaki_interview.asp.
- [208] M. Leone, *Ninja Gaiden developer reunion*, Polygon, Aug. 30, 2021. Accessed: Apr. 26, 2026. [Online]. Available: <https://www.polygon.com/2021/8/30/7546763/ninja-gaiden-developer-reunion/>.
- [209] J. Bycer, *How punishment systems hurt gameplay*, Game Developer, Apr. 11, 2019. Accessed: Apr. 27, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/how-punishment-systems-hurt-gameplay>.
- [210] J. Bycer, *Traveler's Tales vs. Nintendo in game design appeal*, Game Developer, Dec. 9, 2014. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/traveler-s-tales-vs-nintendo-in-game-design-appeal>.
- [211] A. Donaldson, *Dark Souls 3: Miyazaki explains the difference between "difficult" and "unreasonable"*, VG247, Mar. 2, 2016. Accessed: Apr. 27, 2026. [Online]. Available: <https://www.vg247.com/dark-souls-3-miyazaki-bloodborne-interview>.
- [212] JMac & Webbsta, *The lost Crash Bandicoot game! - part 1*, YouTube, Jun. 22, 2025. Accessed: Feb. 1, 2026. [Online]. Available: <https://www.youtube.com/watch?v=JJPGyRZRbYk>.
- [213] D. Boutros, *Difficulty is difficult: Designing for hard modes in games*, Game Developer, Sep. 16, 2008. Accessed: Feb. 28, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/difficulty-is-difficult-designing-for-hard-modes-in-games>.

- // www.gamedeveloper.com/design/difficulty-is-difficult-designing-for-hard-modes-in-games.
- [214] C. Gile, *Motion controls have solvable problems*, Game Developer, Oct. 3, 2016. Accessed: Mar. 8, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/motion-controls-have-solvable-problems>.
- [215] J. Brown, *Difficulty curves start at their peak*, Game Developer, Sep. 22, 2010. Accessed: Feb. 26, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/difficulty-curves-start-at-their-peak>.
- [216] Staff, *Making Meat Boy move*, Game Developer, Mar. 22, 2020. Accessed: Mar. 22, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/making-meat-boy-move>.
- [217] R. Terrell, *Save system design pt.1*, Game Developer, Oct. 1, 2011. Accessed: Jan. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/save-system-design-pt-1>.
- [218] R. Terrell, *Save system design pt.2*, Game Developer, Oct. 2, 2011. Accessed: Jan. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/save-system-design-pt-2>.
- [219] Staff, *A eulogy for ironman mode*, Game Developer, Jan. 5, 2016. Accessed: Mar. 8, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/a-eulogy-for-ironman-mode>.
- [220] P. Ellis, *How an environment layout affects difficulty*, Game Developer, Dec. 6, 2016. Accessed: Mar. 8, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/how-an-environment-layout-affects-difficulty>.

- [221] D. Truong, *2D to 3D: The deterioration of video games*, Game Developer, Dec. 8, 2014. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/2d-to-3d-the-deterioration-of-video-games>.
- [222] J. Bycer, *The differences between 2D and 3D camera systems in game design*, Game Developer, Jun. 3, 2015. Accessed: Apr. 29, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-differences-between-2d-and-3d-camera-systems-in-game-design>.
- [223] J. Bellyk, *8 tips & techniques for designing levels*, Game Developer, Apr. 7, 2017. Accessed: Mar. 8, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/8-tips-techniques-for-designing-levels>.
- [224] A. Gavin, *Making Crash Bandicoot – part 6*, All Things Andy Gavin, Feb. 7, 2011. Accessed: Jan. 5, 2026. [Online]. Available: <https://all-things-andy-gavin.com/2011/02/07/making-crash-bandicoot-part-6/>.
- [225] Extra Credits, *The true genius of Dark Souls II - how to approach game difficulty - Extra Credits*, Nov. 26, 2014. Accessed: Jan. 14, 2026. [Online]. Available: <https://www.youtube.com/watch?v=MM2dDF4B9a4>.
- [226] C. Aaby, *Dragon Age 2, and what Terminator 2 can teach RPGs*, Game Developer, Apr. 4, 2011. Accessed: Jan. 13, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/dragon-age-2-and-what-terminator-2-can-teach-rpgs>.
- [227] H. Hale, *You can teach an old skag new tricks: An ode to Borderlands 2*, Game Developer, Mar. 6, 2013. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/you-can-teach-an-old-skag-new-tricks-an-ode-to-borderlands-2>.

- [228] J. Bycer, *The three way struggle between depth, complexity and uniqueness*. Game Developer, Apr. 13, 2011. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/the-three-way-struggle-between-depth-complexity-and-uniqueness->.
- [229] S. Ludgate, *The f-words of MMORPGs: Fairness*, Game Developer, Jul. 5, 2011. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/the-f-words-of-mmorpgs-fairness>.
- [230] G. Cooney, *Battleheart - straddling the casual/hardcore divide*, Game Developer, Feb. 20, 2012. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/battleheart---straddling-the-casual-hardcore-divide>.
- [231] T. Hermans, *Mobility! Thoughts after launching an accessible precision platformer*, Game Developer, Apr. 23, 2018. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/mobility-thoughts-after-launching-an-accessible-precision-platformer>.
- [232] B. Francis, *Q&A: Why Assassin's Creed Valhalla did away with side quests*, Game Developer, Nov. 17, 2020. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/q-a-why-i-assassin-s-creed-valhalla-i-did-away-with-side-quests>.
- [233] J. Couture, *Balancing a two-hero battle system with Bossgame: The Final Boss Is My Heart*, Game Developer, Nov. 22, 2022. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/bossgame-the-final-boss-is-my-heart>.
- [234] J. Matulef, *Analysis: Have it your way - tailoring a game's difficulty to players*, Game Developer, Mar. 8, 2011. Accessed: Dec. 27, 2025. [Online]. Avail-

- able: <https://www.gamedeveloper.com/game-platforms/analysis-have-it-your-way---tailoring-a-game-s-difficulty-to-players>.
- [235] M. T, *Difficulty and fairness in Rainbow Laser Disco Dungeon*, Game Developer, Sep. 29, 2021. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/game-platforms/difficulty-and-fairness-in-i-rainbow-laser-disco-dungeon-i->.
- [236] C. Lister, *Games studies: A cross analysis of realism in games*, Game Developer, Jan. 26, 2021. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/games-studies-a-cross-analysis-of-realism-in-games>.
- [237] E. Adams, *The designer's notebook: Bad game designer, no Twinkie! IV*, Game Developer, May 23, 2003. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/the-designer-s-notebook-bad-game-designer-no-twinkie-iv>.
- [238] J. Bycer, *Overwatching: An analysis of X-Com Enemy Unknown*, Game Developer, Nov. 20, 2012. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/overwatching-an-analysis-of-x-com-enemy-unknown>.
- [239] E. Brouwer, *What lessons can action games learn from classic DOOM?*, Game Developer, Nov. 21, 2019. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/what-lessons-can-action-games-learn-from-classic-doom->.
- [240] D. Churchill, *The Prismata AI: How I learned to stop worrying and love the bots*, Game Developer, Dec. 18, 2014. Accessed: Mar. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-prismata-ai-how-i-learned-to-stop-worrying-and-love-the-bots>.

- [241] J. Bycer, *An anti-social (games) rant*, Game Developer, Oct. 21, 2010. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/an-anti-social-games-rant->.
- [242] A. Wawro, *When two generations of Final Fantasy devs meet: Sakaguchi and Tabata speak*, Game Developer, Sep. 2, 2016. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/when-two-generations-of-i-final-fantasy-i-devs-meet-sakaguchi-and-tabata-speak>.
- [243] C. Gile, *Difficulty*, Game Developer, Jan. 16, 2013. Accessed: Jan. 31, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/difficulty>.
- [244] T. Battey, *Accessibility & the folly of exclusivism*, Game Developer, Apr. 23, 2013. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/accessibility-the-folly-of-exclusivism>.
- [245] A. Kehnscherper, *Video games, blindness and sight-loss: A discussion*, Game Developer, Feb. 8, 2019. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/video-games-blindness-and-sight-loss-a-discussion>.
- [246] L. del Pino, *Make your game accessible with these tips*, Game Developer, Nov. 30, 2020. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/make-your-game-accessible-with-these-tips>.
- [247] T. Keenan, *The difficulty I want*, Game Developer, Nov. 5, 2010. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/the-difficulty-i-want>.

- [248] Staff, *Designing dual-perspective puzzles for 2D-3D platformer Toodee and Topdee*, Game Developer, Aug. 17, 2021. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/designing-dual-perspective-puzzles-for-2d-3d-platformer-i-toodee-and-topdee-i->.
- [249] C. Ellsworth, *On violence*, Game Developer, Feb. 28, 2012. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/on-violence>.
- [250] L. Taylor, *Option D: Skip everything*, Game Developer, Jul. 23, 2012. Accessed: Jan. 7, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/option-d-skip-everything>.
- [251] T. Bair, *Motivate me: Crafting better game difficulties*, Game Developer, May 11, 2015. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/motivate-me-crafting-better-game-difficulties>.
- [252] S. White, *Tools of a game designer: What I use and what is out there*, Game Developer, Oct. 31, 2011. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/tools-of-a-game-designer-what-i-use-and-what-is-out-there>.
- [253] J. Chen, *Flow in games*, A Jenova Chen MFA Thesis, 2006. Accessed: Dec. 27, 2025. [Online]. Available: https://jenovachen.com/flowingames/Flow_in_games_final.pdf.
- [254] R. Hunicke and V. Chapman, “AI for dynamic difficulty adjustment in games”, *Challenges in game artificial intelligence AAAI workshop*, vol. 2, p. 7, Jan. 2004.

- [255] J. Harris, *@Play 87: Interview with Josh Ge, creator of Cogmind*, Game Developer, Nov. 15, 2018. Accessed: Jan. 15, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/-play-87-interview-with-josh-ge-creator-of-cogmind>.
- [256] B. Sheffield, *Interview: Soren Johnson - Spore's strategist*, Game Developer, Jul. 11, 2008. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/interview-soren-johnson---i-spore-i-s-strategist>.
- [257] P. Kjaer, *Difficulty in games*, Game Developer, Dec. 23, 2010. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/difficulty-in-games>.
- [258] N. Halme, *An argument for difficulty*, Game Developer, Nov. 27, 2012. Accessed: Jan. 31, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/an-argument-for-difficulty>.
- [259] K. Burgun, *Variants: The challenge of changeable design*, Game Developer, Jun. 12, 2013. Accessed: Jan. 13, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/variants-the-challenge-of-changeable-design>.
- [260] J. Bycer, *Improving your game's ass-kicking potential (or AKP ©)*, Game Developer, Jul. 16, 2010. Accessed: Dec. 27, 2025. [Online]. Available: <https://www.gamedeveloper.com/design/improving-your-game-s-ass-kicking-potential-or-akp->.
- [261] J. Bycer, *Debating difficulty settings in game design*, Game Developer, Jun. 21, 2016. Accessed: Jan. 13, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/debating-difficulty-settings-in-game-design>.

- [262] A. Korogodin, *GDCuffs interview: Richard Bartle*, Game Developer, Feb. 7, 2018. Accessed: Jan. 13, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/gdcuffs-interview-richard-bartle>.
- [263] T. Kelly, *Opinion: Fairness is a perception*, Game Developer, Apr. 21, 2011. Accessed: Jan. 13, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/opinion-fairness-is-a-perception>.
- [264] R. Boyd, *Lessons from 2014 JRPGs: Bravely Default, Child of Light, Persona Q*, Game Developer, Dec. 23, 2014. Accessed: Jan. 13, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/lessons-from-2014-jrpgs-bravely-default-child-of-light-persona-q>.
- [265] N. Wojtyna, *Stress analysis in games and engaging play*, Game Developer, May 1, 2015. Accessed: Jan. 13, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/stress-analysis-in-games-and-engaging-play>.
- [266] B. Douville, *Opinion: Ten tips for managing difficulty in games*, Game Developer, Feb. 19, 2009. Accessed: Mar. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/game-platforms/opinion-ten-tips-for-managing-difficulty-in-games>.
- [267] C. Dunson, *Are games crippled by easy modes?*, Game Developer, Dec. 13, 2013. Accessed: Jan. 13, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/are-games-crippled-by-easy-modes->.
- [268] I. Beram, *Retrospective: Deus Ex, part 4*, Game Developer, Aug. 15, 2011. Accessed: Jan. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/retrospective-deus-ex-part-4>.

- [269] G. Dahl, *Irrational play and design*, Game Developer, Apr. 10, 2013. Accessed: Mar. 2, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/irrational-play-and-design>.
- [270] J. Bycer, *The problems with padding out game design*, Game Developer, Jul. 7, 2014. Accessed: Mar. 3, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-problems-with-padding-out-game-design>.
- [271] A. K. Keles, *Graveyard Shift - post-mortem*, Game Developer, Feb. 27, 2017. Accessed: Jan. 13, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/graveyard-shift---post-mortem>.
- [272] A. Wawro, *Nioh director makes a case for designing difficult games*, Game Developer, Oct. 4, 2016. Accessed: Jan. 13, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/-i-nioh-i-director-makes-a-case-for-designing-difficult-games>.
- [273] Staff, *Analysis: Blame the game, not the player*, Game Developer, Aug. 3, 2009. Accessed: Mar. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/game-platforms/analysis-blame-the-game-not-the-player>.
- [274] G. Pellechi, *Exposition as ammunition*, Game Developer, Jan. 28, 2019. Accessed: Mar. 21, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/exposition-as-ammunition>.
- [275] Staff, *Stop insulting me: When negative reinforcement turns ugly*, Game Developer, Mar. 30, 2010. Accessed: Jan. 24, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/stop-insulting-me-when-negative-reinforcement-turns-ugly>.

- [276] S. Warmuth, *Protect the moron!*, Game Developer, Jun. 9, 2013. Accessed: Jan. 13, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/protect-the-moron->.
- [277] K. Stuart, *Is frustration an essential part of game design?*, The Guardian, Feb. 14, 2013. Accessed: Jan. 13, 2026. [Online]. Available: <https://www.theguardian.com/technology/gamesblog/2013/feb/14/frustration-in-game-design>.
- [278] T. Chatfield, *Tom Chatfield on video games: Difficulty is the point, not the problem*, Wired, Jan. 17, 2014. Accessed: Aug. 19, 2025. [Online]. Available: <https://www.wired.com/story/difficulty-in-video-games/>.
- [279] E. McNeill, *The aesthetic of indifference*, Game Developer, May 26, 2014. Accessed: Mar. 3, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/the-aesthetic-of-indifference>.
- [280] C. Nutt, *Making Knack: An interview with Mark Cerny*, Game Developer, Dec. 20, 2013. Accessed: Mar. 3, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/making-i-knack-i-an-interview-with-mark-cerny>.
- [281] M. Codd, *On replayability: Emotion, mechanics, and necessity*, Game Developer, Jul. 27, 2015. Accessed: Jan. 13, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/on-replayability-emotion-mechanics-and-necessity>.
- [282] C. Nutt, *Platinum Games' guide to action game design*, Game Developer, Mar. 18, 2016. Accessed: Mar. 8, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/platinum-games-guide-to-action-game-design>.

- [283] J. Georgiev, *Keeping players engaged*, Game Developer, Jun. 23, 2013. Accessed: Mar. 2, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/keeping-players-engaged>.
- [284] A. Kubodera, *Designing for difficulty: Readability in ARPGs*, Game Developer, Apr. 18, 2022. Accessed: Mar. 25, 2026. [Online]. Available: <https://www.gamedeveloper.com/game-platforms/designing-for-difficulty-readability-in-arpgs>.
- [285] A. McAloon and B. Francis, *Three pain points in the production and design of Shadow of the Tomb Raider*, Game Developer, Sep. 27, 2018. Accessed: Mar. 18, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/three-pain-points-in-the-production-and-design-of-i-shadow-of-the-tomb-raider-i->.
- [286] E. Thoa, *Furi: Some tough design decisions striving to make a memorable game*, Game Developer, Jul. 29, 2016. Accessed: Mar. 8, 2026. [Online]. Available: <https://www.gamedeveloper.com/design/furi-some-tough-design-decisions-striving-to-make-a-memorable-game>.
- [287] D. Ang and A. Mitchell, “Representation and frequency of player choice in player-oriented dynamic difficulty adjustment systems”, in *CHI PLAY’19: Proceedings of the Annual Symposium on Computer-Human Interaction in Play*, Assoc Comp Machinery, 2019, pp. 589–600, ISBN: 978-1-4503-6688-5.