GAMES LITERACY AND GAMING CAPITAL: A THEORETICAL AND PRACTICAL EXAMINATION

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The goal of this study is to examine the notion of video game literacy and gaming capital from both theoretical and practical perspectives. The study outlines a series of concepts to refine the ideas of gaming literacy, gaming capital, and how they interconnect, comparing those notions of literacy with learning to read and write traditional text. Concepts from the field of cognitive sciences are introduced to further discuss the idea of how people learn through action, how that action allows them to make more informed judgments in the future, and how digital games in particular enable players to learn as they play. A practical experiment is then engineered based on this research to test these concepts in practice, by observing test subjects of varying skill levels playing *Super Mario Bros.*, and judging their ability to learn as they play in order to observe their personal capacity for games literacy, and observing the practical differences between games-literate players and non-literate players.

Keywords: game studies, new media literacy, game culture, games literacy, psychology in games

Foreword & acknowledgments

When I started researching this thesis in earnest, I began to notice quite a few parallels between the topic I chose to approach and the way I went about approaching it. Some thesis writers themselves may see similarities here too: Being thrown head-first into a large writing assignment, being instructed on it as you go, and still expecting good results. And then the epiphany: It's actually not all that different from the world of games, is it?

Obviously thesis writing in itself is not a game nor does it feature inherently gamelike features (unless you equate a page count to a high score), but maybe approaching it as such would help make the process easier, I figured. After all, games excel at motivating the player to do things for themselves – hence the interest in harnessing the potential of games in classrooms – and thesis writing is also notorious among students for being hard to be motivated towards. ”The Ultimate Classroom Text”, as Kimmo Svinhuvfud puts it.

With that in mind, a little ways into my research process I decided that I was going to write this text primarily for my own needs. Not necessarily just to advance the field of science, or to make a teacher happy, but to make myself happy first and foremost. If you, the present reader, find this research to be especially interesting too, whether you're an educator, a fellow student or someone who simply has to grade this text, then that could be described as a happy accident.

The writing of this thesis was enabled in part by the input of the following persons, who remain in my gratitude for their input:

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1. INTRODUCTION

Consider the following: In our society, the ability to read and write is so vital to the functioning of our civilization that it is the very first thing that is often taught to children who are just entering school, alongside basic arithmetic functions. As they mature and carry on through the school system, they are further taught how to critically analyze and interpret different texts, and are expected to have familiarized themselves with classic literature to the point of being able to discuss their finer meanings and allow for critical discussion about their themes. These are the tenets of what we refer to as literacy, something that those of us inhabiting western civilization are expected to adhere to. However, with so much scrutiny and effort placed into properly educating the population to adhere to the criteria of basic literacy, the same cannot be said for the popular media we consume today, which in some forms is arguably one of the greatest manifestations of our literacy skills that we consume every day in its myriad forms.

There is still one form of popular media we consume today that speaks a whole other language, and that is the language of games and play. The primary language of games as we understand them is through play – through interaction between the user and the system (Adams, C.D. 2010). While narrative-driven games that communicate to the player through written or spoken word have always been popular, at its heart the core of a game is driven by the ludic interaction of the system of the game, its rules and its feedback. Digesting that kind of communication is completely different from being able to read and interpret text or music, yet we use the same terminology to understand it. In doing so, we as players develop a new understanding, a new way to process these interactive texts – *gaming literacy*, in other words – as well as a consolidated understanding of everything we know about the way these texts behave, pooled from our experiences both inside and outside their systems – *gaming capital*, as it's called.

In this study, we explore these concepts from a theoretical background, alongside a real-world study that seeks to understand how these concepts manifest in genuine experiences of play. The goal of the study is to examine how a novice gamer may develop an understanding of a game through the feedback of the system, how expert players display their knowledge in-game, and how the capital that a player brings to a game session shapes their play and understanding of the game.

2. THEORETICAL BACKGROUND

2.1. Motivations and staring questions

Gaming literacy as a concept has seen limited research thus far, usually being lumped in with concepts like new media literacies and "edutainment" software at its best, or simply not given the time of day at worst – the fact that the vast majority of the relevant literature on the subject was penned by a relatively small number of authors in the literature review may serve as proof of that. With digital games being as big an industry as they are, and drawing attention from both pundits and academics, some serious discussion about what it means to be "fluent" in games and to actively participate in the gaming world ought to be topical. These are the questions that this study seeks to answer.

The ultimate goals of this study are to observe ways in which people who have not necessarily played games, or played relatively few digital games, first approach the world of digital gaming, and how they begin to understand the medium contrasted to seasoned veterans that have a fair amount of experience under their belts. The metaphor of traditional text-based literacy is used as a starting point, where in this study "reading" is viewed as interpreting the "text", in this case audiovisual cues from the game, and "writing" is understood as the ability to interact with "text", to navigate game worlds and solve its challenges in an informed manner. In addition, this is mirrored with the concept of *gaming capital*, defined as an existing corpus of knowledge that one brings into a gameplay scenario, in order to weigh how produced knowledge and preexisting knowledge affect the gameplay experience.

To wit, the basic questions that this study seeks to answer are:

1. If the ability to read and write are the prerequisites of traditional literacy, then what are the prerequisites of games literacy?
2. How does the ability to interpret games differ between beginners and experts, and can this difference be used as a yardstick to measure games literacy?
3. How does a player's prior knowledge affect their performance in-game, and how do they acquire that knowledge?

2.2. How games enable learning: games as simulations

While there already exists a fair amount of discussion on the potential of using games as learning tools in the classroom (Squire, K. 2005), to properly understand the learning potential of games, we need to understand what it is about games that makes them an ideal learning environment.

In spite of some rather divisive discussions happening in academia regarding what exactly constitutes a game and what doesn't (Franklin, C. 2013), with some attempted definitions dating all the way back to the very origins of game studies (Huizinga, J. 1949), for the purposes of this thesis we can make a few base assumptions: A game as we understand it is an interactive system, usually with a user-controlled avatar or other means of interaction inside that system, often with explicit goals to aspire towards. These goals can involve “winning” the game by performing a certain action, avoiding an explicit failure state for as long as possible, or something between the two. Some of these rules bend slightly when discussing different games or interpretations of what games are, but these tend to be fairly universally accepted factors – other authors would gladly add or subtract two or three more criteria to that list based on their own core beliefs for what constitutes a game and what doesn't. (Salen, K. & Zimmerman, E. 2003)

The specific part that we're interested in here is the view of games as simulations: After all, simulations in themselves are often used to actualize a certain theoretical model, or to practically show how the rules of nature apply in practice. These kinds of simulations are sometimes used, for instance, in classrooms to show physical models or to display how changing certain parameters causes a change in the behavior of an object – let's say using a physics simulation to show how an object behaves in a vacuum as opposed to the atmosphere of our Earth. These kinds of simulations help greatly in better understanding the theoretical content of a text by not just seeing the theory in action, but also by being able to interact with the system that is being simulated.

With that said, a ”game” makes for a fantastic learning environment in theory, because after all, what is a game if not a simulation of an isolated system with its own rules? For instance, James Paul Gee elaborates on the subject by way of cognitive sciences, comparing the simulation systems of games to the simulations that people

create in their minds to better understand the subjects that they study to better understand the subject matter, such as a performance routine that a dancer or performer might rehearse – only in a game they would be performing this routine on-the-fly, with instant feedback that they could adjust their performance by. One of the core assumptions of this line of thinking is that the 'performer', as it were, does not already know the exact pattern that they are performing, but in fact is learning as they go along: in other words, *performance before competence*. (Gee, J.P, 2005a)

Some of these concepts, though applied in different contexts, are already old hat in the education space when discussing the way children learn through play in early education – given the tools that afford structured learning, young children can absorb all sorts of information about the world in exactly the same way that the games we discuss allow players to learn, by allowing the learner (a player in our scenario, or a child in a learning environment) to explore their options and manipulate objects in order to learn about their functions and properties (Pinkham, A. et al, 2012). In a way, we can consider this a natural way for humans to learn and process information, by placing problems within physical spaces (simulated or real) and allowing one's own cognitive processing abilities to take over. This gives us a dichotomy of *procedural knowledge* (information gained through physical action and interaction with the world) versus *declarative knowledge* (explicitly stated information, usually delivered textually or audibly).

Indeed, the learning possibilities of gaming have not gone unnoticed within the industry itself: With so much money revolving around the games industry, creating a game that someone would want to engage with and be engaged by is a top criterion for creating a successful product. As such, dedicating enough time to making sure that the systems the product utilizes are easy to learn and that the system engenders effective learning is not just required, it is also a core element of a fiercely competitive, global, multi-million dollar industry: A game that fails to properly teach a new player of the functions of its systems, for example by failing to communicate the game's ruleset to the player properly, can easily flounder in the marketplace despite being otherwise well designed or technically impressive. Therefore, the game that succeeds is the game that motivates the player to learn (Prensky, M. 2003), and as such, many of the titles released today with expensive production values take great care to inform the player of

how their systems work, either declaratively through text-based tutorials or through subtle game design tricks.

In this respect, creating interesting experiences of ”play” out of something that might not be otherwise desirable activity is something that the games industry has excelled at for years – for instance, a game like *Papers, Please* (Pope, L. 2013) received critical acclaim for creating an entertaining and enthralling game about the rote job of an immigration officer under a totalitarian government. After all, according to several definitions, ”play” is something that is performed voluntarily, not out of a sense of obligation – therefore to create a game that people would want to play voluntarily is of utmost importance, and creating an engaging game from what some would consider a chore is especially worthy of praise. These voluntary elements have also shown signs of significantly improving exercises such as training drills and simulations by increasing user involvement and motivation with the addition of gamelike elements – for instance, a stock submarine control simulation was found to be much more effective when adding game-like goals and scoring to the mix, greatly improving user involvement and the quality of the actual learning. This act of adding game-like elements to systems is what's known as *Gamification*, which has been advocated as a way of increasing user efficiency across the board at any imaginable task. (Deterding, S. et al, 2011)

2.3. The feedback loop of games

The learning benefit of a simulation, whether or not the simulation in question is accompanied by a theoretical background on the user's behalf, is that any action can be observed and its result digested by the user immediately. In the context of games, this is not unlike a young animal learning about the ways of the world through play in a safe and controlled environment. A simulation like that may not exactly attempt to replicate real-world phenomena (and in fact is never required to do so), but these simulations inhabit systems in and of themselves where the victory and failure states are self-contained (though money-oriented gambling games like Poker blur the lines on this front). Thus, with no real-world consequence for failure within the isolation of the game system, a player should theoretically be invited to experiment and explore to find their boundaries. In addition, clear and specific goals lead to directed play, and particularly difficult goals will direct players to push themselves harder, leading to enhanced performance (Garris, R. et al, 2002). In games discussion, this idea of a game being an isolated subsystem separate from the real world is known as the Magic Circle idea – the notion that a game encompasses a place and time where only its own rules apply, and where fantasy replaces reality (Huizinga, J. 1949).

To put it into words, whereas learning is typically understood as first acquiring knowledge to put into action (*declarative knowledge*, as mentioned above), authors such as Crookall and Thorngate (2009) place an emphasis on acquiring knowledge through action (or *procedural knowledge*), by first committing an action, then reflecting on the outcomes of that action. Traditionally, this has been the way that games teach their players in the days before extensive focus testing, excessively user-friendly design and up-front tutorials to teach the player through declarative knowledge: A player was primarily expected to experiment with the game's systems on their own accord, learn what works and what doesn't, and independently apply this understanding to their play.

One of the core aspects that enables this kind of learning is the game's own responses to player actions and how they correspond to the player's own intent. This is known as *perceivable consequence* – the notion that actions committed by the player do indeed have consequences (positive or negative), and the player can understand what consequences their actions can have: Pressing a certain button makes their character jump, holding it down for a certain length of time makes them jump higher,

and touching a certain enemy or dropping down a pit leads to the player character's death (Church, D. 1999). The notion of perceivable consequence specifically ties into the idea of games as simulations, where the consequences of actions may be observed in a contained space to learn from them – and conversely, a game that relies heavily on player actions to carry itself forward but that does not offer perceivable consequences for those actions is more likely to frustrate than entertain players, therefore incorporating clear consequences for actions is a key criterion to creating enjoyable player-driven experiences.

In this context, the feedback loop of action, reaction, observation and learning is what's called the ”game cycle” by some – the cycle by which the user constructs knowledge from experience (Garris, R. et al, 2002). The concept of a cyclical game experience ties nicely into the idea of a gameplay loop as it is known in game design, which is a cycle of system-side reactions to player inputs and internal calculations that keep the game running. One could even say that the game cycle and the game loop happen in parallel – one occurs within the player as they weigh the consequences of their actions, the other occurs in the system that reacts to the player's own inputs combined with the game's own rules: Together they create a dialogue of player inputs and system calculations.

The cycle mentioned above has been charted out before in a concrete fashion – one such case is the Gaming Involvement and Informal Leaning Framework (Iacovides, I. et al. 2014) that outlines this process: A cycle where the players' own identity shapes the way they view the game both through information that they know from within the game and outside of it (either from their own informal research or from discussions and interactions with other players), and how interactions within that cycle feed into that sense of player identity. For the purposes of this study, this model can be interpreted in a very small-scale way, where every individual loop of the game cycle is its own interaction, or a cycle within the loop of the framework: Every new interaction adds to that pool of knowledge, and every subsequent action is weighed by the information in that pool – a kind of holistic, continuous and rapid learning, where the void of knowledge that existed before the session began is being filled continuously with new knowledge, in accordance with the idea of performance before competence.

Authors such as Marc Prensky (2006) have noted that this is the kind of learning that the digital natives of today are used to: Over the last 30 years or so we've

seen the maturation of the first generation to have had easy access to video games for the entirety of their adolescent lives, alongside the relative popularity of the medium that has allowed these games to be introduced to them at a young age – Some might call this the Nintendo generation, the same generation that today does most of its reading online, on blogs and social media instead of reading the printed word on paper. These differences in thinking patterns may well be a leading cause in the disinterest of young students and their choice to escape into virtual worlds instead of engaging with the classroom: Because the virtual systems of video games offer the kind of instant loop of trial and feedback that's immediately gratifying to the user, whereas the schools they spend their days in expect them to slow down, absorb the information free from its context, and only then eventually, possibly experiment on that knowledge in real life or through a computer simulation.

As mentioned before, the school system expects the youth of the day, the digital natives as they're called, to put knowledge into action, while the games they play assume action before knowledge – this effect has even been noted in the games sphere, where a manual that bluntly explains game functions may be interpreted in a completely different way to the actual ludic (in-game) experience of learning the use of that function (Gee, J.P. 2007). This is referred to as the ”Knowledge-Action Gap” by Crookall and Thorngate (2009); A failure to translate the knowledge acquired into the real-world actions that the knowledge is supposed to prepare you for, or in other words, a situation where one cannot translate declarative knowledge into procedural knowledge.

There are, however, ways that games can deliver textual information effectively to offset that problem: Despite the effectiveness of procedural knowledge, declarative knowledge is still often required, and in order for the player to make use of it, the information must be delivered exactly when the player needs it or specifically asks for it – or in other words “Just in Time” and “On Demand” (Gee, J.P., 2005a). This is enabled in games by either pop-up tutorial messages, or an in-game instruction guide. These methods are especially effective at providing deep-seated learning, because they give the player an opportunity to immediately attempt to use the information they're told, see the consequences of their actions, and learn what they're being taught in practice. In other words, declarative knowledge and procedural knowledge can have a striking effect when used in conjunction with one another – something that game developers learned quite some time ago by introducing progressive game tutorials.

2.4. Affordance: Evaluating possibility spaces

As defined above, one of the defining features of a game is that it features either an explicit win state that the player strives to reach (such as Klondike Solitaire, a game that is ”won” when all cards are put in a proper order), a lose state that must be avoided (consider *Tetris* (Pajitnov, A. 1984), where the player cannot ever “win” the game, but must avoid losing for as long as they can by clearing constantly falling tiles efficiently), or a combination of both. These are what define the first half of a game's ruleset – what they *must* and *mustn't* do – and the other is defined by the available actions that are at the player's disposal – what they *can* and *can't* do. In many games, players are often placed into the metaphorical shoes of the characters they have control of (avatars, as they are sometimes known), which enables them to identify with the goals and challenges of that character because they are also tied to the game's own internal rules – its victory and failure states. This concept is recognized as *embodied empathy*, where the user can place themselves in the middle of a system and understand how it behaves there, in conjunction with all the other components of that system, not unlike the aforementioned simulation metaphor. (Gee, J.P. 2005a)

Indeed, to reach these win states or avoid a failure state, the player must learn how to use the tools the game provides for them effectively – in the field of human-computer interaction these would be called *affordances* (Norman, D. 2013), for example, mastering the use of light and shadow to evade the attention of hostile characters in a stealth-oriented game like *Thief: The Dark Project* (Looking Glass, 1998), where the player takes control of a burglar in a medieval environment. At expert-level play some players may only see the affordances that they have at hand, and the metaphor of the system slips into the background, just as a master craftsman can visualize the exact series of actions they must perform to get the result they desire – in the case of *Thief*, an expert player no longer sees a medieval castle to sneak through, but a series of potential paths in the form of dimly lit areas, and guards as obstacles. Putting it all together, James Paul Gee describes games as ”action-and-goal-directed preparations for, and simulations of, embodied experience” (Gee, J.P. 2005b) or to deconstruct the phrase, simulated situations where the player is placed as a participant in an interactive system with a clear goal, and a series of actions they may take to facilitate that goal.

2.5. Gaming capital: learning through affordance and attempt

To summarize all the previous observations: Learning through games as we understand them is to attempt an action, weigh its outcomes be they positive or negative, assess the situation afterward, and then attempt further actions based on those observations about what worked and what didn't. Through this process a player gains a personal inventory of knowledge about what the implicit rules of the game are, what actions they can perform within the game, and what strategies are the ones that will keep them alive in the long run. This inventory, as it's understood in games academia, is known as gaming capital – which is not only similar to sociological understandings of capital, but also inextricably tied to it.

Bringing up the Gaming Involvement and Informal Leaning Framework once more, we can see that the concept of gaming capital is represented there as the sense of the player's own identity as a gamer (for whatever implications that word may have), which is constructed from both internal and external experiences with the game: Elements that they have learned both from within their gameplay experience (diegetic machine and operator actions, or micro-level actions), and outside of it from external elements – or in other words, engaging with the community of practice that gamers inhabit (non-diegetic actions at a macro level).

In this sense, games literacy can be considered a form of procedural literacy: Games are static texts in the same way that books and film are only if the player does not engage with them (which, as you might imagine, would make for a fairly boring game), and the heart of a game is the interaction that the system affords, and the interaction that the player performs within it. Therefore, the meanings derived from the experience of playing games are procedural, as they formed through the interaction of the player and the system – for example, Apperley and Walsh (2012) describe this as a "*procedural rhetoric*" between the player and the system, or as we've described it before, the interaction between the gameplay loop of the game system coupled with the player's own mental game cycle of reacting to the changing states of the system. Indeed, if the text (as it were) of playing a game is a procedural interaction of performance and feedback, then the understanding of that text is a form of procedural literacy: crafting meanings through changing game states and possibility spaces. Therefore, literacy in this context demands an understanding of the rules in the system (what one's abilities

and boundaries are), the significance of those rules, what those rules say about the world, and how the player reacts to those claims.

Of course, the discourse between the game and the player only forms one half of the equation. The other half is formed by the discussion outside the game, or the paratext as it's sometimes referred to (Apperley, T. & Walsh, C. 2009): Just as reading and discussing literature is paramount to understanding its place in the world, playing games is situated in the wider culture that surrounds gaming, which includes social media aspects as well as games press and marketing. What makes paratext particularly special is that in gaming, paratext is not periphery to the gameplay experience, but central: These include walkthrough guides produced both officially or otherwise, shared gameplay experiences through social media (sometimes in the form of online video), and the fan culture that surrounds video games and produces content in fan outreach, including machinima and game modifications. Information pooled from all these sources can significantly affect the way players perceive certain games, whether by being exposed to various tactics, secrets or interpretations of the game's systems before getting a chance to play for themselves, or through the expectations that a player may have developed from observing the press or marketing surrounding the game.

Gaming capital, therefore, is understood as the key to understanding how people interact with the wider culture surrounding games: Exchanges of gaming capital are where the paratexts of games are produced, and where items of knowledge relating to play are contextualized through discussion of individual actions in play. Even a gamer playing on their own is situated in a greater context of play, for instance discussions of play online and in person, strategy guides and playthroughs that they may have read or seen, hardware or software modifications they have performed, made or used, and the wider marketing environment that may have influenced their decision to buy and play the game. This also establishes an implicit pecking order among gamers based on their knowledge of the texts and paratexts of play: i.e. the kid who knows all the cool secrets or has the most valuable items in the game is going to be the top of the heap.

The attainment of gaming capital is also tied to other sociological understandings of capital, namely cultural, economic, social and symbolic capital: After all, participating in the wider media culture of games can require one to own specialized machines (sometime expensive ones) to play those games on, and a social environment of other like-minded players that are open to that kind of discussion. The acquisition of

gaming capital, therefore, is contextualized by the possession of capital in those areas, and can alter one's perception of games – a game that was a completely solitary experience to one player may be a very social one to others as they discussed their strategies and experiences openly among others, or a certain player may have had to settle for a lesser version of a game because they could not afford to purchase the more expensive system to play a superior version on, or a different game entirely. In that light, the various kinds of capital that one possesses chiefly define many interactions with others, and is therefore worth exploring to place gaming into a greater cultural context.

With this in mind, it's safe to say that the ideas of gaming literacy go essentially hand-in-hand with the notion of gaming capital: To take part in the greater cultural circle of gaming is to exchange said capital, and to learn how to interact with games and talk about them is to attain it. The prerequisites of attaining that sense of literacy are laid out right in the open: A sense of understanding how games as interactive systems function, the ability to interact with them in an informed manner, the cognitive abilities required to make judgments and react to the game's output for further judgments, and a sense of sufficient capital that enables a player to make informed predictions about how the game's systems work based on previous knowledge.

3. LITERATURE REVIEW

3.1. Why games literacy?

With the increasing popularity of digital games, efforts have already been taken to make sure new-coming players as well as educators can enrich their gaming lives adequately (Harviainen, J.T. et al, 2013). As digital games have become more widespread, they have taken the place of things that were once considered great social mediation spaces, i.e. the dinner table or the prime-time television block. One issue with this, however, is that there now exists a noticeable cultural divide between those who have spent their lives since childhood with digital games and those who have not, such as educators, legislators and parents - in other words, Generation Jones (Norton-Meier, L. 2005) - a situation that is further troubled by the growth of the digital games industry that shows no signs of stopping. In this environment, understanding of what constitutes a typical game enthusiast and what doesn't are rapidly blurring – to partake in gaming is to partake in the larger pop culture landscape of our generation and vice versa – therefore, it is this space where an understanding of digital games, or digital games literacies, is needed.

Many discussions of gaming literacy that have been found so far are partly based in using games in schools as teaching tools, either through educational games (classics such as *The Oregon Trail* (MECC, 1971), *Math Blaster* (Davidson, 1983) or *Mavis Beacon Teaches Typing* (The Software Toolworks, 1987), which are familiar to many American schoolchildren) or by using contemporary history-based games to teach learners through play about the circumstances of political leaders of ancient civilizations. This, however, is not the focus of this thesis, because even though using games to teach has wonderful potential, we are more interested in learning to digest video games as a medium in the same way that one could critically understand literature or film. Our interest is less in the idea of teacher-aided use of games in the classroom, but rather gaining an understanding of the medium through independent and voluntary play guided by certain standards and principles. However, the effectiveness of games in the classroom to help motivate underachieving youths into engaging with their subjects is undeniable, and it is this contrast between the qualities of performing well in a game space compared to performing well in an academic space that makes games literacy so

intriguing – humans and other animals have always learned through play in their childhoods, and there is no reason that they would stop learning through play as they mature (Squire, K. et al, 2005).

Though the core definition of literacy is in the capacity to read and write, literacy also extends to understanding the practical discourses of the medium: To follow up on the previous dichotomy, games literacy would be considered the ability to understand or interpret games effectively like a reader would interpret poetry, and in the same way an academic author would be expected to be able to engage with other writers about their chosen field, so too should the literate gamer be able to engage with other gamers, to discuss the shared but slightly divergent gameplay experiences between them. This literature review examines these two aspects of games literacy – literacy as being able to critically understand the medium, as well as being able to engage in the discourse of games, the latter of which is a core tenet in exchanges of gaming capital.

3.2. Games literacy as understanding the structure of games

Because games are fundamentally interactive texts, the way they are analyzed differs somewhat from how a static text such as a book or film would be analyzed. Indeed, a game without a player is more often than not completely static (though there are certain exceptions in the range of interactivity certain games provide, from typical platforming and role-playing games to low-interaction visual novels and interactive movies, which still fall under the scope of games for the purposes of our research). Therefore, it is argued, that examining a game is just as much an examination of the text itself as it is an examination of the player's actions within that game – in other words, the interaction between player and play space, or the player's performance in the game (Squire, K. 2008). Indeed, some contemporary game designers have taken notice of this interplay between the player and the game system, and constructed games specifically to highlight this interplay in a post-modern fashion, such as *The Stanley Parable* (Wreden, D. 2011), a game that uses the interplay between the player and an interactive narrator to play with the player's expectations.

The core of games literacy, just like literacy in the sense of writing and reading, is the ability for one to engage with the text and understand its basic grammar, as well as produce text of a similar caliber, which is where the comparison between text literacy and games literacy becomes slightly more muddled. In examining new literacies

such as games, web content and social media, a paradigm of study has already emerged, comparing the studies of digital ”new media” to the study of traditional media, such as the written word.

Despite the differing structures of the two, some similarities can be seen between, for instance, literacy of text and literacy of games. Since the term itself is somewhat ill-defined and the discourse surrounding the concept is relatively young, some differing interpretations have appeared as to what exactly it means to be literate in games: For instance, Andrew Burn (2007) examines games literacy as a notion of being able to interpret and produce content; according to their definition, to be games-literate one would have to personally know how to create digital games from scratch, on the basic level of comparison to traditional literacy as an ability to produce and consume content (i.e. writing and reading) in an informed, intelligent manner.

It is in our opinion that this interpretation is too narrow-minded to be of use for our framework, as it equates literacy to a mastery of a tool – in this case, software used to create games, compared to a bladesmith forging a sword, or an author using a pen – and seeks only to treat games as static artifacts, as if treating a book simply as a collection of written words. We reject this interpretation on the basis that games are, indeed, interactive texts, and in this metaphor, the “creation” of text is not in making games, but interacting with them: In the metaphor that we embrace, the “text” of the game is not just the game that exists, but a malleable text that changes based on how it is played – after all, to be a master swordsman has almost nothing to do with knowing how swords are forged. Instead, we embrace James Paul Gee's definition of literacy, where the player becomes a “co-designer” of the game as they play, and by the very act of interacting with the system, they are forging their own unique path through the system and authoring their own narrative through it (Gee, J.P. 2005a).

In the metaphor that we examine here, the writing part of literacy becomes the player's own ability to perform in the game world itself with the tools they have been given, whereas the reading part is their ability to interpret visual, audible and gameplay cues as affordances, in the same sense that any piece of interactive software provides a framework of what can and can't be done with it (Hjorth, L. 2011). The catch is that, in addition to each game's defining ruleset that determines the actions they may take at any given time, digital games are also wrapped in an audiovisual language that is unique to them, where the rules of the game take shape in what one can see and do in

the game's world itself: A kind of audiovisual coding where the player must deduce that certain in-game objects are beneficial, while others are malevolent (Adams, C.D. 2010).

To use *Super Mario Bros.* (Nintendo, 1985) as a familiar example, the first-time player may not be able to tell that the brown, mushroom-shaped enemy (also known as a Goomba) will kill their character on contact, or they have not yet mastered the act of maneuvering around this enemy and will perish on their first attempt. Likewise, they may not know that jumping into certain blocks yields positive surprises, or that the mushroom-shaped power-up items can help them, when the very first thing that killed them before also resembled a mushroom. Meanwhile, an expert player of *Super Mario Bros.* will not only maneuver expertly around the first enemy, but will probably also know to travel underground through pipes to find hidden coins, jump up at just the right spot to find a hidden extra life, and climb up to the ceiling of the second level to skip over the exit and warp directly to the last levels of the game.

From this we see the paradigm begin to emerge, that to be literate in games is to understand audiovisual and gameplay cues (such as, say, a hammer flying in your character's face) and possessing the ability to react to those cues (dodge out of the way or, depending on the game, shoot the hammer out of the air). The same paradigm applies to different games in different ways: A proficient player of strategy games ought to understand what resources provide what advantages and how to deal with certain enemy units, and an experienced puzzle game player can mentally plan out the perfect sequence of moves that they need to accomplish their goals without a second thought.

In the same way that a reader well versed in the ways of fiction can put themselves in the writer's shoes and see exactly where the story is going, a well-versed gamer can metaphorically put themselves in the shoes of the designer and see just how everything clicks. This phenomenon provides a sense of intertextuality within games, where experiences from past games can ready the player to new challenges, even if it's in rather basic terms. (Wolf, M.J.P. & Perron, B. 2014)

This scenario of course is a two-way street, as a game itself also has to enable any kind of learning for one to become fluent in its ways. Although designing functional games is different from designing functional productivity software, some core principles apply, as a game must have a consistent set of rules with predictable in-game object behaviors as well as consistent results to player actions that allow the player to

make reasonable judgments about the system (Pinelle, D. et al, 2008). Having a clearly understandable audiovisual language is also vital to make the game easily understood.

The principles that enable games to teach players effectively are the same kinds of principles that allow a game to be successful: For example, James Paul Gee (2005a) notes that games as interactive systems incorporate numerous functions that allow games to be a meaningful system of learning by giving the player agency inside a self-contained system, give instructions to the player as they are needed and can be utilized immediately, and walking a fine line of offering just enough challenge to keep a player engaged, but not too much to make the player frustrated, in accordance with their own set of skills and abilities. These are all qualities that are particularly exhibited by what would be considered a "good" game: A poor game is the one that fails to indicate to the player what they should do and how to do it, or one that fails to engage the player by being too easy or too difficult. Staying in a perfect balance of being just difficult enough to be engaging but not too difficult or easy to be frustrating is what's known as flow, a state that is often sought as a holy grail of game design (Chen, J. 2007), and one that is equally useful in teaching and learning (Csikszentmihalyi, M. 2002) – we might call this a serendipitous coincidence that the same thing that allows players to engage better with their games also improves their capacity to learn.

James Paul Gee's concept of "*embodied empathy for a complex system*" (Gee, J.P. 2006) is a particularly interesting idea, as a clever way for a game to contextualize the narrative of a game by framing the in-game stated goals and undesirables (indeed, its affordances) with the game's own rules: The player wants to reach the end of the level not just because that's where an arbitrary "goal" is, but because there's something to be found or done there, and the player wants to avoid losing all their health because they themselves are presumably not suicidal. They might want to avoid detection and gather loot while playing *Thief*, because those are both the goals that allow them to win as well as the goals of the player character, the master thief Garrett, whom they're playing as. These notions, as mentioned before, wrap into the game's audiovisual and narrative language that allow the player to mentally travel to a new location, and assume the identities of people other than themselves. In other words, the player isn't simply sitting in front of a television with a piece of plastic in their hands. In that moment, they have become Mario themselves. It's a kind of engagement that other forms of 'teaching' could only dream of.

3.3. Games literacy as discourse of practice

It has also been highlighted that literacy in gaming also means being able to partake in games media and gaming culture at large, much in the same sense that mastery of any practice would involve mastery of the discourses of that practice. The way it applies to gaming, however, opens up new variations on understanding games as performances and, indeed, understanding video game fandom as participatory culture (Soderman, B. 2009). In this network of shared experiences, players compare and contrast each others' playthroughs of individual titles to form a better understanding, reflect on different kinds of playstyles to see different ways to play the game, and ask for advice and share hints with each other, a feature that games developers themselves are now encouraging (for example, Nintendo's Miiverse service gives players game-centric message boards where they can solicit advice, share hints and provide drawings and screenshots based on the games). These social dimensions even allow players to share individual 'performances' through video sharing services (Miller, K. 2012), often through annotated video recordings known as 'Let's Play', which are most often accompanied by humorous commentary (Hale, T. 2014). In some cases, popular Let's Play series have succeeded in propelling otherwise unknown games into the spotlight through popular videos and playthroughs constituting free advertising for the game itself.

The enthusiasm of shared gameplay experience reflects on the willingness of gamers to engage with their pastime through creative pursuits, be it in the form of fan creations such as illustrations, comics or even music, or through modifying the titles themselves by creating modifications, better known as game mods (Scacchi, W. 2010). The availability of interesting mods has occasionally boosted the popularity of their parent games, whether it's through the addition of new gameplay systems, cosmetic alterations, fixing issues that the developers couldn't address themselves for various reasons, or fans creating an entirely original game out of the framework of a currently existing title. In some cases, a mod with sufficient popularity may even branch out into a commercial title of its own; Mods such as *Team Fortress,* which eventually spawned a stand-alone sequel, and *Counter-Strike*, a franchise that began as a free mod and has now spawned at least three whole games, are particularly noteworthy examples of mods branching off to become independent, commercially released games.

In other cases, many developers in the industry have first gotten their start by creating mods, which allows them to essentially 'practice' the craft of game creation on a smaller scale and relying on a preexisting game's framework to support it. It is this creative drive that makes games culture as a particular facet of fan culture so interesting, especially as a form of symbiosis where both developers and users benefit from the creation of mods: Interesting mods are likely to spur interest in the game itself from the consumer's perspective, as well as allow people to create their products and share them freely to others (Weidman, G. 2013). Indeed, as far back as the early days of the mod scene, developers have tapped into this potential by deliberately making their games easier to modify, fostering a healthy and creative community around their games (Borland, J. & King, B. 2014). In a best-case scenario, high-profile modders may even be hired to create games as a living in a professional environment based on their efforts as amateur modders (Postigo, H. 2007).

On the other hand, the shadier side of gaming culture and discourse tends to reveal itself whenever games are discussed as having problematic content ranging from promoting violence, racism or sexism, and that they might be affecting the players themselves with similar attitudes (Leonard, D. 2009). These criticisms have both come from outside the sphere of gaming culture itself as well as within it – for example, the Sega CD game *Night Trap* (Digital Pictures, 1993) once became the topic over a congressional hearing in the early 1990s due to excessively violent content for what was considered a product aimed at children, sparking discussions of how to protect children from excessively violent content in digital games (Kent, S. 2001). The same discussions sparked up again later in the wake of the Columbine shooting, as video games came under excessive scrutiny for their violent content when it was revealed that the perpetrators were fans of violent first-person shooter games, and indeed may have created levels in said games to rehearse their massacre in advance (Borland, J. & King, B. 2014). In many such cases where the content of games is 'attacked' by such critics, gamers immediately jump on the defensive, as debates about problematic content in games frequently become passionate defenses of these gamers' chosen hobbies and the content of their games, including imagery that could be considered racially charged (Brock, A. 2011) .

Part of the problem may stem from the way that games, as an offshoot of computer science and other 'nerdy' interests, have been typically seen as a masculine hobby (Cassell, J. & Jenkins, H. 1998), in the same way that G.I. Joe dolls and Trans-

formers toys have – worsened further by the fact that many best-selling contemporary video games, such as the *Halo* and *Call of Duty* franchises, draw on imagery of boyish military fantasies or macho sporting events, like the best-selling *Madden* and *FIFA* sports franchises which are based around American football and soccer respectively. Therefore accusations of sexism in the field of gaming has been defended by a corpus of mostly male video game enthusiasts who are unable to emphasize with issues faced by women within the field, leading to a mostly one-sided conversation. In recent years the gaming landscape has begun to diversify, however, bringing with it voices that have not been heard before in a gaming space, such as criticisms of popular video games from a feminist perspective. The unfortunate side effect of this change is a push-back from the existing gaming community, some of whom reject a change to the status quo of gaming as a male-dominated space (Braithwaite, A. 2013), while others consider the new influx of progressive, feminist-oriented viewpoints as an unnecessary injection of politicized discourse into what was, in their minds, a carefree and nonpolitical space (Franklin, C. 2014).

Whatever the case, from these examples we see that the fandom surrounding games and their culture is in a state of symbiosis with the industry itself, producing both critical and adoring content of the works that drive their passion for the medium. But in a way, participating in the gaming community is just as much interacting with the medium as it is interacting with others who consume it. The sense of community around games has proven to be a powerful social factor, even taking precedence over the games themselves – after a certain point, fostering the existing friendships around the community takes precedence over engaging with the medium. This sense of bonding has only grown stronger with the proliferation of the Internet: Now players the world over can form and maintain these relationships over the internet, instead of having to be bound to a single geographic location like in the olden days of tabletop roleplaying games. Players miles apart from one another may meet their future best friends, even spouses, in online games as adventurers or combatants (Borland, J. & King, B. 2014). Gaming has always provided a sense of escape to the people who need it, but today it can also provide something greater than that: A sense of community and belonging to a group of like-minded people. Perhaps it is this sense of community that inspires players to defend their chosen hobby with the fervor discussed above – while not always commendable, this dedication is at least admirable.

3.4. In closing

From the aforementioned duality we can see that games literacy and games studies is a diverse field, but the different facets of games literacy deserve to be evaluated as a whole rather than in segments. In the previous chapter, we discussed how games literacy and gaming capital were related as concepts, and in the interactions between players we see their identities as gamers take shape – indeed, as they exchange capital.

The aforementioned exchanges of capital can take many forms, from in-jokes among gamers regarding certain humorous video game scenes, to the trading of hints between players: It is no secret that many of the mysteries of a game like *The Legend of Zelda* (Nintendo, 1986) are no longer mysteries, but now common knowledge among the gaming public thanks to what must have been endless playground discussion between players of the game and a gradual unveiling of its mysteries – a phenomenon that continues to this day, when a game's secrets are often laid open days, if not hours after its release. The question isn't if the internet has killed off the idea of secrets in games (which may arguably be true), but rather what opportunities it affords us to engage with games today, bringing players from around the world together to discuss the medium that they are passionate about, for better or for worse.

This duality gives us our theoretical definition of games literacy – a capacity to engage both with games on a level of interpreting and acting in an interactive space in an informed way, to interacting with other players in discussions of those texts, sharing strategies, rumors and hints with others. Both of these feed on the player's sense of identity as a player, also known as their capital, as seen in the Gaming Involvement and Informal Learning Framework (Iacovides, I. et al, 2014).

4. RESEARCH PLAN

This chapter explains the further motivations of the study, as well as explaining the practical details of the experiment and the research question at hand, as well as the methods that were used to attain these results.

4.1. Motivations and research methods

The results of the literature review show a distinct dichotomy between two forms of gaming literacy: Literacy as a means of discussing the ability to engage with text (i.e. "skill"), and literacy through engaging in the community of practice of gamers and absorbing capital through them ("discourse") (Squire, K. 2008). This even split provides us with two distinct avenues that we can use to examine the concept of games literacy: Learning to play a game through play itself, and using pre-existing knowledge to construct new experiences. Both of these avenues will be considered in the following test as two metrics of "games literacy" that feed into each other and interact in interesting ways.

As mentioned in the opening chapter of this study, we want to observe how gaming literacy, as an abstract concept, can manifest in practice, and what exactly it practically means to be "literate" in the context of a video game. With that in mind, we intend to conduct a practical study examining these concepts, by placing random participants into a gameplay session and evaluating their capacity to learn the game as they play, as well as comparing how the preexisting knowledge of play that they brought into the session weighs upon the outcome of the session. These observations will hopefully provide us with an idea of what exactly it means to be literate in games and how the test subjects as players can learn to "interpret" the text of the game.

The study outlined below will be conducted through qualitative research and analyzed by way of its methods, including quantification of both the measurable, concrete numeric data, as well as the abstract data, to hopefully form a core understanding of how games literacy can manifest in a study, and how gaming capital shapes the outcome of a gaming session.

4.2. Games literacy as expertise: The quantitative study

To understand what it means to be literate in games is to see for ourselves how people react to games differently, similarly to examining the ways one interprets and reads different texts when discussing typical text-based literacy. To do this, a volunteer test will be conducted to observe people's reactions to a game of our choice. These tests are to be performed in early 2015, and analyzed over the following months.

Each test setup encompasses the same basic parameters: First, a series of volunteer test subjects is acquired through university mailing lists to partake in the study. The test subjects will not be informed that the test is in any way related to gaming or games studies until they actually begin the test, so as not to introduce a self-selection bias. No specific properties are demanded of the test subjects, apart from an understanding of either the English or Finnish language in order for the organizer to guide the subject accordingly and interview them afterward. Other than the aforementioned, test subjects will not be discriminated based on age, gender or any other criteria. Since the test subjects recruited through this test are university students, it is reasonable to expect most of them will be young adults between the ages of 18 and 30. During the test, test subjects will each be given a game to play until a predetermined time limit is up or the test subject themselves decide to end the experiment, to limit the length of the test (the approximate maximum time limit is fifteen minutes, but subjects will be allowed to carry on longer than that so as not to halt the test abruptly).

While playing, the subjects will be asked to verbalize their internal thought processes as they play to gain an understanding of what they're thinking of with each passing moment of gameplay, and how their mental processes correlate with their actions within the game space. The test subjects will specifically be instructed to verbalize any thought that goes through their head at that time without any kind of conversational filter or need to explain their thought processes, so as not to distract themselves from the action of playing the game by having to think too much about what they say at the same time – if the subjects prefer it, they can remain silent to focus entirely on the game, and explain their thought processes after the fact. The subjects will also be observed during play for certain metrics, which are again dependent on the game. After the session concludes, the test subjects will be interviewed with questions relating to their history of playing games, as well as their feelings about the game and the play session

itself. The questions in full can be found in Appendix 1 and 2, for the English and Finnish-language versions respectively.

The questions used include:

- Have you played digital games before, and if yes, how long have you been playing them?
- How often do you play video games?
- Have you played this game before?
- What platforms do you play games on?
- How much did you enjoy your play session?
- Did you find the game to be too difficult or too easy?
- What did you like and dislike about the game?

Because of the implicit assumption that computer science students are more likely to have experience with digital games compared to other majors, and because the experiment demands a contrast between absolutely beginners and experts, test subjects were recruited from both the literature and humanities majors' mailing lists respectively, named Motiivi and Humanika, as well as the computer science majors' mailing list FreeLoop and the information science majors' mailing list UDK.

4.3. Test set-up and equipment

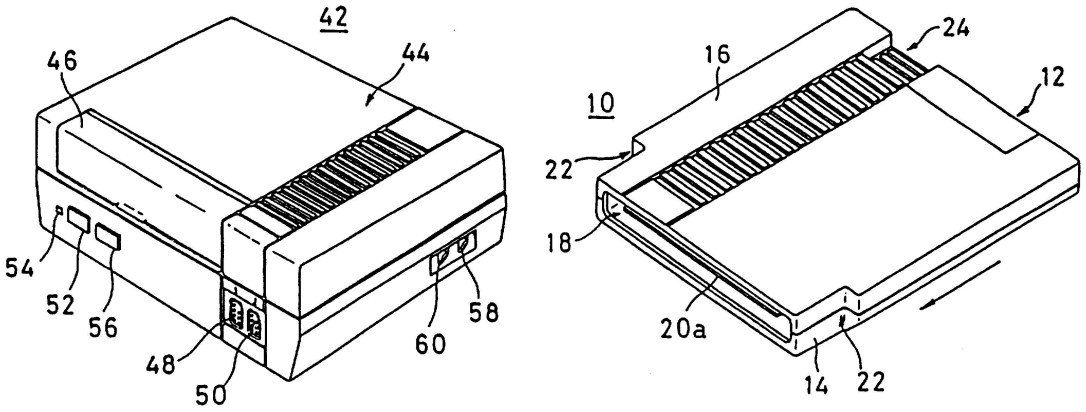

Figure 1: A patent illustration of the Nintendo Entertainment System game console, as well as the cartridge-based storage medium that its games were distributed on (not drawn to scale). From US Patent RE34161: Memory cartridge and information processor unit using such cartridge, filed by Nintendo Company Limited.

For this test, it was decided that subjects would be playing *Super Mario Bros.* (Nintendo, 1985) on the Nintendo Entertainment System (an illustration of which can be seen in Figure 1). As the western equivalent of the Japanese Family Computer system produced by Nintendo, the system itself is well known for being one of the first Japanese-developed systems to make a foothold in the western gaming community, especially in the United States where it debuted after a large-scale implosion of the American video game industry. (Ernkvist, M. 2006)

Figure 2: A proprietary Nintendo Entertainment System controller, manufactured by Nintendo. Trademarked as Nintendo Select Start A B, serial number 86565763.

As its name implies, the Nintendo Entertainment System was marketed as a device focused strictly on entertainment rather than the business or productivity applications one would find on home computers. The primary input device of the system is a controller, depicted in Figure 2, which features a cross-shaped directional controller used for in-game movement, as well as two action buttons for in-game functions (labeled A and B), and two more function switches labeled Select and Start, often used for menu functions in games such as changing a selection and starting or pausing a game. The system outputs an audiovisual signal to a television screen, either through a composite or coaxial video connection depending on the user's choice.

Figure 3: The title screen of Super Mario Bros.

Super Mario Bros. (shown in Figure 3) was chosen for this test as it is a natural starting point in observing both games literacy and gaming capital: It is a highly successful and popular video game that boosted its titular character and publisher into prominence in the western market, and has achieved such levels of acclaim that virtually anyone who is familiar with digital games is also likely familiar with Mario, not to mention the character's penetration into popular culture at large as one of video games' most enduring icons.

Even to this day, Super Mario continues to be synonymous with video games to many people, and despite the fact that the character was already introduced several years before in games such as *Donkey Kong* (Nintendo, 1981), *Super Mario Bros.* is often considered the game that put the character of Mario on the map, leading to a franchise of best-selling video games in the *Super Mario* franchise, as well as spinoffs starring the same cast of characters such as *Mario Party* (Nintendo, 1998), *Super Mario Kart* (Nintendo, 1992) and *Mario Tennis* (Nintendo, 2000).

4.4. The First Goomba Assumption

Thanks to the game's inescapable popularity (with approximately 40 million units sold over nearly three decades, currently the fourth best-selling video game of all time), it is easy to assume that almost everyone who considers themselves a dedicated player of video games has played *Super Mario Bros.*, or at least one of its numerous follow-ups and imitators at some point in time – therefore, many of its secrets could be considered common knowledge among gamers, including ways to skip between levels by discovering what is referred to in-game as the Warp Zone, an area where the player may literally 'warp' to a level of their choosing.

On the one hand, the game is old enough that players accustomed to more recent games may find significant difficulty with this installment, thanks to certain older design choices that many newer games avoid to appeal to a larger audience and to be more user-friendly (for instance, a limited number of tries and a player character who can be killed by being touched by an enemy even once, or simply by failing to jump over a ravine, and a lack of introductory tutorials to inform players of how the game should be played, meaning the game's system of teaching the player is more procedural rather than declarative). On the other hand, the game's audiovisual language is simple and straightforward, and its control scheme is easy to understand with minimal trial and error: a directional pad to move the character, one button to make Mario jump, and a second button to make them run faster and shoot fireballs under certain circumstances. The game also features a 'power-up' system that allows the player to gain an advantage in play: Grabbing a mushroom will increase the size of the player character and allow them to sustain an extra hit before death, and collecting a flower allows them to shoot fireballs to eliminate enemies.

With the remarkable legacy of *Super Mario Bros.*, much ado has been made about the very first enemy the player encounters in the game, a short, brown mushroom-like monster called a Goomba, who appears on the right side of the screen, dawdling slowly towards the player in the very first seconds of the game. (Emmons, D & Portnow, J. 2014) This first enemy has been considered a litmus test for whether or not a player is equipped to handle the challenges that the game presents: To provoke the enemy to appear in the first place, a player must know how to move and make the screen scroll, and to avoid or defeat him the player must know how to jump. In an ex-

ample of subtle teaching of the game's systems through play, by maneuvering around this enemy the player is now equipped to handle a vast majority of the challenges that await them in the rest of the game, and it has been often joked that this first Goomba has claimed the (virtual) lives of thousands, if not millions of careless or unprepared players. Hence, our interest in this phenomenon neatly encapsulates the idea of games literacy as a discourse of practice, and gives us one metric by which we can examine it. Therefore, it is not unreasonable for us to assume that we will see these cases for ourselves in the test, both from complete amateurs and simply careless players.

During this test, participants will be asked to play as much of Super Mario Bros. as they can during the 15-minute duration of the test, mostly focusing on the first World of the game (the first four levels, or approximately one eighth of the full game). This first stretch of the game will likely be very familiar to most hardened players, but can still pose a moderate challenge to newcomers. The beginning point of the test is the starting screen of the game, where the option to commence a one-player or two-player game appears. During this test, we will pay close attention to which challenges players succumb to, with particular emphasis on the very first Goomba to prove or disprove the aforementioned assumption. Discovery of secrets (hidden lives and secret areas, for example), whether they be accidental or intentional, will also be noted and evaluated depending on whether the player stumbles on them procedurally, or already knows that they exist: A player who discovers the secret Warp Zone that allows them to skip whole worlds of the game will be of particular importance. The test may also end if the player reaches a Game Over (fails several times in a row and runs out of extra lives), and does not wish to try again.

Because of the implicit assumption that the game's control scheme is fairly simple and in order to gauge the user's ability to learn through play, no explanation of the game's control scheme will be provided, requiring the test subject to experiment on their own to learn how the game is played and construct that knowledge procedurally, if they do not already know – the only instruction given is that the test subject may commence the game by pressing the Start button. From this, it'll also be observed how well the player will succeed in learning the game's controls and rule set: For instance, whether they learn that holding down the jumping button for longer will increase the height of their jump, or if they can infer that pressing B will allow them to run faster while the button is held down, or shoot fireballs when they have acquired the Fire Flower power-up.

4.5. Evaluation

Based on the test, the participants will be evaluated on the following metrics:

- How many levels they completed over the course of the test
- How many times they died in the game, as well as the cause of their deaths
- What kinds of specific challenges they encountered over the course of the test that caused significant difficulty
- What their history with games is, and how their previous experience in games translated to success in the test
- Verbal statements uttered during the tests that give insight to the subjects' thought patterns during the test

This data will be used to roughly determine an approximate skill level for each player based on number of failures and victories, and weigh that against their stated history of play to measure how well their existing gaming capital could be seen in the test. To contrast that, the results will be used to observe how beginning players react to the game for better or for worse, and evaluate the differences in play between expert and amateur players, as well as how beginning players managed to attain procedural knowledge through play (whether or not they were able to properly assimilate the game's rules from their play experiences, and how the learning they did changed their play throughout the rest of the session).

Discovery of secrets will be assessed as especially valuable, along with comments from the test subject detailing whether or not their discovery was accidental or intentional: In accordance with the idea of gaming capital as transfers of knowledge between players, we shall observe how many players that do discover these secrets find them knowingly, and how many simply stumble upon them. If the majority of players find these secrets accidentally, it would mean that they are using procedural knowledge rather than existing capital. Knowledge of these secrets may also be tied to other non-explicit methods of playing *Super Mario Bros.* well that the game never explicitly states, such as knowledge of the way the game's power-ups and controls function.

4.6. Expected results

The initial assumption, based on the setup of the case tests, is that new players will be noticeably confused by their lack of understanding for the games they play: They will fail to interpret audiovisual cues, the causes and effects of their actions, and the basic rules of the game. In doing so, however, they learn to play and develop a sense of learning through play. The end result of this cycle is what some would call mastery, though just as someone can read a whole book without fully grasping its contents, so too could someone theoretically play through an entire game without learning all its nuances. Nevertheless, we will see conscious understanding of and success in the game as a token of literacy, based on both the test subject's performance as well as their inner monologue reflecting their thought processes, and observe their continued success based on previous experiences – or, conversely, we may very well also see players failing challenges again and again as they fail to properly "read" the text of the game, or clear a single challenge once but fail it again eventually in subsequent attempts, showing that they do not fully understand the rules of the game despite having cleared individual challenges.

The expectation would be that people who both routinely spend more time with games and have been playing games for a longer time than others would show a greater amount of skill in them, as these would be the signs of dedicated, lifelong gamers who are committed to the hobby and have therefore assimilated lots of knowledge on games. This may not always be the case, as we are open to the idea of being surprised by the eventual results. Similarly, we will assume that secrets will mostly be discovered and utilized by those who already know about them at the outset, with relatively few players discovering these secrets for the first time as opposed to knowing them in advance. Just as before, we will be open to the possibility of surprising results.

5. TESTS AND RESULTS

Figure 4: Room B2076, where the pilot test and Round 1 of testing were held.

The test was conducted in three "rounds", henceforth referred to as the Pilot Test, Round 1 and Round 2. The pilot test and Round 1 were conducted in room B2076, also known as the Playlab, at the University of Tampere. The space was chosen due to its ideal nature in performing games-related practical studies, as well as its own equipment and casual atmosphere. Because of difficulties in booking the space for subsequent tests, another more generic space was chosen for Round 2: Room B1074 at the University of Tampere, a testing and storage space. The testing area was set up with some small amount of decoration in all three cases to provide the nearest possible circumstances to a casual, domestic playing session, mimicking a comfortable real-life experience. Photographs of both testing spaces can be seen in Figures 4 and 5, for reference.

Figure 5: Front and back views of room B1074, the site of Round 2

In each test, participants played *Super Mario Bros.* for approximately 15 minutes, while having their gameplay monitored by the organizer and recorded via a video camera. Often test subjects would play for longer than 15 minutes, so as not to end the test too abruptly. Every player death was recorded in the notes, along with the time of death since the beginning of their session as well as the cause of their death and what level each death occurred on.

Before commencing their play, each test subject was informed of the basic parameters of the test:

- The test subject had fifteen minutes to play the game,
- they were to "play at their own pace",
- that a camera would be recording their performance,
- that they were encouraged to say anything that came to mind during the play session, so as to help the organizer monitor their thought patterns, and
- that they could begin the game by pressing the Start button on the controller.

No further instructions were provided on the nature of the game, even when test subjects specifically asked for it. This was done to ensure that players would only bring the existing capital that they had into the test, and learning solely through play within the test itself rather than through outside factors.

After each test, the test subjects filled out a single-page form asking for their age, gender, and thoughts about the play session and their general gaming history. They could grade their enjoyment of the session on a scale of 1 to 5 (5 being maximum enjoyment, and 1 being no enjoyment at all), and list things that they particularly enjoyed or disliked in their session. In addition, they could tell which platforms they usually play games on, how often they play them, and how long they have played them. The practicalities of each round of testing are presented here in their respective subchapters, along with a final subchapter detailing the overall results of the test, evaluated as a cohesive whole.

5.1. Pilot Study

The pilot study was conducted in early February of 2015 in order to test the feasibility of the testing setup and to see if there was need for changes or improvement in the final setup of the test. For this test, random participants were culled from the University of Tampere's common space Oasis, with no criteria for joining the test apart from having the time and willingness to participate. Some participants entered the tests in groups of two or more, allowing other participants to observe in advance before their own performance in the test by themselves. No reward was promised or given to participants.

Six participants entered in total, but the complete set of evidence could only be recorded for five of them. Unlike the final test (Round 1 and Round 2), a video camera was not available to record the test data, therefore the measurements recorded during the tests were completely dependent on the organizer's own abilities of observation and note-keeping without a concrete recording of the events. As such, the data collected during the pilot study is less reliable and accurate than what could have been achieved with the use of a camera to record the user's gameplay session.

From these tests, it became clear that while the rest of the setup for the test was sound, a recording device was needed to make sure the test material could be available for scrutiny at a later date, and to provide more accurate data. Some adjustments were also made to the questionnaire form provided at the end of the test, as the initial wording of the questions gave the users a false impression that the tests were conducted specifically to seek gameplay improvements or possible modifications to the game. In addition, it was decided that even the small amount of briefing that the users were given in the test could be worded better, as initially telling the users to ”get as far as they could” may have distorted their own goals and expectations for the test, and caused them to act recklessly where they otherwise would not for the sake of advancement. As such, for the experiment proper, it was chosen to tell test subjects to “play at their own pace” to gain a more accurate view of what a relaxed and private test session might look like.

5.2. Round 1

The first round of tests was organized in the first full week of March 2015, with tests subjects recruited primarily through major-oriented university news groups at the University of Tampere. The invitations were sent to the major newsgroups for information sciences and computer science majors, as well as humanities and literature students' mailing lists where possible. No explicit reward was promised due to budgetary reasons, but sweets were offered at the test site as a modest reward for participation. The test was advertised in these emails as a ”fun and different” user case test, without making any explicit mentions of the study being game-related to avoid any self-selection bias. Users could arrange an appointment on any date from the two weeks allotted for the test, reserved via the booking system Simplybook.me.

Unfortunately, these two latter criteria resulted in a miniscule turnout for the actual test: Of the six people who signed up for the test, only two eventually showed up. Since the organizers considered this a far too small sample size to make any meaningful conclusions on, it was decided that a second round was to be organized to gain additional data, as well as limiting the scope of the test to better focus on the smaller eventual turnout from the tests.

5.3. Round 2

For the second round of testing, a mostly similar arrangement to Round 1 was organized: Once again test subjects were recruited through the same major-oriented university mailing lists at the University of Tampere, with a slightly reworded recruitment email. The major differences in the recruitment process were:

1. Participants to-be were now told up-front that the experiment was explicitly related to games and game studies.

2. Participants were promised a reward for their participation: In this case, a movie ticket, as is customary for local experiment-oriented studies at this university.

3. Because of a strict limit on how many subjects could be rewarded, the times when tests could be organized were now limited to a three-hour time span across three days.

These changes resulted in a completely opposite reaction from the public: Where Round 1 resulted in a miniscule turnout, Round 2 was booked solid within two days, even resulting in email inquiries about attending the test despite the schedule being already fully booked. Some extra tests were organized with this arrangement in mind to allow for a maximum number of participants, and other times the test was outright double-booked. However, thanks to the lenient time frame of the tests themselves, this was not a significant issue. The tests themselves were organized in the first weeks of April 2015, between the 6th and 10th of April.

5.4. Test results

For the sake of dissecting the results of the test, the results from Round 1 and Round 2 were evaluated as a cohesive whole, since the test setups were nearly identical between them and the sample size of Round 1 was considered too small to draw meaningful conclusions from in isolation. The results from the pilot test, despite being comparable to the results of the finished test, were not accounted for due to slight discrepancies in the testing method: These include allowing several participants in a room at a time, allowing these participants to converse with one another during the test and to provide hints to each other, as well as reduced ability to monitor or judge the test results without a camera to capture the testing event. The lack of any recorded footage from the pilot test would have forced the test organizer to make judgments based only on the notes taken during the test, which are not as accurate as video footage in this case. Thus it was decided to base the analysis exclusively on the results of Round 1 and Round 2.

In total, 20 test subjects were included in the test, not counting the participants from the pilot study. The average age among respondents was 25.55 (median age 24.5), with the youngest participants being 21 years old, and the oldest reporting an age of 39. In regards to the gender division of the participants, 8 were male and 12 were female, though the participants' gender was never strictly controlled in the recruitment process. Despite pulling the participants from different academic disciplines, the educational backgrounds of the participants were not accounted for in the data or in the analysis, as they were considered extraneous factors and the conclusions drawn from those comparisons was not considered statistically significant.

Virtually all participants were familiar with *Super Mario Bros.* to at least some degree: Of the 20 persons interviewed, only 4 said that they had never played the game before. In spite of that, some respondents who claimed to have never played the game before in the questionnaire had mentioned that they played some derivatives of Mario, such as sequels and modifications – Subject #10 expressed disappointment that reaching the top of a flagpole at the end of the level did not yield extra lives, a design trait introduced in later *Super Mario* titles such as *Super Mario 3D World* (Nintendo, 2013). The same subject also mentioned familiarity with *Mari0* (Stabyourself, 2012), a fan-made game that combines elements of *Super Mario Bros.* with the popular first-person puzzle game *Portal* (Valve, 2007). One other subject mentioned that instead of playing the game themselves, they had seen others (such as their own siblings) play the game and pulled from their experiences instead of their own. In that sense, one could say that *Super Mario Bros.* enjoys a healthy 80-90% cultural penetration rating among the audience surveyed in this test.

Because the test setup required players to learn to play on their own, a lack of instruction provided by either the test organizer or the game itself became an apparent distinguishing feature between amateur and expert play. For instance, at the very start of their session, beginning players would individually push each button to observe their functions – from this they learned that the A button is used to jump. However, when pushed in isolation, the B button does not appear to have any function – in actuality, pressing B while holding a direction on the directional pad causes Mario to move faster in that direction. With these factors, it was noted that many amateur test subjects (up to 11 of the 20 participants) failed to make use of the B button at all, and only one subject discovered its use in the middle of the session rather than knowing about it right from the start.

Coupled with the lack of knowledge about the game's controls is its power-up system, where amateur players failed to identify the function of some power-ups even after grabbing them – some even went out of their way to avoid power-ups altogether and simply progress through the level, not knowing that power-ups would have been beneficial to that goal. Similarly, only players who were previously familiar with the game knew how to make use of the Fire Flower power-up, which allows them to shoot fireballs at range by pressing B – a button that, as mentioned above, relatively few players even knew had any function. As such, some players would grab it without un-

derstanding its benefit, believing it to simply change Mario's color scheme. Likewise, of the players who eventually discovered the Warp Zone, few expressed surprise at finding it, showing that the ones who did find it most likely knew it was there in the first place.

The post-session questionnaire was an important contributor in understanding how prior experience with games (and this game in particular) influenced the experience. The responses from this questionnaire are listed in Appendix 3. The names of the participants have been removed to maintain their privacy, and are only referred to by their test subject numbers. Most participants answered the questions in Finnish, and as such their free-form statements have been translated into English for sake of comparison. Most participants answered the questionnaire themselves in writing, with only one of the interviewees answering the questions orally instead, to account for a lack of available forms during one session because of overscheduling.

The most significant variable used to examine player skill was the number of deaths in each session. The record holder across all sessions died 21 times during their session, while the person with the least deaths died only 4 times. Usually every third death resulted in a Game Over, which required the player to start the game over from the beginning, though some more skilled players did manage to gain extra lives during their session, allowing them to extend their gameplay. The number of deaths was recorded into a chart, showing all deaths in the first world of the game, along with the identifying number of the person who died in that specific spot (Figure 6).

The chart in Figure 6 reveals a few interesting facts about the distribution of player deaths: For one, the assumption that beginning players would fall victim to the very first Goomba of the game turned out to be somewhat true (notice the cluster of deaths around the start of the level, where the first Goomba spawns), although most players learned to maneuver around it quite fast: Only two players had their very first death of the game to the first Goomba. However, the pattern that eventually emerged was that players who would become frustrated with the game would run into the first Goomba without thinking, rather than not knowing what to do – a pattern exhibited by six of the test subjects who had once cleared the first Goomba with no significant difficulty, but later had to start over due to deaths or game overs.

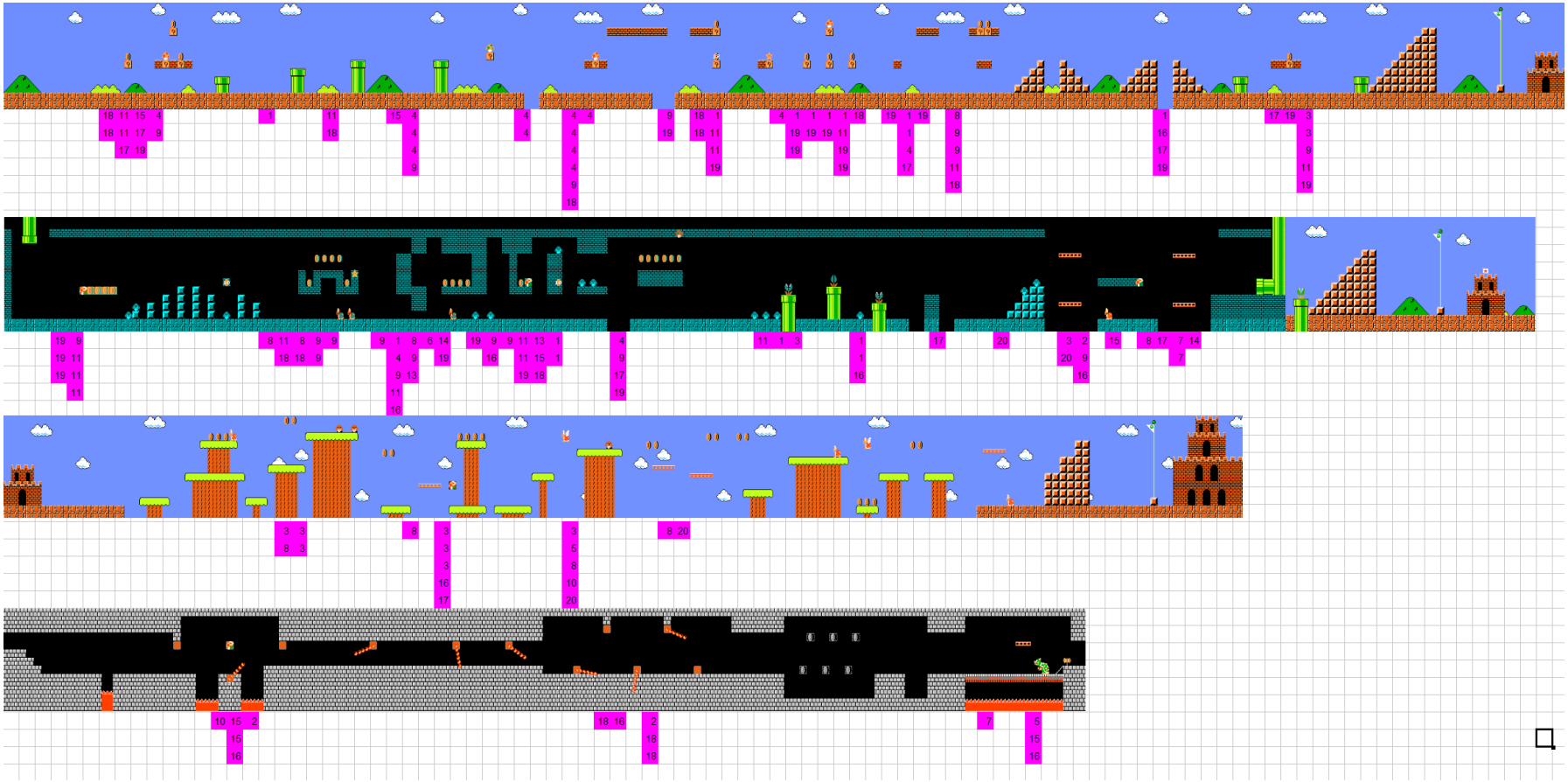

Figure 6: A chart of all player deaths in World 1-1, arranged by location and coded by test subject ID number. The placement of the numbers corresponds to the approximate location of one player fatality (nearest square on the grid), and the number represents the identifier of the test subject. Note that several locations feature numerous appearances of the same numbers, indicating that the same test subject failed to the same obstacle multiple times.

This behavioral pattern is consistent with another emerging trend: That players who had once cleared levels successfully by exercising caution and moving slowly would become far more reckless as they were sent back to the level they had already beaten, and then tried to clear the level faster to get back to where they were, which often lead to their demise. Players who may have completed World 1-1 on their first try and received a game over on World 1-2 suddenly had significant difficulty with 1-1 again, as their false confidence and a desire to progress faster caused them to fall into traps that they had already overcome before. Meanwhile, players who played consistently carefully despite being relatively rusty at the game made significant progress, such as Subject 20 who successfully cleared the entirety of World 1 during their session.

Another observation is how the majority of user deaths are centered around World 1-1 (with 70 deaths in total) and 1-2 (62 deaths), with the total number of deaths dwindling between World 1-3 (17 deaths) and 1-4 (10 deaths). This is explained by the game's Game Over mechanic where, if the player dies many times and runs out of lives, they must begin the game again from the start. Very few players managed to gain any extra lives at all, meaning that most sessions were limited to three lives per Game Over. The result is that players of relatively low skill level would never reach the later levels at all during the session, and as such the vast majority of their deaths were clustered around Worlds 1-1 and 1-2, often almost exclusively. In addition to the deaths reported in the chart in Figure 6, 7 deaths were recorded in World 2-1, 12 in World 3-1, 10 in World 4-1, and 8 in World 5-2. The high death counts of worlds 2-1, 3-1 and 4-1 can be explained by those levels being accessible via the Warp Zone tactic, which many players used to skip directly to World 4-1 when given the option, along with Worlds 3-1 and 2-1. World 5-2 was reached only by three players, with none progressing further than that level in their sessions. One death each was also recorded in Worlds 2-2, 2-3, 3-3 and 4-2.

Several particularly painful spots can be found on the map based on the distribution of deaths: The earliest being the latter half of World 1-1, where players began facing lots of Goombas in formations of two. Unprepared players would often attempt to bounce on both Goombas one after the other, with the momentum of jumping on the first Goomba carrying them to the next. However, amateur players often failed at this due to miscalculating their jumps, often falling directly between the Goombas or in an otherwise unfavorable spots. The second major bottleneck of the session is found in

the first half of World 1-2, where players had significant trouble maneuvering around a narrow section with three enemies, and then another group of three enemies falling from above immediately afterward. In this section, many players would die attempting what is known as the Koopa Shell Maneuver, by jumping on the turtle-like Koopa enemy to knock it on its back, then attacking it again to cause its shell to roll along the ground and defeat other enemies effectively. Some players would not realize that a second jump on the Koopa was not necessary, and that the player could simply walk into the shell to get it moving – with missed jumps, this sometimes led to the Koopas turning back around and killing the player, or sometimes they would successfully launch the shell, only to have it recoil off a wall and kill them.

It should be noted, however, that some of the spikes on the map are the result of users making repeated mistakes in the same spot, which can be distinguished from the repeated appearance of the same numbers in the same spot. Therefore, the same spots were not always problematic for many players, some players developing their own unique "trouble spots" throughout their session where they tried and tried again to overcome the same obstacle – sometimes without success.

In the interest of analyzing the results of the test statistically, a numerical index of player skill was calculated by counting the number of levels the player cleared during their session (including clearing the same level multiple times), divided by the number of player deaths during the session – or in other words, the measurable number of player successes counted against their failures, the results of which can be seen in Table 1.

For the purposes of numerical examination, a player with a Skill Index of 0.75 or higher was to be considered a skilled player by the standards of the test, so as to evenly divide the data between an equal number of skilled and amateur players. This data can also be seen in a scatter plot in Figure 7, where each player is represented by a point on the graph.

Table 1. A chart detailing the number of player deaths and levels cleared, as well as the resulting Skill Index calculated from those two variables.

Player ID	Levels Cleared	Deaths	Skill Index
1	2	15	0.13
2	8	9	0.89
3	8	12	0.67
4	1	15	0.07
5	8	6	1.33
6	11	6	1.83
7	9	6	1.50
8	5	9	0.56
9	5	18	0.28
10	10	8	1.25
11	6	16	0.38
12	12	7	1.71
13	14	7	2.0
14	8	6	1.33
15	6	7	0.86
16	6	9	0.67
17	3	9	0.33
18	5	15	0.33
19	3	21	0.14
20	8	4	2.0

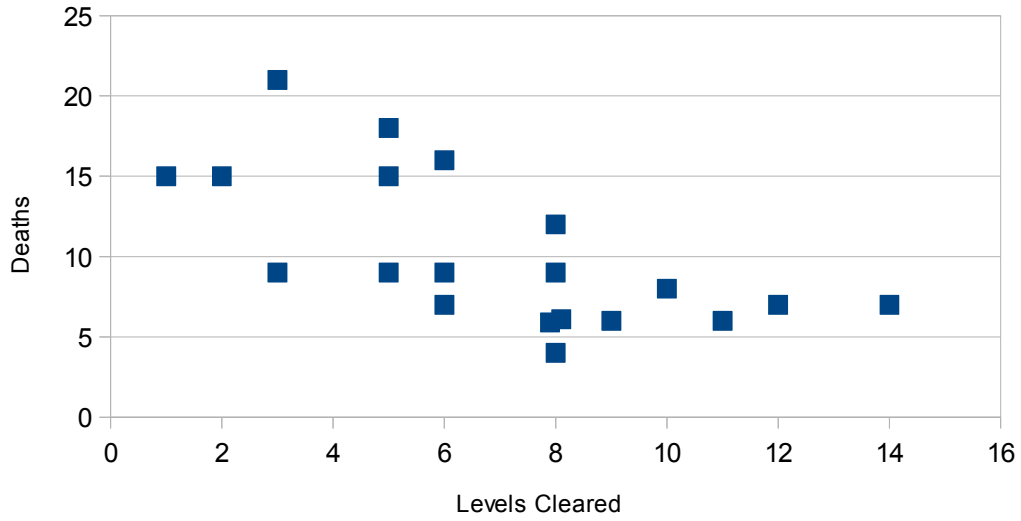

Figure 7: A scatter plot of player deaths versus number of levels cleared during the test session

The assumption in drafting the Skill Index ranking was that a player who cleared many levels during their session and died relatively rarely could be considered an experienced player. For the most part this held true, with 10 of the 20 test subjects scoring an index of 0.75 or higher, but anomalies could still be found: Two people shared the record for the highest Skill Index of 2.0, one of whom demonstrated highly skilled play, despite not sharing many of the common indicators of expert-level play by others who scored a high Skill Index in the test – or, indeed, the person they tied with. Rather than speeding through levels and utilizing the Warp Zones, Subject 20 simply made progress by moving slowly and cautiously, taking the time to evaluate each situation carefully before proceeding. While other highly skilled test subjects claimed to be frequent gamers, Subject 20 was not (claiming to play games only once or twice a month), and despite the presence of many unskilled players who had played Mario before, Subject 20 trumped their performance despite all odds.

All in all, this anomaly demonstrated that succeeding in *Super Mario Bros.* was not solely related to basic motor function skill, memorizing the layout of the game by heart or even using advanced tactics or Warp Zones, but could be achieved simply through careful progress and evaluation of the oncoming challenges – including explicitly changing their strategies when one strategy caused a failed outcome.

5.5. Questionnaire results

To place the aforementioned results in proper context, we also compared player behaviors and successes against their answers to the post-session questionnaire, in order to test our assumptions about how the platforms that the test subjects most commonly used correlated with their performance in, and approach to, *Super Mario Bros.*

Almost all participants reported having played games for more than five years (most of them 10 years or more) meaning that very few of the participants were complete newcomers to games – in fact, only one person admitted that they had not played video games before, or at least regularly. As such, we did not see many complete beginners over the course of the test as we had hoped, although the final data gathered over the course of the experiment did still demonstrate a significant gap between certain players, quantifiable or otherwise. On the other hand, the frequency that they reported playing games had more of an impact: Test subjects who claimed to play games fairly regularly ("Weekly" or more often) also showed more success at the game, averaging about 0.95 on the Skill Index. Conversely, those who claimed to play games less often ("Once or twice a month" or less commonly) showed a skill index of 0.87. These findings could suggest that those who showed more skill at *Super Mario Bros.* were not the ones who have been playing games for a long time, but instead those who continue to play games regularly.

Male players averaged a Skill Index ranking of 1.37, while female players averaged a ranking of approximately 0.61. While we would not be sold bold as to claim that men are inherently better than women at video games, we might still see this split as a symptom of the cultural male-dominance of the video game community, as discussed in the literature review. We hypothesize that a culture that allows men to more openly express interest in games and the resulting large percentage of men partaking in video game-related discourse has resulted in the males who participated in this test having a much more expressed interest in games compared to the women. As a result of this, the female participants tended to approach them game on more of a blank state, coming into the experiment from the cultural perspective of growing up in an environment where being a woman who plays video games was considered a cultural oddity as far back as the turn of the millennium. For comparison, however, it should be noted that

the participants who shared the highest Skill Index ratings in the test were a man and a woman respectively.

Players were also profiled between systems that they reported playing games on: These ranged from dedicated home consoles (such as the Nintendo Entertainment System used here in this test) to handhelds (portable, dedicated games systems, such as Nintendo's own Game Boy), to personal computers, and mobile phones and Facebook. In drafting these questions, we had initially hoped to see a difference between players who are used to playing games on dedicated games systems, and those who primarily play games on mobile phones and Facebook, as those platforms are primarily home to what are referred to as “casual” games – less serious and more easily approachable games created for a wider audience. However, the vast majority of respondents (15 overall) did answer that they play games on dedicated systems (home console or handheld), while only two respondents claimed to only play games on mobile phones. These two respondents showed a Skill Index of 0.38 and 0.33, clearly on the lower end of the spectrum of results for this test, suggesting that the previous hypothesis might in fact hold true. However, with only two units of data to compare, it is not possible to make a solid conclusion based on the limited amount of data.

6. DISCUSSION

Looking through the data from a purely quantitative perspective (i.e. simply comparing player deaths and successes), we can see a clear dichotomy between what it means to be a beginning player and an expert player in terms of gaming performance: As predicted in the research plan's assumptions, an expert player was shown to breeze through levels with no effort, make it farther through the game than beginning players, and discover and utilize secrets to the best of their ability. Concluding the study at that, however, would only allow us to generate tautological conclusions like "people who are good at video games are good at video games". Therefore, we must examine how the data collected in the study pertains to the concept of games literacy more thoroughly.

This chapter features an extensive elaboration on the meanings of the results discussed in the last chapter. Chapter 6.1 presents a brief summary of the practical limitations of the study that should be considered when reading the data to better contextualize it. Chapter 6.2 examines how the player behavior exhibited in the test can be interpreted as displaying varying amounts of literacy and how the game enables players to learn as they play. Chapter 6.3 discusses the impact of the capital that the test subjects brought to the test, and Chapter 6.4 represents some final closing thoughts on the analysis with a brief summary.

6.1. Limitations of the study

In the interest of transparency, it should be noted that the limits of the test setup and the practicalities of organizing such a study were a limiting factor to the kinds of analysis that could be performed with such an amount of data, and indeed the original scope of this study was far more broad: The initial plans for conducting this study included several more test sessions with a variety of different games, specifically *The Legend of Zelda* (Nintendo, 1985) and *Dark Souls* (From Software, 2011), in order to perform a more thorough qualitative analysis on the different ways that players approached these games, and to compare the reactions between games. However, in light of the difficulty faced in the recruitment process for these tests in the first place, it was decided that the test should be scaled down significantly to better suit the scope of a thesis study, as it was concluded that a study of the proposed magnitude would be better suited to, for

example, a doctorate study that continued on the same themes as this study. As such, it should be noted that the relatively small sample group of test subjects being exposed to only one game limits the way that the data can be analyzed and applied outside of its scope, so there is still quite a bit of room for extrapolation of these themes, possibly in the form of a more extensive follow-up study. Evaluating the criteria that this test was based on with a much more difficult game, such as the aforementioned *Dark Souls*, would be of especially great interest for a follow-up test.

In spite of the aforementioned, it was still concluded that the sample size would be adequate to form reasonable conclusions with, as the number of test subjects was enough to provide a statistical saturation point for the purposes of a qualitative test – a minimum of ten subjects per test, or five skilled players and five amateur players, was considered a reasonable saturation point for the data. Therefore, we feel that we can proclaim the following results as representative of the overall population in good faith.

6.2. Ludic literacy, and how *Super Mario Bros.* enables it

To begin directly at the start at the notion of comparing expert-level play to amateur play, we were allowed to see the divide between those playstyles clearly in the outcomes of the test. From that, we could also see how knowledge was developed during the play session in the minds of beginning players, and certain factors that enabled them to do so. As these beginning players were relatively inexperienced with the game, we could see how their limited amount of knowledge was being filled on the fly as they played – this relates to the idea of performance before competence (Gee, J.P, 2005a), in that players were very much learning to play with very little instructions given from either the game or the organizer of the test. It is these subjects' capacity to learn as they play, however, that separates the wheat from the chaff.

Returning to the original statements of what games literacy is, we can assume some basic ideas to relate to the performances observed to the test: A “games literate” player will be able to interpret the affordances provided by the game and use them to their advantage to improve their performance, learn the rules of the game and adapt to them, and learning from mistakes and failures to better their performance in subsequent attempts (i.e. developing capital). Furthermore, to expand their horizons and fully understand the scope of the game's system, a literate player would have to show a certain level of outside-the-box thinking in order to discover tactics that give them a

strategic advantage to advance in the game, and to assume the full scope of the game's system.

In terms of evaluating subjective behavioral patterns between experts and beginner-level players, the pattern of failing repeatedly to similar challenges could be considered a particular indicator. These can be seen in the death chart in Figure 6, especially in regards to the number of players who died to the same obstacle several times during their sessions – failing to maneuver around pairs of Goombas for example turned out to be troublesome for some, let alone two pairs immediately one after the other. According to our hypothesis, a sufficiently "gaming-literate" player would have stopped on their tracks to attempt different methods of getting around these obstacles, and then proceeded later on based on the knowledge they gained in that successful endeavor. In our results we saw the natural opposite of this scenario, as amateur players would fail several times at the same obstacles without realizing how to get around them, or indeed, succeeding once at an obstacle and then failing again as they are forced to re-attempt the same situation they cleared before.

If we are to use adaptability and an ability to search for alternate solutions to overcome challenges as one of the metrics of gaming literacy, we can see that those who attempt the same strategies and fail every time are, to a degree, not what we would qualify as "gaming literate". It is worth noting that using the same strategies and expecting different results is not particularly effective in games like *Super Mario Bros.*, which are heavily driven by the player's actions and feature almost no random elements, compared to something like a typical board game in the style of *Snakes and Ladders* (or even Nintendo's own *Mario Party* series of games, a video game analogue to traditional board games), where the outcome of the game is heavily determined by random factors (here defined as being beyond the player's control), and the player's own skill and strategic thinking are not significant to the outcome of the game. In such games, using the same strategies may indeed yield different outcomes thanks to the inherently chaotic systems of those games, where contrary to popular wisdom, doing the same thing again and again can in fact yield different results! However, when it comes to games that emphasize skillful, guided player actions rather than a roll of the dice to advance the game, creating systems that behave in a predictable fashion is key to creating a usable system within that framework (Pinelle, D. et al, 2008): A game that has no consistent rules and where player progression is largely up to chance essentially boils down to a roll of the

dice, where victories are no longer rewarding and losses are frustrating due to a complete lack of player agency in the outcome.

As assumed in the research plan, most of the data did indeed fall to the expected pattern where newcoming players commit many mistakes, as well as more time-worn players showing expert progress and moving along smoothly, supported by their pre-existing knowledge of the game's systems. However, this becomes more interesting when we examine the anomalies in this data, specifically the case of subject #20, who performed exceedingly well in their test despite showing none of the typical signs of an expert-level player: While most expert-level players made advantages by using the B button to run and knew how to take advantage of secrets to advance, subject #20 instead progressed simply through careful trial and error by slowly evaluating each situation. Subject #20 even completed their session without knowledge of the benefits of the fire flower powerup, which would likely have accelerated their process further. Likewise, the verbal statements made by Subject #20 during their test amplified the notion that they were very much learning as they played, in spite of saying that they had played the game before (presumably they had not played very much as they were still surprised by some elements), explaining how they formed their learning experience through trial and error: Being killed by the fish-like Cheep Cheep enemies elicited the response “I guess those fish aren't very friendly”, signifying how the subject learned as they played: Afterward they navigated successfully around these enemies, clearing the level with no further issue.

The pattern of attempting, failing and reattempting was one that was repeated across the board, as discussed in the very first chapter of this thesis, and outlined in the Gaming Involvement and Informal Learning Framework (Iacovides, I. et al, 2014): The loop of evaluation, attempt, outcome and interpretation was very tangible, as players who might have failed a challenge or discovered ways around others would verbally describe their thinking patterns, which lined up with this assumption. Players expressed surprise as they discovered they could make the Koopa shells fly along the ground, or indeed, get knocked around by said shells and die in turn. Players audibly weighed the options of whether or not certain power-ups were beneficial to them or not, both before and after they had attained them (as mentioned above, few players learned the benefits of the B button to shoot fireballs). Players successfully learned that Piranha plants would not bite them if they were standing directly on top of the pipe from which

they emerge. Indeed, Subject 11 audibly stated “Oh, so touching that kills me. At least I'm learning something.” as they touched the very first Goomba in the game and died, not even ten seconds into the test.

These are all evidence of the loop of learning and feedback outlined before – an attempt is predated by a body of knowledge (or lack thereof, if we assume performance before competence), that knowledge is challenged in that attempt to overcome a challenge, and the outcome of that challenge creates new knowledge upon which they may evaluate future struggles in the space of the game. This concept has alternatively been referred to as a “*Cycle of Expertise*”, (Gee, J.P. 2005a) where an action that the player performs regularly that suddenly fails will give them pause to reconsider, and is one of the many tools that games use to engender learning experiences. The fact that these players audibly expressed these facets in their commentary while playing made this cycle of learning concrete, even though it wasn't practiced by all players, and indeed, not all players had the same observations or learning experiences, owing to how differently they all tackled the same challenges and the amount of experience they brought into the test, just as expected.

On the other hand, some of the players who showed significant difficulty with the game eventually became frustrated with their inability to progress, and expressed their frustrations accordingly in the questionnaire that came after the test. While very few of the players explicitly considered the game 'too difficult', they did still express frustration with the game's somewhat outdated mechanics and having to restart the whole game over after getting a Game Over (a sentiment echoed even by more skilled players, who still experienced failures and Game Overs, albeit to a lesser extent than the beginning ones). In a scenario where evaluating the playability of *Super Mario Bros.* itself was the main criteria, this would constitute a necessary fix for the sake of basic usability – being allowed to attempt a challenge again quickly would certainly make it easier for one to perform a trial-and-error function and improve their skills, while having to retread all the way back again on failure was seen as stretching that process out needlessly. In fact, these are exactly the kind of issues that have been ironed out consistently in more recent games, a fact lamented by many participants who are used to more modern games, in both their verbal assessments and their questionnaires: Subject 18 expressly stated “Games are easier nowadays” during their test, for instance.

Even then, the fact that test subjects consistently complained about having to retry challenges again and again demonstrates a certain kind of challenge about *Super Mario Bros.*: Even though it is not exactly considered particularly difficult among the games of its era, it is still difficult for some to return to for its use of certain archaic design choices, further worsened by a reliance on procedural knowledge than explicitly stating certain gameplay cues in a way that modern video games often do, which was evident in how little the B button was used by players, either to sprint or to shoot fireballs. These factors combine to define *Super Mario Bros.* as a game where a player who can explore the rule space adequately is a player who succeeds, by exploring all the options they have on-hand and to use their discoveries effectively, rather than having everything spelled out to them from the get-go, as many modern games do. James Paul Gee (2005a), for instance, refers to this as "system thinking" - understanding how every piece of a puzzle fits together, or rather as a complete understanding of a game's rules and systems.

The aforementioned findings also reflect specifically on the nature of *Super Mario Bros.* as a vehicle of learning and its own challenges: As mentioned previously in this text, learning to play is a two-way street where both the player and the game are in a feedback loop with each other, and as such, the game has to enable learning in the first place in order for the player to learn, and a game that does not teach the player adequately is a game that will fail (Prensky, M. 2003). Thankfully, *Super Mario Bros.* benefits in this regard from both its simplistic structure and subtle design that is created to engineer learning of its systems: For instance, by beginning the game by making the player face to the right on the left side of the screen, the game is subtly hinting that this is the direction of progress, and its early enemy and obstacle layouts can subtly clue the player in on how the enemies and power-ups of the game work (Emmons, D. & Portnow, J. 2014).

Likewise, the simple audiovisual and ludic languages of *Super Mario Bros.* meant that its systems were easy to grasp: Most players could learn quickly how to get around certain obstacles and the benefits of certain power-ups. However, the fact that some of its less obvious functions went widely unused by people who didn't know it was there in the first place would suggest that a different mechanism could be better used in its place, or a more explicit tutorial to convey that information to the player, in accordance with game-specific heuristic analysis (Pinelle, D. et al, 2008) – although it

has been argued that using extensive tutorials in more simplistic games can actually have an inverse effect on player engagement and retention of knowledge (Andersen et al. 2012), suggesting that an extensive tutorial system for *Super Mario Bros.* would have to be designed with enough care so as not to be intrusive nor obtuse.

In spite of the above, none of the players expressly stated that a lack of explicit tutorials were what they would consider explicit flaws, and a vast majority of players enjoyed their play sessions. Despite deeming the game somewhat challenging, few considered the game to be explicitly too difficult for them: Only two of 20 applicants thought the game was too difficult, while the rest reported that the game was fair in difficulty. Very few players also explicitly blamed the game for their mistakes as they played, even the few participants who did consider the game particularly hard: Indeed, when interviewed about what they liked and disliked about the experience, the subjects considered the game simple enough to learn, and that their own failures were due to their own skills having "gotten rusty", and only one player mentioned the fact that the game gives little explicit advice as a negative point. This shows that, on the whole, these subjects were indeed receptive to learning continuously, and could accept when they had failed and that they had failed because of their own actions.

For the purposes of our test, we can consider learning a sort of dialogue where the player has to be receptive to new knowledge from the beginning: A player who assumes that they are consistently in the right and that any of their committed failures are because of the game and not themselves can not be considered "literate" in this case, because by making that assumption they can not open themselves to learning from their mistakes, meaning that learning through play simply can not happen. Once again, this kind of mentality may be applicable to certain more hands-off games where the outcome depends on factors beyond the player's control and, indeed, the player may sometimes fail due to "random" factors. Then again, as stated before, *Super Mario Bros.* is the kind of game where these situations are extremely rare, being that it is a player-driven and highly reactive game that obeys a consistent set of rules, and to succeed in it the player must be an active participant and learn from their own failures.

Exploring and adequately understanding the rules of the game extends not only to the ruleset, but also the game space, here referring to the environment and the secrets within it: For example, none of the players attempted to travel left at the starting screen, instead choosing to immediately move to the right at the start. In this sense, all

players at least managed to interpret one of the basic messages that the game attempts to deliver through its design: As mentioned above, this is a subtle piece of design that shows the direction of progress throughout the rest of the game, which has become a sort of universal rule in similar titles. Of course, later on certain games have taken advantage of this notion first put in place by *Super Mario Bros.* by placing secret items to the left of a player's starting position, under the assumption that a player would immediately begin moving to the right, and a sufficiently savvy player could have attempted this trick during the test too. None did, however, suggesting that the players who were wise enough to look beyond the start of the level knew that, in this case, there was nothing to find.

This may also correlate with how few players discovered secrets at all: Since none of the participants expressed surprise when discovering secrets, it is reasonable to assume all who did find secrets knew they were there in the first place. Discovering these secrets without prior knowledge would in itself require an especially inquisitive and exploration-minded participant, who is willing to explore outside the stated rules of the game – something that wasn't exactly seen during the test. These notions could be tested further in more open-ended games that explicitly reward exploring, such as *FEZ* (Polytron, 2012), *Super Mario 64* (Nintendo, 1996), or *Banjo-Kazooie* (Rare ltd, 1998). All in all, it seemed as if most players seemed content to simply follow the given path and only try for alternatives either when they were clearly indicated, or they were forced into a situation that demanded them to experiment.

Returning to our original research questions, based on the findings of this study and how we classify literate and non-literate players and their behaviors, we find these common abilities as tokens of games literacy: An ability to interpret the audiovisual language of games as well as its interaction and rules, a capacity to experiment with that rulespace to find out what the extent of those rules is, an ability to perceive the consequences of one's own actions, and the critical faculties required to judge those actions and their outcomes to better advance in the game. Conversely, the game itself must enable this kind of learning with a clear audiovisual language, consistent and well-defined ruleset, short iteration time upon failure, and by clearly communicating to the player what their affordances and the consequences of their actions are.

6.3. The significance of capital versus procedural learning

Another interesting aspect of the experiment were players who showed some amount of capital by knowing about in-game secrets, but not having played the game much themselves: These would be the players who either watched their friends or siblings play the game when they were younger, or heard from their friends about secrets – one test subject expressly described this as the "apartment stairway" effect, where rumors about in-game secrets would circulate between friends in social places like schoolyards or, indeed, stairways between neighboring apartments. These subjects showed some knowledge of hidden tactics and skills, but still showed little skill in the game itself: For instance, Subject #8 in the test described how they would watch their sibling play the game and learn some tricks from them, such as being able to walk on the ceiling in World 1-2 and the location of the Warp Zone, but did not perform specifically well in spite of this knowledge because they themselves hadn't played the game very much before.

From this scenario we see an interesting subcategory of gamers: Players who possess low skill in the beginning of the test, but moderate gaming capital to assist them in their performance, which results in some advanced "secret" knowledge married by a lack of basic skill. The word-of-mouth knowledge that enables these kinds of subcategories of players to exist may indeed be a sign of the level of cultural penetration enjoyed by *Super Mario Bros.* more than anything else, but the fact that these kinds of players can exist at all is worth considering from a developer's standpoint as an interesting curiosity. Either way, for the ramifications of this study, it is important to note that great hand-eye co-ordination skill and a capacity to understand the systems of the game does not always go hand-in-hand with high amounts of capital: It is very possible to possess one without possessing the other!

With the aforementioned in mind, we would suggest that games literacy and gaming capital, despite it being possible to discuss both of those concepts as two sides of a coin, be considered as part of a two-dimensional continuum or matrix of "skill", where one axis measures an ability to grasp the systems of play, and another details the amount of preexisting knowledge about the systems themselves. In this test, we saw at least three categories based on a binary interpretation of these axes: Players with both a high level of literacy and a high level of capital, players without much capital but

high literacy (who managed to perform well despite lack of knowledge), and both low literacy and low capital (players who did not succeed well in interpreting the ruleset of the game, nor had very much pre-existing knowledge about it).

To compare to the results of the test itself, we saw players who possessed low literacy and low capital stumble with even the simplest of obstacles and basic mechanics of the game: One participant showed significant difficulty grasping the concept of holding down a button longer to jump higher, and others repeatedly failed to the same obstacles – showing a failure to adapt to even the basic rules of the game and interpret the causes and effects of their actions. Other participants (in this case those in the high-literacy low-capital range) showed decent progress and learned to cope with the oncoming situations they faced, but showed little advance knowledge of the game itself. Of course, at the very top of the heap we find the high-literacy high-capital players, who relied on a thorough existing familiarity of the game's rules and performed exceptionally well.

The aforementioned categorizations of players also reflect on the test's numerical results, in that these players' varying degrees of literacy and capital showed in how many times they failed over the course of the test and how they failed. Returning to our indexed rankings, players who possessed a Skill Index of 0,89 or higher were usually in the high-capital high-literacy group, which reflected in their foreknowledge of the game that allowed them to coast through hazards with expert precision (The average Skill Index within this group is 1.39, and of the 9 players surveyed in this study who fell under this category, 7 were male). Conversely, players with a Skill Index of 0.5 or less often fell into the trappings of “illiterate” players by failing to the same obstacles numerous times in a row, as evidence of their inability to adapt or adjust (This group exhibited an average skill index of below 0.25). The remaining players fall somewhere in between, making steadfast progress and learning from their failures despite not possessing much foreknowledge of the game itself (thanks to the presence of an anomalous 2.0 ranking, this group held an average of 1.01). However, these categorizations based on the calculated index rankings are nebulous, as the border between these groups is not firm – and indeed, the highest Skill Index seen throughout the test was shared by one player who behaved like a typical “expert” player, and a second player who did not show the typical signs of a well-versed player, but simply displayed excellent adaptability to the circumstances they were presented with.

These results in total show how the idea of literacy – as both an understanding of the structure of a medium and an ability to interpret and reflect on it – manifest in the realm of digital games, and how the concept can be tangibly observed as a variable between players. It also highlights the importance of the capacity to discuss games and participate in the wider cultural sphere of digital gaming, as the exchange of ideas between players allows them to interpret the "text" of games differently based on the capital they exchange amongst themselves. These are the aspects that we hold as tangible manifestations of new media literacy – the capacity to intelligently interpret, interact with, and discuss the material, or to be able to engage with both the media and its community of practice.

Throughout this thesis we have examined the notion of games literacy as a skillset that simply exists in the mind of a player at any given time. However, this is not to say that games literacy in itself is simply a static pool of ability that never evolves, like a preset talent that one is simply born with – instead it is a skill that one develops gradually and over time. Some people may possibly be more innately attuned to this kind of learning and able to grasp gameplay concepts inherently better than others, but there is no reason to assume others might not be able to develop to a similar level of understanding through years of exposure to, and interaction with, digital games.

We attempted to observe differences in the aforementioned variable over the course of the test in order to evaluate whether people who had spent a long time playing games (in our case, five years or more) exhibited a greater understanding of games, but unfortunately no correlation could be observed within a reasonable margin of error, as a vast majority of players reported having spent more than five years playing games. Therefore, a study with a tighter control on what kinds of gamers are recruited and observed could be used here to draw further conclusions, along with studying this change over time could make for fertile ground to explore in a follow-up study, but such a study would necessitate a far greater time investment than what is available to us here.

In addition, we also observed contradictory results as we saw that players who played games more frequently tended to do slightly better in the test, rather than players who had simply played games for a significant portion of their lives. This would suggest that games literacy is not just a skill that is developed over time, but must also be regularly maintained, as the players who performed the best in the test claimed to play games at least weekly. This could also mean that the high skill demonstrated by

frequently playing participants is in fact a reflection of their own commitment to the medium: As dedicated gamers who play games frequently, they show a detailed familiarity with *Super Mario Bros.* that allows them to exceed at the test, pooling on their vast amount of capital as dedicated participants of gaming culture and the exchange of capital within it, combining with their own gameplay experiences from the past. In fact, one of these participants jokingly compared the gameplay experience to playing "a *Souls* game" (such as *Dark Souls*) by FromSoftware, comparing the difficulty of the game to that of the infamously difficult *Souls* series in a display of intertextual knowledge – a surefire sign of a dedicated player with a wide reference pool of knowledge.

Lastly, the fact that the women involved in the test performed, on average, worse than the men did is most likely not tied to any innate ability for men to play video games better than women (because a statement such as that would be simply preposterous). Rather, we propose that this split is influenced by the amount of gaming capital that the women participating the test possessed, which is a direct result of societal expectations placed upon these women and the long-prevalent idea of games as "boys' toys" (Casell, J. & Jenkins, H. 1998). We hypothesize that the women in this study, on average, had not had the chance to accumulate the same kind of gaming capital that the male participants might have had, as they had grown up in an environment where video games were considered a traditionally masculine, if not outright boyish hobby, and the social discouragement from embracing digital games has led to lesser opportunities for the participating women to develop a similar base of gaming capital compared to the men. As mentioned before, the formation of gaming capital is dependent on already possessing other forms of capital, including social, and one's gender can indeed be considered a form of social capital – therefore, the prevailing idea of games and computers as a gendered activity has created a set of circumstances under which the women participating in this test have been less likely to develop a similar amount of capital.

The repercussions of the aforementioned gender division can be seen in the results of the test, where fewer women fit the profile of high-capital players than men. Thankfully, these notions are rapidly changing as digital technology becomes more ubiquitous in everyone's lives and gaming is becoming a less gendered interest, partly thanks to through breakout titles that have found a significant following among women, such as *The Sims* (Maxis, 2000). Sadly, the same was not true for the environment that these participants must have grown up in: All female participants were

between the ages of 20 and 29, meaning most of them spent a significant portion of their childhood in the 1990s when the idea of digital games as gendered activities was more widespread.

The findings on the differences between male and female participants extend only to past experience that these players had with these games: our findings here showed that the participating women were just as able to develop a sense of gaming literacy as the men in the absence of significant capital. Our results show that the difference in performance is caused by social reasons rather than biological ones, and both men and women have an equal capacity to learn to play – these findings have been echoed in earlier research as well, finding that the view of computers and digital games as gendered activities has reduced the chances for young women to attain digital literacy skills (Subrahmanyam, K. & Greenfield, P.M. 1994), and that when placed in an isolated environment, women can learn to play as skillfully and competitively as male players (Jenson, J. et al, 2007).

Despite taking place two decades ago in a completely different climate in terms of computer science, gaming and technology, it seems as though Subrahmanyam and Greenfield's hypotheses were prophetic: The view of digital technology and gaming as gendered hobbies has most likely had an impact on the likelihood of these women attaining capital, leaving them at a relative disadvantage as digital technology becomes more widespread. This is in spite of the changing landscape of gaming and digital technology between when those studies were conducted and today; However, as noted by Jennifer Jenson and Suzanne de Castell (2010), in many ways the gender divide in gaming exists in the exact same way as it did ten years ago: The rise of outliers like *The Sims* did not lead to a massive revolution in women-centric games that some had hoped for. As such, the remnants of the old attitudes regarding gender and gaming could also be seen in our own results, decades apart from Subrahmanyam and Greenfield's study.

To answer one of our original research questions, the information that a player brings to the experience of play can help fill out the knowledge that the player learns as they play and what the game may fail to communicate, either on purpose or due to error – seen here by the lack of sprinting by many players, for example, or by the discovery of secrets. These findings clearly show that the discourse of the gaming community can have a profound impact on the actual experience of play.

6.4. Final thoughts

So all in all, what do our results have to say about games literacy? The results would suggest that games literacy is a skillset that isn't strictly dependent on how much time one spends playing video games every day (though that certainly has shown to help). Rather, the ability to interpret games and interact with them is rooted in fundamental activities like problem-solving, lateral thinking, an understanding of the rules that a game presents, and an ability to properly observe cause and effect to understand those rules further and to modify their tactics when needed.

The results of this study could be especially useful for developers for understanding that certain players might not be able to "get it" at first blush, meaning that these players are going to need a bit of a helping hand to get off on the right foot. As the game used in this test, *Super Mario Bros.* has shown several avenues both positive and negative to continue on: The game's audiovisual presentation and gameplay systems are easy to interpret relatively quickly, but many aspects are not immediately obvious to beginning players, and the power of secrets as rewards to be discovered was palpable in the test. To guide the player's hand, therefore, developers can use well-timed and succinct tutorials in order to teach the player adequately, or through subtle tricks of level design the same way *Super Mario Bros.* itself does. The most important aspect is that the advice that the player receives is, of course, "Just In Time" and "On Demand" (Gee, J.P. 2005a).

As for players who want to join the literacy club, here is our choice advice: Simply dig in and start playing. Gaming is a diverse, rich medium where there is no doubt at least one game that will eventually catch anyone's fancy – there are games for those who don't want to kill innocents, and for those who don't want to just stack blocks all day. But if one really wants to learn to "get it", they must keep a sharp eye and a critical mind: Explore the space of the rules until you understand everything you can and can't do, apply tactics that are unusual just to see what works and what doesn't, and challenge yourself to do as well as you can. But most of all: Have fun.

7. CONCLUSION

In this study, we have observed how a given player's reaction to a game is significantly altered by both the prior experiences that a player brings into a gameplay situation, as well as their own capacity to construct meanings and interpret an interactive 'text' in the form of a game system. We have seen how different kinds of players have a different capacity for such learning, and outlined ways in which this allows a player to succeed in a game, such as a capacity for exploration and lateral thinking, a willingness to experiment and learn from the outcome of their actions, and an understanding of cause and effect in the context of an interactive system, alongside obvious factors such as hand-eye coordination.

The test that was conducted showed how games literacy and gaming capital are related as concepts: As suggested in the Gaming Involvement and Informal Learning Framework, knowledge is constantly constructed based on both small and large-scale actions, which are in turn influenced by pre-existing knowledge (both from inside and outside the system of the game), and which further increase the base of knowledge that the player has. However, for that knowledge to be constructed in the first place, the player must have a capacity to accept and develop that knowledge: in other words, interpreting the interactive text of gameplay. The capacity to interpret that text and learn through play is what we define as gaming literacy.

The results of the test itself show a clear dichotomy between the ways in which those of us who are gaming-literate approach games, and those who are not: In this dichotomy, the “illiterate” gamers stumble to understand the correlation between action and consequence, fail to interpret audiovisual cues, and commit similar mistakes again and again as they refuse to attempt new strategies or learn from past actions. Similarly, the differences in the level of previous experience exhibited in the game could be tangibly seen in their results, as experienced players possessing vast amounts of gaming capital used tactics and previous knowledge in a completely different way. The players who did not possess this knowledge, on the other hand, formed it as they played through the cues given to them by the system of the game, and their capacity to understand the system of the game showed subtle but significant variations – a phenomenon that we understand as varying degrees of games literacy.

In the test we also observed significant changes in the way existing gaming capital altered the outcome of the test: Players with a particularly large amount of knowledge about the game also demonstrated a high level of skill, and even those who had simply observed the game from the sidelines in their childhood came to the test better-equipped than complete novices. As very few players expressed surprise at discovering secrets or explicitly mentioned that they were finding them for the first time during play, we can surmise that finding secrets in *Super Mario Bros.* is heavily reliant on knowing them in the first place, which brings to mind the "school yard" effect: A passing of rumors and basic knowledge of the game that eventually translates to improved performance in the game, telling strongly of the capacity to engage with other players and discuss shared gameplay experiences as a metric of games literacy, and the importance of gaming capital and the exchange of paratexts in changing how players approach games. We also observed how gender can have an affect on one player's likelihood to attain capital, at least for as long as video games and digital gaming are considered gendered activities – in our case, we observed women as being less likely to possess high amounts of capital in advance, no doubt owing to the general attitude regarding digital games as masculine activities during their formative years.

It should be noted that this study is indeed only a single examination, using only a single game and a relatively small sample size from which to draw conclusions, in spite of the fact that we can still safely apply these results to the greater population. Therefore, this study should provide ample room for similar follow-up studies using different types of games in different genres, especially ones that place heavier emphasis on lateral thinking, player exploration and creativity. That said, using *Super Mario Bros.* in the test did have its advantages, as the cultural reach of the game and its legacy certainly factored into the results of the test, and most players were familiar with the game on at least some level, either through its sequels or discussions with other players.

This specific test also revealed some aspects of *Super Mario Bros.* itself as far as the game is concerned as a platform for teaching the player to play: While the game does contain subtle audiovisual and gameplay cues and level design aspects tailored to engineer learning and teach the player its systems, it also offers little explicit advice and virtually no advisory text at all, which resulted in few players intuitively learning about some of the game's more secretive aspects, such as the function of the B-

button that was less obvious. Therefore, future game designers could stand to learn that while naturally teaching the player to play through its level design is ideal, some functions should explicitly be spelled out to the player if they are less obvious, or should be re-engineered to be more intuitive.

We hope that the results of this thesis, as well as the research committed to prepare for it, will be useful to future games developers who want to engineer their games to be more approachable to the general public, and can use these results to understand the ways in which different types of players approach and interpret games. If nothing else, we hope that this thesis inspires similar follow-up studies regarding differing approaches to different games, and a general inquiry into what exactly games mean to the people who consume them, how players might hope to become games-literate themselves and how game developers can help players in bridging that gap, and how digital games can further develop as a meaningful, interactive medium based on this research.

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APPENDIX 1: QUESTIONNAIRE FORM (ENGLISH)

Attachment: Game history survey

Name: _____ Age:_____ Sex:_____

How often do you play digital games?

☐ Never ☐ Rarely ☐ Once or twice a month ☐ Once a week
☐ Every few days ☐ Daily

How long have you been playing digital games?

☐ As long as I can remember ☐ Over 10 years ☐ Over 5 years ☐ Over a year
☐ Less than a year ☐ I do not usually play games

Which platform do you play games on? Check all that apply.

☐ Phone or tablet ☐ Game console ☐ Computer ☐ Facebook

Have you played this game before? ☐ Yes ☐ No

On a scale of 1 to 5, how much did you enjoy your play session?

Very much 5: ☐ 4: ☐ 3: ☐ 2: ☐ 1: ☐ Not at all

Did you find the game especially difficult or easy to play?

☐ Very difficult ☐ Just right ☐ Very easy

What did you like about the game the most?

_____

What did you dislike about the game the most?

_____

APPENDIX 2: QUESTIONNAIRE FORM (FINNISH)

Liite: Pelihistoriakysely

Nimi: _____ Ikä:_____ Sukupuoli:_____

Kuinka usein pelaat digitaalisia pelejä?

☐ En koskaan ☐ Harvoin ☐ Kerran pari kuussa ☐ Viikoittain
☐ Parina päivänä viikossa ☐ Päivittäin

Kuinka pitkään olet pelannut digitaalisia pelejä?

☐ Koko ikäni ☐ Yli 10 vuotta ☐ Yli 5 vuotta ☐ Yli vuoden
☐ Alle vuoden ☐ En pelaa

Millä alustoilla pelaat digitaalisia pelejä? Merkitse kaikki, joilla pelaat

☐ Puhelin tai tabletti ☐ Pelikonsoli tai kannettava ☐ Tietokone ☐ Facebook

Oletko pelannut tätä peliä aikaisemmin? ☐ Kyllä ☐ Ei

Asteikolla yhdestä viiteen, kuinka paljon nautit pelisessiostasi?

Erittäin paljon 5: ☐ 4: ☐ 3: ☐ 2: ☐ 1: ☐ En ollenkaan

Oliko peli mielestäsi liian vaikea tai helppo?

☐ Liian vaikea ☐ Sopiva ☐ Liian helppo

Mistä pidit eniten pelissä?

Mitä inhosit eniten pelissä?

APPENDIX 3: QUESTIONNAIRE ANSWERS

Subject Number:	**1**
Age:	24
Gender:	Female
How often do you play games?	Once or twice a month
How long have you played games?	All their life
Which platforms do you play games on?	Handheld, game console, computer
Have you played this game before?	Yes
How much did you enjoy the session?	4/5
Did you find the game too hard or easy?	Just right
What did you like the most in the game?	Background music, jumping
What did you like the least in the game?	Her skills had gotten rusty

Subject Number:	**2**
Age:	25
Gender:	Female
How often do you play games?	Daily
How long have you played games?	Less than ten years
Which platforms do you play games on?	Handheld, computer
Have you played this game before?	Yes
How much did you enjoy the session?	5/5
Did you find the game too hard or easy?	Just right
What did you like the most in the game?	Nostalgic childhood memories of playing the game, finding familiar secrets etc.
What did you like the least in the game?	Having to start all over again

Subject Number:	**3**
Age:	21
Gender:	Male
How often do you play games?	Daily
How long have you played games?	Less than ten years
Which platforms do you play games on?	Mobile, game console, computer
Have you played this game before?	Yes
How much did you enjoy the session?	4/5
Did you find the game too hard or easy?	Just right
What did you like the most in the game?	Replay value and challenge
What did you like the least in the game?	Precision control compared to contemporary games

Subject Number:	**4**
Age:	22
Gender:	Female
How often do you play games?	Once or twice a month
How long have you played games?	Less than ten years
Which platforms do you play games on?	Mobile, game console, computer
Have you played this game before?	Yes
How much did you enjoy the session?	4/5
Did you find the game too hard or easy?	Just right
What did you like the most in the game?	A simple idea executed well, fun to play
What did you like the least in the game?	Having to start again after running out of lives

Subject Number:	**5**
Age:	24
Gender:	Male
How often do you play games?	A few days a week
How long have you played games?	All their life
Which platforms do you play games on?	Mobile, computer
Have you played this game before?	Yes
How much did you enjoy the session?	4/5
Did you find the game too hard or easy?	Just right
What did you like the most in the game?	Good control feedback, a feeling of progress
What did you like the least in the game?	Some maneuvers (jumping on flying Koopa as big Mario) produced unpredictable results

Subject Number:	**6**
Age:	33
Gender:	Male
How often do you play games?	Once or twice a month
How long have you played games?	Less than ten years
Which platforms do you play games on?	Computer
Have you played this game before?	Yes
How much did you enjoy the session?	4/5
Did you find the game too hard or easy?	Just right
What did you like the most in the game?	A sense of nostalgia
What did you like the least in the game?	Sudden deaths

Subject Number:	**7**
Age:	27
Gender:	Male
How often do you play games?	Rarely
How long have you played games?	All their life
Which platforms do you play games on?	Console, computer
Have you played this game before?	Yes
How much did you enjoy the session?	4/5
Did you find the game too hard or easy?	Just right
What did you like the most in the game?	Music, graphics, nostalgia
What did you like the least in the game?	Being rusty at the game

Subject Number:	**8**
Age:	25
Gender:	Female
How often do you play games?	Never
How long have you played games?	Does not play
Which platforms do you play games on?	Console, computer
Have you played this game before?	Yes
How much did you enjoy the session?	3/5
Did you find the game too hard or easy?	Just right
What did you like the most in the game?	The platforming
What did you like the least in the game?	Frustration and not wanting to put in the effort

Subject Number:	**9**
Age:	24
Gender:	Female
How often do you play games?	Once or twice a month
How long have you played games?	Less than ten years
Which platforms do you play games on?	Console, computer
Have you played this game before?	No
How much did you enjoy the session?	3/5
Did you find the game too hard or easy?	Too difficult
What did you like the most in the game?	Platforming
What did you like the least in the game?	Difficulty

Subject Number:	**10**
Age:	21
Gender:	Male
How often do you play games?	Daily
How long have you played games?	All their life
Which platforms do you play games on?	Mobile, console, computer
Have you played this game before?	No
How much did you enjoy the session?	4/5
Did you find the game too hard or easy?	Just right
What did you like the most in the game?	Classic, simple platforming, fighting Bowser
What did you like the least in the game?	Not knowing about the Warp Zones would make it irritating to have to start all over when you lose your lives

Subject Number:	**11**
Age:	24
Gender:	Female
How often do you play games?	A few days a week
How long have you played games?	Less than ten years
Which platforms do you play games on?	Mobile
Have you played this game before?	No
How much did you enjoy the session?	3/5
Did you find the game too hard or easy?	Just right
What did you like the most in the game?	Fun retro feeling
What did you like the least in the game?	Having to play the same levels over again

Subject Number:	**12**
Age:	39
Gender:	Male
How often do you play games?	A few days a week
How long have you played games?	All their life
Which platforms do you play games on?	Mobile, Computer, Facebook
Have you played this game before?	Yes
How much did you enjoy the session?	4/5
Did you find the game especially difficult or easy to play?	Just right
What did you like the most in the game?	Nostalgic feeling of playing a familiar game
What did you like the least in the game?	Not being used to the controls and losing lives

Subject Number:	**13**
Age:	30
Gender:	Male
How often do you play games?	A few days a week
How long have you played games?	All their life
Which platforms do you play games on?	Mobile, console, computer
Have you played this game before?	Yes
How much did you enjoy the session?	3/5
Did you find the game too hard or easy?	Just right
What did you like the most in the game?	First-grade controls
What did you like the least in the game?	Still not being able to beat it

Subject Number:	**14**
Age:	25
Gender:	Female
How often do you play games?	Rarely
How long have you played games?	Less than ten years
Which platforms do you play games on?	Mobile, console
Have you played this game before?	Yes
How much did you enjoy the session?	2/5
Did you find the game too hard or easy?	Just right
What did you like the most in the game?	Nostalgia
What did you like the least in the game?	Failure

Subject Number:	**15**
Age:	25
Gender:	Female
How often do you play games?	A few days a week
How long have you played games?	Less than ten years
Which platforms do you play games on?	Mobile, console
Have you played this game before?	Yes
How much did you enjoy the session?	4/5
Did you find the game too hard or easy?	Just right
What did you like the most in the game?	Nostalgic feelings, simplicity
What did you like the least in the game?	Dying and having to start over

Subject Number:	**16**
Age:	28
Gender:	Male
How often do you play games?	A few days a week
How long have you played games?	Less than ten years
Which platforms do you play games on?	Console, computer
Have you played this game before?	Yes
How much did you enjoy the session?	3/5
Did you find the game too hard or easy?	Just right
What did you like the most in the game?	Fun music, concept, power-ups, koopas, colors
What did you like the least in the game?	Outdated graphics, lack of hints

Subject Number:	**17**
Age:	22
Gender:	Female
How often do you play games?	Daily
How long have you played games?	All their life
Which platforms do you play games on?	Mobile
Have you played this game before?	Yes
How much did you enjoy the session?	3/5
Did you find the game too hard or easy?	Just right
What did you like the most in the game?	Simplicity
What did you like the least in the game?	Starting over

Subject Number:	**18**
Age:	22
Gender:	Female
How often do you play games?	Weekly
How long have you played games?	All their life
Which platforms do you play games on?	Mobile, console, computer
Have you played this game before?	No
How much did you enjoy the session?	3/5
Did you find the game too hard or easy?	Too difficult
What did you like the most in the game?	Music
What did you like the least in the game?	Simplicity

Subject Number:	**19**
Age:	27
Gender:	Female
How often do you play games?	Once or twice a month
How long have you played games?	Less than five years
Which platforms do you play games on?	Mobile, computer
Have you played this game before?	Yes
How much did you enjoy the session?	5/5
Did you find the game too hard or easy?	Just right
What did you like the most in the game?	Simple to understand, doesn't require difficult button combinations
What did you like the least in the game?	Mario dies from one touch from a monster

Subject Number:	**20**
Age:	23
Gender:	Female
How often do you play games?	Once or twice a month
How long have you played games?	Less than ten years
Which platforms do you play games on?	Mobile, console, computer
Have you played this game before?	Yes
How much did you enjoy the session?	5/5
Did you find the game too hard or easy?	Just right
What did you like the most in the game?	Simple story
What did you like the least in the game?	Sometimes monsters came back from the left side of the screen, sometimes not