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Digital Game Competence

- Literacy or Repertoire?

Steve Dahlskog

School of Computing
Blekinge Institute of Technology
SE-371 79 Karlskrona
Sweden

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Contact Information:
Author:
Steve Dahlskog
Address: Rudeboksvägen 187, 226 55 LUND
E-mail: steve.dahlskog@mah.se

University advisor(s):
Stefan J. Johansson & Mikael Svahnberg
School of Computing

School of Computing
Blekinge Institute of Technology
SE-371 79 Karlskrona
Sweden

Internet : www.bth.se/com
Phone : +46 455 38 50 00
Fax : +46 455 38 50 57

ABSTRACT

Context. Digital games are an important application of software due to its growing popularity in society. As digital games are introduced in a growing number of homes we see a rapidly extending user base ranging from young to elderly. Since digital games now have reached beyond the early adopters and now engage a range of users that are more unfamiliar with the context of digital games and thus less trained and schooled in the clichés of digital games, the importance of previous knowledge in the digital games area are entering a sort of common knowledge to interpret and make meaning of society.
Objectives. The thesis cover two related aspects of basic digital game competences; firstly a theoretical review of the topic that secondly is followed by a study where we investigate how experienced players learn to play a digital game together and which types of activities they utilize in order to do so.
Methods. This thesis consists of two parts with different methods; a review of the term and concept of game literacy as well as a case study performed as an interaction analysis of players engaging with a new digital game. For the second part the interaction analysis was conducted in three phases 1) recording of players and notes of timestamps of interesting situations, 2) actual interaction analysis and transcribing and 3) review. To be able to show a modus operandi for the players' interaction and learning situations, a single pair of players were selected, and therefore also allowed for a chronological presentation of the play session and learning situations.
Results. In the first part of the thesis we present our results concerning that the use of the term game literacy is not consistent throughout the discourse, but rather two different viewpoints. Furthermore we suggest a taxonomy that allow for a more continuous view of game literacy knowledge than previously presented. Secondly we show that competences from previous games not always allow for a more efficient play performance due to the fact that different games have different cognitive schemas.
Conclusions. We conclude that concepts like game literacy and "the player's repertoire" where it is suggested that the player builds on previous knowledge to perform better within any game should be viewed with more criticism than previously. Previous experience of how a game function and the solution to solve problems in other games may not be fruitful at all. Players that utilize the same cognitive schemas they developed in other games could be hindered when trying to play a new game. Furthermore we conclude that the "reflective" learning style that other researchers (i.e. Gee) refer to, when playing games, is not the only one and that the players take some time to reach a reflecting level during play.

Keywords: Game literacy, situated play, player interaction, social interaction, digital games.

CONTENTS

1 INTRODUCTION

Today, there are very few areas in the Western society that are not affected by software. Our economies of scale build heavily on the possibilities of international banking systems and business-to-business (B2B) systems. Telecommunication systems, the Internet and Web applications like Facebook and Twitter support our human social interactions. We, as modern humans use different systems, on a daily basis, to gain knowledge, information, news and data for different purposes, whether it may be for private usage or in our working life. Even in our spare time we use complex digital artifacts to enjoy our self's. These artifacts can be very different and vary from digital games to iPods and iPads and even be smartphones or Tamagotchis. All of these applications are in essence software driven systems. These software systems"… are not isolated systems but rather essential components of more extensive systems that have some human, social, or organizational purpose… These broader systems are sometimes called sociotechnical systems. They include nontechnical elements such as people, processes, regulations, etc., as well as technical components such as computers, software, and other equipment." (Sommerville, 2011)

Since our daily life in the Western world is affected in, at least, some way by software, we, as individuals gain knowledge how these systems are used and how to interact with them. When we make use of this previously gained knowledge in new systems we sometimes can, without formal training, succeed in doing things outside of previous contexts due to the fact that we have learned to interpret, interact and operate other systems. This crossover of knowledge from one system context to another can be viewed as a significant asset for the individual. However, this, perhaps sometimes overlooked, competence is not a simple, standardized and universal competence that private people and hired personnel are trained in to equal levels. This ability to understand, and make oneself understood is similar to our ability to use the written word and therefore similar skills have since the 1980ies been referred to as computer literacy (Curran & Curnow, 1983), or later Digital literacy (Lanham, 1995; Lankshear & Knobel, 2007) and New Media literacy (Kellner, 2002).

Nowadays, most of the hi-end user interface is designed by specialists like; usability engineers, interaction designers and user experience designers and the software engineers tend to focus on the internal aspects of the development. However, if this trend of dividing the software development into different areas where guilds of specialists work with different parts one can wonder how far we have moved into a situation where we are building mismatched constructions of badly designed tools for the end user. The software should be an efficient alignment of its inner functions as well as its shell and boundary toward the user. If software engineers and interaction designers does not share a common understanding of the functionality of the software, its construction, its qualitative attributes and interaction with a user; the next generation of software with greater demands on complexity, transparency, usefulness, reliability and efficiency will stand as an equally greater challenge for the next generation of software developers.

However, the next generation of software users will be living in a world where software is a familiar thing. These new users will, in contrast to previous generations of users, be armed with important basic computer interaction skills. For them the desktop metaphor[i] is a minimalistic ground zero and more advanced users are turning their computer use and reality into a post desktop-future[ii] (Kaptelinin & Czerwinski, 2007).

As builders of software systems, and especially sociotechnical systems, our understanding of the users' abilities, reactions to and interactions with our construction helps us to create software with a higher quality level for the emergent properties like reliability, usability and security (Sommerville, 2011). Reliability is affected by the perspectives of hardware, software and operator reliability[iii] (Sommerville, 2011). Likewise, humans and organizations are often the main cause of security failures (Whitman, 2010; Sommerville, 2011) and dependability (Sommerville, 2011).

In such a not too distant future, the concept of a basic user ability to use computers and learning to use new software is more similar to a modern and digital literacy than ever before.

2 BACKGROUND

This thesis is an attempt to explore how untrained but experienced users interact with a new system. However, in order to provide a useful result for the next generation of software developers making the next generation of software in the post desktop-future we cannot use software with graphical user interfaces (GUIs) based on the traditional desktop metaphor. Instead we approach a specific area in software information systems, namely entertainment software, due to the fact that a large part of these system's users are able to perform well with these system with little or no formal training without the use of their knowledge of a desktop metaphor GUI.

Therefore our thesis combines two aspects; 1) the suggestion of a knowledge model for users in the post desktop-future and 2) explore how such users learn to user such software. Unfortunately it is extremely hard to find users possessing extensive knowledge about post desktop socio-technical systems where high collaboration and communication is not hindered as in the traditional desktop GUI.

However by approaching this problem as an exploration of how untrained but experienced users interact with a new system we are able to propose a knowledge model of modern literacy in order to understand a user's competence as well as to identify a specific user's position in this knowledge model.

Therefore the thesis consists of two parts. The first part describes the theoretical foundation of a basic information system competence – commonly named in the discourse as "literacy". The second part of the thesis reports a minor case study where users, with an extended knowledge background that can function as the basis for a basic competence with similar systems, are studied during a real life situation. The study focuses on the performance of the users as well as the learning situations they encounter, in accordance to the different task the users are presented with. In the end of the second part we bring in the knowledge model and place the users' performance in the model.

2.1 Setting the Context

Traditionally, areas such as usability and interaction design have proposed heuristic rules (Molich & Nielsen, 1990; Nielsen, 1992; Preece, 1994) for cost effective interface design for new digital artifacts (Sharp, 2007) something that entertainment software usually does not comply to and will therefore function as a software system in the "post-desktop" metaphor. The "post-desktop" metaphor was introduced by Kaptelinin & Czerwinski (Kaptelinin & Czerwinski, 2007).

"Post-desktop" systems should in contrast to desktop systems express, co-operation, collaboration and fast learning (Kaptelinin & Czerwinski, 2007). The reader should keep in mind these aspects in when we introduce the empirical part of this thesis. By doing so we hope that the reader will understand the choice of software and physical set up as well as the method of choice.

3 RELATED WORK

In this part of the thesis we intend to clarify the meaning of basic competence or "literacy" within the context of entertainment software, i.e. game literacy, and investigate the roots of the literacy term in a digital game context as well as exemplify how the term "game literacy" and "literacy" have been used in the academic discourse.

3.1 Methodological approach

In order to get an overview and be able to reach further with the related work a methodological approach must be set to minimize the risk of losing out on important related material. For our topic the there exists two great challenges in finding relevant material. The first challenge lies in the ability to minimize the vast amount of material concerning traditional literacy regarding reading and writing that can be accomplished with the ordinary pen and paper and steer towards material that is focusing on more computer oriented literacy. The second challenge lies in the aspect of cross-disciplinary material that our thesis need input from. Cross-disciplinary in academia and research usually means that different traditions are the foundations for each subject. These traditions affect where and how the scholars within each subject aim to publish their results. Different subjects' scholars may focus on journals; others on books and a third subject may favor the publication in a specific conference proceeding above a journal or book. In order to overcome these challenges we applied a mixed approach to our literary review; in which we utilized meta databases (ELIN, Samsök, Google Scholar, etc.), publishers of multiple journals (SAGE, IEEE), individual journals (Gamestudies.org, DiGRA, Eludamos, Games & Simulation), publishers of books (Routledge, MIT Press, Addison-Wesley, SAGE) and individual researchers (James Paul Gee, David Buckingham, Eric Zimmerman, T.L. Taylor, Jesper Juul, Espen Aarseth, etc.). In general we have found that it has been more valuable to follow a specific researcher or the references in a research paper / book rather than to rely on meta databases. It seems that the humanistic tradition of dissemination of information and researched material are in effect a series of published peer-reviewed papers that are reworked into a book chapter and when sufficient papers are published the researcher publish the next book. Our conclusion is that the researchers in educational science and social science favor books over journals and specific journals over other journals and conferences, since certain journals' and conferences' submissions are more related to position papers rather than peer-reviewed papers. Key references are tied to individual game study scholars like James Paul Gee who are cited by several in specific subfield. If we exemplify with James Paul Gee, T.L. Taylor and Jesper Juul we can see that they are often cited in their as follows; James Paul Gee in learning in and with digital games as a subfield, T.L. Taylor in MMORPG-subfield and Jesper Juul in the digital game analysis subfield.

3.2 Why literacy?

The users of digital information services today can be compared to yesterday's newspaper and book readers. As they engage the media at hand they show a basic competence that helps them engage with the media and produce a meaning out of their use of the media. This basic competence is not just the means of invoking a simple process of decoding symbols into words and sentences, but the competence also allows them to understand a message or complex reasoning communicated in this context.

3.3 Introducing a common view of literacy

Literacy, as it is most commonly used, means the ability to read and write. When measuring the level of literacy of the population in a country, we usually refer to a

relative value; say one in three, of how many of that country's population that can read a newspaper. However, literacy has evolved from a simple competence level of being able to read and write one's name, and over time the literacy ability have been expanded into a more complex ability of combining reading, writing, understanding, interpret, create and communicate by using printed and written material, in association to different and varying contexts. It should be noted that this literacy is not universal but differ due to the level of how common digital information systems are in each context. The modern literacy has transformed from a quantitative ability into a qualitative ability and is hard to measure in simple terms. We will not explore the common literacy term further in this thesis but rather to investigate literacy in a pop cultural context; software for entertainment purposes, specifically; the game literacy.

What does it really mean to be game(s) literate? In our review of the term, we have found a few definitions but also an inconsistent use of the term. Notable digital game scholars like Gee (2003), Salen (2007), Squire (2008) and Zagal (2008), have been using the term "game literacy" or "literacy" in the digital games context. When studying the two terms more closely there seem to be a lack of coherence between the terms' use and their meaning. In order to understand this incoherent use of terms, we present a brief overview of the two term's previous use.

3.4 Two historical roots of game literacy

The concept of knowledge and play, or knowledge and games have been touched upon by academics prior to the initialization of the field of game studies; but linking literacy with games are not explicitly done in either of the founding works of game studies like "Homo Ludens" (Huizinga, 1998) or "Man, Play and Games" (Caillois, 2001). From a game centric approach game scholar Juul have introduced a term called "the player's repertoire", which refers to the knowledge the player accumulate when playing games. Even though playing video games can be viewed as a simple and fun activity, not all aspects of playing games are easy and straightforward. All games demand some skill to be played efficiently. Juul recognize that learning in games is important by stating that, "playing a game is an activity of improving skills in order to overcome … challenges, and playing a game is therefore fundamentally a learning experience" (2005: 5). During a session of play, these skills usually increase. However, all players do not have to be able to play as well as John Romero, (the co-creator of Doom, id Software, 1993) who "was so good at Pac-Man that he could maneuver the round yellow character through a maze of fruit and dots with his eyes shut" (Kushner, 2003: 5). Players usually play more than one game during their career and thus the knowledge of playing one game is typically used when the player learn to play another game. If two games resemble each other, more knowledge is drawn from previous game experience; even though Doom and Quake (id Software, 1996), are more alike than Lumines (Q Entertainment, 2005) and Quake, a player could still benefit from the learning experiences of both Doom and Lumines when playing Quake. Doom is useful as it is a FPS (First Person Shooter), comes from the same developer and share similar solutions for their problems, share player mechanics and therefore lets the player utilize the same types of cognitive patterns. Lumines is useful because it trains reflexes and eye-hand coordination.

In an attempt to bring a clear understanding of the term "game literacy", its use and meaning, we try to find the term's roots by trying to recreate a path of its use in academic discourses. Notable academic fields in areas concerned with a prior use of "literacy" are education & literacy studies and media studies. By understanding these two different uses of the term, and thus be able to make a comparison between the discourses and definitions of literacy within each field, we might understanding the incoherence of the terms' use in game studies.

3.5 Literacy moving towards New or Digital Literacies

For over a decade a set of ideas and theories have made the field of literacy take an advancement that extend the common notion of literacy – the ability to read and write. One idea, the theory to understand literacies from a socio-cultural perspective, has been put forth. This socio-cultural approach is an applicable one for digital games, because it incorporates multimodal abilities to literacy. This perspective "means that reading and writing can only be understood in the contexts of social, cultural, political, economical, historical practices to which they are integral, of which they are a part" (Lankshear & Knobel, 2007:1) and has consequently grown in importance within literacy research. Here, in this context, the practice and its connection to the "production, distribution, exchange, refinement, negotiation and contestation of meanings" are essential (Lankshear & Knobel, 2007:2). The ability to encode and decode print is very much building on the way it is read, and if it is to read in a meaningful way. "A Christian Fundamentalist, for example, will read texts from the Bible in radical different ways from, say, a liberation theology priest" (Lankshear & Knobel, 2007:2). In this theoretical viewpoint the participants of different social practices, for instance, the players of *World of Warcraft* (Blizzard, 2004), "not only read texts of this type in this way but also talk about such texts in certain ways, hold certain attitudes and values about them, and socially interact over them in certain ways" (Gee, Hull & Lankshear 1996:3).

When we follow this theoretical approach, we can see that the initial focus lies in the understanding of language and not primarily in the surrounding carrier of information. However, it does not end with this. During roughly the same time, Lanham claims that "literacy" have outgrown its initial semantic range and meaning of "the ability to read and write" to its more currently and actual meaning "the ability to understand information however presented" (Lanham, 1995). Such a claim suggests that other forms of communication like sound and images are incorporated in the common literacy idiom. For Lankshear and Knobel this ideal of a modern and digital literacy "enables us to match the medium we use to the kind of information we are presenting and to the audience we are presenting it to" (Lankshear & Knobel, 2007:3). The focus of this modern literacy lies in "mastering ideas, not keystrokes" (Glister, 1997). This allows us to talk about a collection of new literacies or digital literacies.

Digital literacy today, or the ability to live and digest necessary information in a digital age, include a wide range of competences that can be divide into four groups; 1) underpinnings, 2) background knowledge, 3) central competencies and 4) attitudes and perspectives (Bawden, 2007). Notable is that the first group contain both the traditional literacy and computer literacy. The second group contains the knowledge that educated people have on how information is produced or a modern "publication-chain" works for the medium at hand. The third competence group includes something that perhaps best could be a tool-set of how to read and understand digital and non-digital formats and creating and communicating digital information. The last group consists of abilities to perform independent learning as well as having an ability to act sensible and with a correct behavior in the digital environment, which "may include issues of privacy and security" (Bawden, 2007). To conclude; literacy can be viewed as Kellner does, "gaining competencies in effectively using socially constructed forms of communication and representation" by "gaining the skills and knowledge to read and interpret the text of the world" (2002: 91).

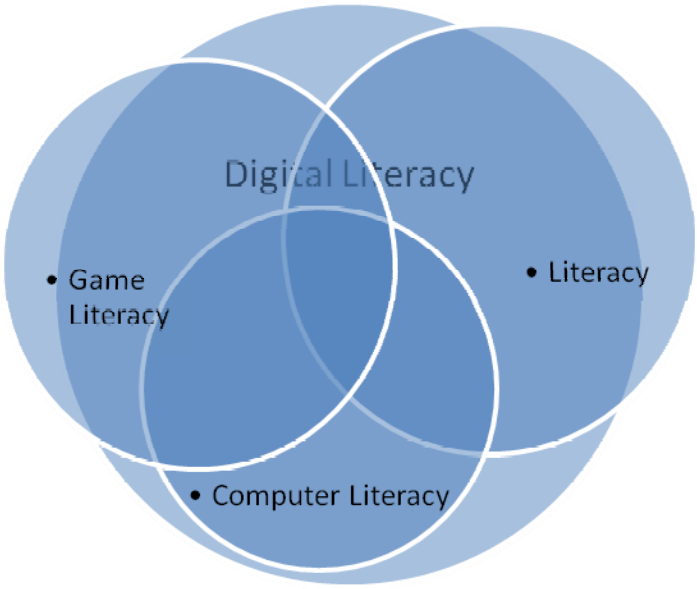

Figure 1 - Game Literacy in the context of Digital Literacy

In Figure 1 we can see the relations between the different suggested literacies (Literacy, Computer Literacy, Game Literacy and Digital Literacy). Game Literacy contains (game) abilities that are connected to other games like card games and board games which go beyond the border of the Digital Literacy.

3.6 Media Literacy

During the investigation of the use of "literacy" in our literary review for this thesis, we have found an academic field in the vicinity of game studies that in more than one case, shows an interesting previous use of combination of "literacy" with another phenomenon. This field is media studies, or more precisely, the subfield; media education. The interesting use is how the use of literacy is a reoccurring one, like 'TV literacy' and 'computer literacy' etc.

Buckingham have found that the term literacy have been used in the context of media studies for quite some time and it can be dated to at least the 1970s "where a range of mostly short-lived 'television literacy' curricula were introduced in the United States" (Buckingham, 2003:35). Examples of this are, for instance, Andersson's addressing of a critical viewing curricula (Andersson, 1980), and the suggestion of a TV-literacy for young children (Dorr, Browne Graves and Phelps, 1980) and the work with elementary schoolchildren to learn about TV (Singer, Zuckerman and Singer, 1980). Another similar connection to the understanding and ability to use of a phenomenon was introduced during the eighties and subsequently books like *Overcoming Computer Illiteracy – A Friendly Introduction To Computers* (Curran & Curnow, 1983) was published. These examples show a primarily focus on the understanding of how the medium works and not as in the digital literacies-approach, where the focus is on the coding and decoding information.

The justifications of adopting the term "literacy" to another field than its original allow for a suitable indicator of its importance. If a person cannot retrieve or receive information from a specific source, the person will suffer an information vacuum and be in a less than advantageous position compared to the literate persons. The most devastating effect for an illiterate person of phenomenon 'X' is the exclusion from parts of our society, information resources, power or a possibility to self-

empowerment. Typically such comments on the use of "literacy" in together with other phenomenon, than reading and writing, in order to bolster the claims of importance, are given by Buckingham; "Advocates of media education have frequently invoked the notion of 'literacy' in attempting to define and justify their work" (Buckingham, 2003:35).

From these, perhaps, initial uses of the term "literacy" with other phenomenon we can see the extension into digital games literacy as a simple one to make, if we acknowledge games either as information sources, cultural artifacts or possibly a medium.

After identifying these previous uses we approach "media literacy" and more importantly, its definition. For Buckingham 'media literacy' refers to the "knowledge, skills and competencies that are required in order to use and interpret media". The "media literacy"-definition that Buckingham presents is more than just a functional literacy (for example to operate a camera or making sense of a film). It is also more than a "cognitive 'tool kit' that enables people to understand and use media". Media literacy, in this sense, is also a form of "*critical* literacy" that involves analysis, some form of evaluation and a critical reflection. (Buckingham, 2003: 36) Another notable part in media literacy, which is often neglected, is the production of media (Buckingham, 2003: 49).

The literacy term would, if we put it brief, from a 'media literacy' viewpoint, incorporate abilities that allow us to; interpret, analyze, evaluate and critically reflect on media as well as produce media. We will return to this definition and its prerequisites when we explore, by other game scholars, previously suggested game literacy definitions.

3.7 Prior work in Game studies

With these two approaches established we move on to a specific context, namely the one of games. In the field of game studies – the specific term "game literacy", or a more general use of the term "literacy" in the games context, are explored by several scholars in various settings and use. The use of the terms "game literacy" and "literacy" stretch from studies with interaction analysis (Jordan & Henderson, 1995) as a method on how untrained players learn to play (Bennerstedt, 2007) and the digital game *TimeSplitters 2* (Free Radical Design, 2002), to describing a process where the players engage in a reflective practice as the play in order to gain new knowledge (Gee, 2003:90).

Some scholars with a literacy viewpoint recognize that games in the context of digital games from a new literacy viewpoint suggest that "gaming *is* thoroughly a literacy practice, requiring players to produce meaning with texts and become expressive with technology" (Squire, 2008:636). This viewpoint focuses on an ability to make meaning of games, not to make games and is therefore more close to the digital literacy approach than the media literacy approach.

Other scholars strive to explore the term "games literacy" in more detail and propose a framework for both game(s) literacy and the understanding of games (Zagal, 2008). The suggested framework has a heavy focus on the understanding of games as cultural artifacts, games in context of other games and technology as well as structure and is therefore linked with media literacy rather than digital literacy. Currently we view this framework as the state of the art.

Yet another approach is to incorporate the ability to design and make games as a form of building abilities to think systematically, as well as a method of gaining fluency in a specialist language by thinking and talking and, later, create and critique games. All of this calls for a "gaming literacy". The "gaming literacy" emerges from an attitude that is tied "to the creative, improvisational, and subversive qualities of play". Salen makes connections to four different literacies;

1) Learning to read a system,
2) Modding (modifying game avatars, games or objects within them) and world-building and navigating in a MMO with out-of-game resources like game guides and FAQs,
3) Learning social norms of a game community and
4) Learning to collaborate within a multiplayer space. (Salen, 2007)

This approach is a combination of the two approaches (digital literacies & media literacy), but from a design perspective. The approach strives to make meaning and communicate design as well as understand games.

In brief, there are several different uses of the terms "game literacy" and "literacy" in the game context. The terms are used to cover a variety of concepts;

1) To have an ability to play digital games,
2) To learn new abilities in a game context,
3) To have the ability to produce meaning within games (Squire, 2008),
4) To have the abilities to play games, understand meanings with respect to games and to make games (Zagal, 2008).

3.7.1 Theoretical scope

The different definitions and uses of the term game literacy are intertwined and can be seen to be well covered by the definition offered by the Games Literacy Framework (Zagal, 2008), therefore our focus, analysis and critique will be placed on this definition. By doing so, repetition will be avoided in the limited space of this thesis. Interestingly, the games literacy framework also provides a stepping-stone for an extension, which is suggested in further down in this thesis.

3.8 Analysis

In this part of the thesis we intend to analyze the Games Literacy Framework and present critique on parts of it. From this critical standpoint we intend to suggest an improvement of the Games Literacy Framework with the intent to promote a qualitative viewpoint instead of a quantitative one.

3.8.1 Critique of the Games Literacy Framework

The games literacy framework suggested by Zagal includes a definition of the term, which is quite detailed. To fulfill the requirements of game literacy, according to this definition, the game or games literate person should i) have the ability to play games, ii) have the ability to understand meanings with respect to games and iii) have the ability to make games (Zagal, 2008).

Before we begin, it should be noted that a common problem of making definitions is to make the definition not too wide, to include to everything, as well as to make the definition too narrow, to include almost nothing. The Games Literacy Framework falls in the latter category due to the fact that the limiting factors of the knowledge and abilities needed to become game literate are rather extreme. But let us first go through each individual part and then conclude with the sum of the parts.

3.8.1.1 The ability to play games and its implications

The first requirement for a game literate is by Zagal's definition having the ability to play games. The definition is not explained enough to get a complete coverage, but at least Zagal notes that; "the ability to play a game can often encompass more than just knowledge of the rules, goals, and interface of a game" (Zagal, 2008). The ability to play is also extended to the ability to "participate of the social and communicational practices of play" (Zagal, 2008). The social and communicational practices of play are demonstrated by Steinkuehler (2006), in her analysis of the communications between players in *Lineage* I and II (NCsoft, 1998, 2003), and subsequently built upon by Zagal. However, it should be noted that this only is applicable to games where social and communicational practices of play are present. Such practices may not be present in solitary play for instance. But if a solitary player were to utilize a webpage with knowledge covering game play like the *community knowledge* of the game (Taylor, 2006), could count for such game related communication depending on how linked to it is to the actual game play and the level of social interaction. To further complicate matter, these social and communicational practices of play may vary from a complex situation where every group, guild or server instance has their own standards to a simpler situation where they are streamlined over the whole game. If the complex situation is put into its extreme it would be possible to be literate on certain servers and at the same time be illiterate on other servers or instances.

Similarly, today's multitude of platforms may also result in a paradox of literacy, meaning that a player may be fully able to play a specific game on a PC but not on a different platform like the Xbox 360 or Wii due to the different interaction methods. Common games to suffer from these 'transitions' are FPS games (First Person Shooters). A player that is performing well in a PC FPS might be considered performing at a beginner level on the same FPS game but on a different platform like the Xbox 360. Furthermore, today, a digital game title may be developed by more than developer and thus the "same" game can be very different on different platforms. Especially games for handheld devices may differ from each other due to different technical specifications or due to development issues like those for license games. License games, i.e. games based on a movie license, may result in very different games due to the fact that in order to release the game simultaneously on most platforms the publisher has to utilize different developers. These differences result in different games with the effect that a player may be performing well in a game on one platform and not as good on a different platform.

Several of the newer digital games are incorporating multiple game modes, or if not the explicit game modes exist, at least a large number of different player mechanics are demanded in different parts of the game. If we were to compare an older game like *Doom* (id Software, 1993) to a newer game like *World of Warcraft* (Blizzard, 2004), we will, with even the simplest analysis tool, observe differences in the multitude of the player mechanics in *World of Warcraft*. For digital games with several game modes or multiple player mechanics, the player's ability to play the game is, of course, a varied one. The difference in game modes and will therefore result in a varied literacy state. For instance, in a game like *World of Warcraft*, where a player moves from the game mode "PvE" (Player VS Environment) to the more challenging game mode "PvP" (Player VS Player), the player may be considered a less able player in the new mode.

A game literacy definition founded on only the ability to play games would leave too large gaps between the mechanical ability to play and the ability to cognitively understand what to do, in order for it to be a useful definition. For instance must the definition include more than just an ability to play games, for example even animals playing games would qualify for being game literate. Animals are in fact game literate;

according to such a limited play centric definition since they play, both with each other, with or without play artifacts (toys) or with humans or even digital games like Ms. Pac-Man (Midway, 1981)[iv1].

3.8.1.2 The ability to understand meanings with respect to games and their implications

Zagal's article focuses on exploring the second requirement; the ability to understand meanings in respect to games. The abilities that Zagal define for understanding games involve the understanding of games from four different perspectives;

- Understanding games as cultural artifacts,
- Comparing games to other games and genres,
- Understanding games in the context of the technological platforms on which they are executed on and finally
- Be able to deconstructing them and understanding their components.

The cultural aspect, according to Zagal is an understanding of the game's relationship with culture and the role it plays in culture. This approach is based on the assumption that multimodality of our cultural artifacts must be observed and understood in order to make meaning of such artifacts. We agree that the suggested examples may be read in such a way, that the cultural surrounding of the games shows the importance of the artifact they are. One of the examples suggested by Zagal is *Animal Crossing: Wild World* (Nintendo, 2005). The cultural approach is based on Bogost's view of the game as a game situated in a context of Western capitalist and materialist culture (Zagal, 2008, Bogost, 2007). However, if we were to have an approach to cover the cultural artifact aspect, it would be wise to acknowledge the culture the game was designed and developed in, instead of pushing a different cultural view on to it. *Animal Crossing: Wild World*, and its previous installments, which are known as "*Oideyo Dōbutsu no Mori*" in Japan, have in reality a goal of collecting fish, flora, dinosaur fossils and insects and sharing these collections with the local museum without monetary representations are transferred. Another goal in the Animal Crossing-series is to decorate your home according to Feng Shui. For instance, orange game objects should be stored in the north of the house in order to have more luck in finding objects (the orange color is a sign of luck in Japan). It should also be noted that the game was designed to allow for family members cooperating in the game but in an asynchronous way. The initial game designer of Animal Crossing designed the game so that he could play with his children, even though he spent long days at work as most other adult male Japanese does.

In covering the aspect of games in the context of technology, we merely suggest that this area is extended to cover design aspects due to the fact that previously invented technology must implemented in a digital games context in order to allow novel game play as well as the other way around like the Wii BalanceBoard, which spawned new types of snowboard and skateboard games.

The last suggested component of the understanding of meanings in respect to games is the understanding of structure and components of games. This ability is likely most useful for presumed designer of games and perhaps not as applicable to the player of games. Ultimately the understanding of the structure and components of games suggest that there is a language of games to be learnt by the game literate. Such a language would therefore be a construction of pieces, like letters and words and ruled by grammar. By contrast, other areas of media literacy have had a problem of making this approach work, due to the fact that, for instance, a film is not made up by pieces like, zoom, panning and stills (Buckingham, 2003, Lankshear & Knobel, 2007).

However, some games are extremely complex and consist of multiple player and game mechanics that together make up an intricate piece of machinery that is hard to analyze in individual units since they function together, as one system, with emergent properties.

3.8.1.3 The ability to make games and its implications

The third requirement has probably risen from the media literacy standpoint. The literate should be able to both to read and write, and subsequently the literate player should be able to read games as well as to write them. However, writing or making games, calls for a rather long list of competences. Even if we exclude the competences one would need to have in order to be hired by a large commercial company that produces triple-A title games (skills like 3D-modelling or programming), the ability to make games that doesn't break in respect to its systematic functioning (rules, dynamics and mechanics) or to make games that are fun to play, are non-trivial. As an example, Salen suggests a short list of competences a person need to have in order to put a game together; "system-based thinking, iterative critical problem solving, art and aesthetics, writing and storytelling, interactive design, game logic and rules, and programming skills" (Salen, 2007).

3.8.1.4 A narrow definition

If we combine the three requirements to cover Zagal's definition of games literacy, we quickly realize that very few people fulfill them. Of course, we have a large number of people that can play games, but it is still possible to be a "newbie" in some games and a "pro" in others, perhaps even in games of the same genre (Aarseth, 2003). For instance it is possible to master a game like *Counter Strike* (Valve, 1999) and be a beginner in *Red Orchestra* (Tripwire Interactive, 2006) due to small changes in game play and mechanics. Persons fulfilling the second requirement of understanding games are mainly a number of scholars in the field of game studies and some of their students. The third requirement is fulfilled by professional game developers and to some extent independent developers. However, it is not often that the two last requirements are covered by the same persons. For instance, Zagal and Bruckman found that students in game studies and game design courses fulfill the first requirement but have troubles fulfilling the second requirement – the ability to understand and describe games (Zagal & Bruckman, 2007). The problem with this approach is that the definition is too narrow to be of any use real use, whether it is in a wider use as in academia, industry or amongst consumers, or in a more narrow use as in cultural criticism like game journalism. We therefore suggest that the term literacy in game studies only include two criteria, 1) the abilities to play and 2) to understand them.

Apart from these small pieces of critique the model presented by Zagal shows promising use in understanding the concept of game literacy. The definition covers aspects that allow for a critical literacy similar to media literacy but is perhaps a too narrow one to have any practical use. The only and really grave aspect of Zagal's model is the lack of understanding of knowledge as a continuum and how knowledge builds upon other knowledge. To allow for a literacy term that, of course, is knowledge based, we suggest a different approach to describe the knowledge prerequisites in another, more accurate way. The problem of describing knowledge as a condition for ability or abilities comes to light when the condition is not fully explained. For game literacy and its suggested abilities we must describe the knowledge in levels. A better model would consist of a continuous range of knowledge and not, as in the Games Literacy Framework, simply as a discrete one that implies that you either are literate or not, without room for being literate in certain areas.

3.9 Summary

Game literacy or literacy in a game context has been used as terms and concepts differently in the discourse. The different use is understandable if we place the writer or user of the term or concept in either of the two following academic background areas; the first one is the learning and literacy (or rather a more modern view – digital literacy) and the second one is understanding and creating content with and for a specific medium (media literacy). The second one have to take into account the use of a critical language for the meta level of the medium as well.

Both views are troubled with a lack of understanding of the problematic nature of games – games share to large extent aspects with each other, but games are still unique artifacts that make them hard to group as a single literacy. By recognizing the two different views; 1) media literacy and 2) digital literacy, during exploration of the literacy discourse in game studies, the explorer will understand each contribution's advantages and limitations.

4 DESIGNING A TAXONOMY

In this part of the thesis we suggest a more detailed approach to the Games Literacy Framework by translating it into a multiple level taxonomy instead of a single level framework. The taxonomy lends itself to the understanding of a person's development in game literacy.

4.1.1 Foundations for the taxonomy

Our suggested model of game literacy takes the form of a taxonomy scheme. The continuous description of knowledge in different levels has been successfully adopted by the SOLO taxonomy. The SOLO taxonomy, which is based on a study of different academic content areas (Biggs & Collins, 1982) present a five level knowledge model (similar to CMM-I) that "provides a systematic way of describing how a learner's performance grows in complexity when mastering many academic tasks" (Biggs, 2003). The taxonomy has five levels that cover a learners advancing and building knowledge. We suggest a combination of the Games Literacy Framework with the SOLO taxonomy in order to create a model that allow the literacy to be based on different levels of abilities and more detailed instead of taking a model with only two states (either you are literate or not) that the Games Literacy Framework represents. We present and exemplify the model as game literacy in a (game) cultural context.

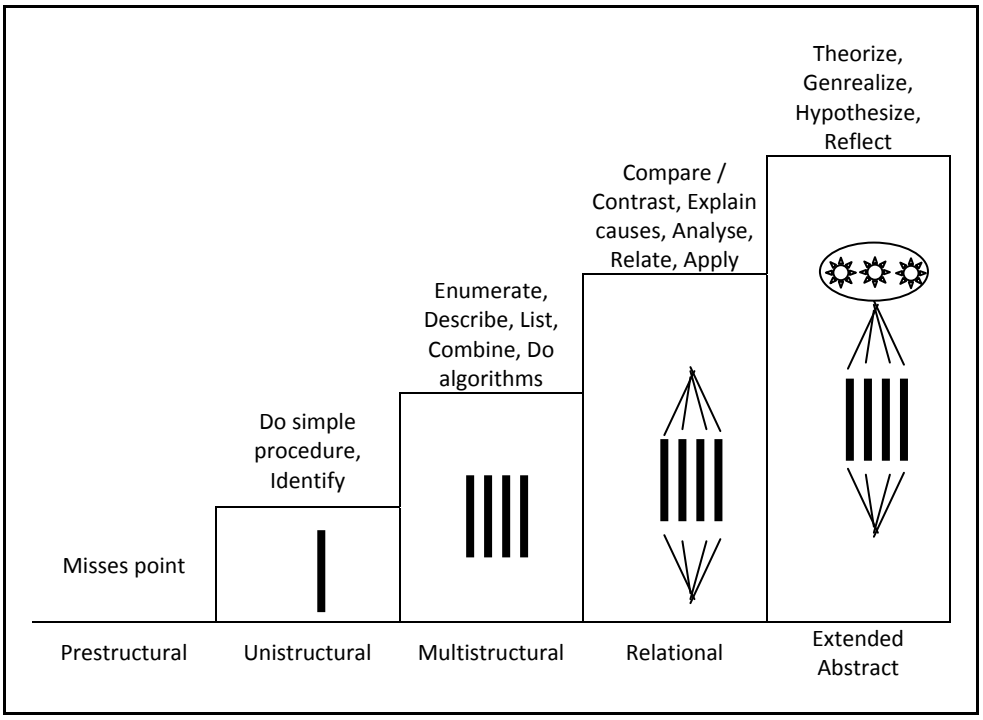

Figure 2 – The SOLO taxonomy (Biggs, 2003)

The taxonomy utilizes levels of cognitive complexity, where the level of knowledge allows the literate on different levels to do activities that are described as verbs in the model.

Yet, it is important to situate the knowledge abilities of the SOLO taxonomy in some sort of domain, namely our game related one, otherwise they become too general to serve any purpose. The four different perspectives suggested by Zagal (2008) functions as borders;

- Understanding games as cultural artifacts,

- Comparing games to other games and genres,
- Understanding games in the context of the technological platforms on which they are executed on and finally
- Be able to deconstructing them and understanding their components.

However, the perspectives only help to box in the area of knowledge; they do not help with the description of levels and specific abilities we need. For this we need the place the different levels in useful contexts. As such, our ability to understand the specific phenomenon needs to be addressed. In order to do so, we utilize a discussion around the definition of games held by Juul (2005: 23-34) where he explains the need for understanding the following;

1. The properties of games themselves (games as a designed artifact)
2. How the player interacts with them (the interface)
3. And what it means to be playing them rather than doing any other activity

Or to sum up; understanding the system, the relation between the system and the user, and the relation between the usage and the rest of the world. As such, both the game and the player exist in a contextual frame – culture, since they are constructions of culture.

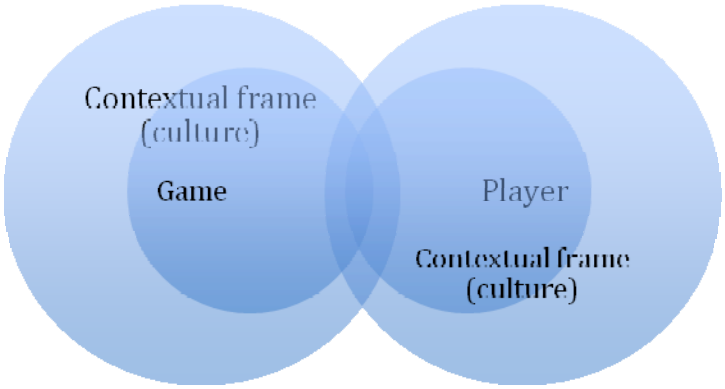

Figure 3 - The frames for the model

Therefore we conclude our knowledge area should consist of three contexts; the first is human culture, the second is the intersection between game and player (often realized as the technological platform) and the third, which is the game itself. We leave out the player since the player's understanding of herself is part of psychology and not the knowledge about and the understanding of games.

From this we map out the different levels of knowledge ("Prestructural", "Unistructural", "Multistructural", "Relational" and "Extended Abstract") and interpolate with the three contexts. We could for instance take an ability of describing cultural aspects (multistructural and the context of human culture) in relation to the the situation Zagal (2008) mentions; "Game could remediate a cultural artifact from another medium – Some videogames are adaptations of comics, books, or movies" and end up with a player being able to describe the adaptations of the *Star Wars* saga to digital games.

4.1.2 A taxonomy for game literacy

In order to explain the use of the game literacy taxonomy we structure examples of knowledge as a table where the cognitive levels represent columns and the rows the different aspects of understanding games.

Table 1 - Game Literacy Taxonomy

Context	**Prestructural**	**Unistructural**	**Multistructural**	**Relational**	**Extended Abstract**
Context of human culture	Sees games as disconnected from culture	Identify single aspects of games that are related to culture	Describe cultural aspects of games	Analyze games in respect to culture, apply cultural view	Hypothesize on the loop of cultural effects games have
Context of other games	Sees games as disconnected from other games	Identify individual game mechanics reoccurring in games	Describe and list different mechanics in different forms of games	Compare and analyze the mechanics in a game to its initial game and other games on same level	Reflect on the emergent properties of multiple mechanics working as a system
Context of the technological platform	All games are unique, the platform has no effect on the game	Identify individual aspects from visuals, peripherals, IP, interaction	Describe different platforms and list different technical specifications	Compare different platforms and explain causes to differences between platforms	Theorize on possible hardware innovations and their applications to games

A detailed example of how the model works is presented as the description of the different levels for the cultural context of games. As we become more literate we move from “Prestructural” to “Unistructural” onto “Multistructural” and then further onto “Relational” in order to reach “Extended Abstract”. The literate player moves from a view of games as something disconnected from culture where all games are unique objects without any relation to literature, society, politics, etc. Games are viewed as “just games”. As the literate begin to relate games to phenomenon in culture and identifies single connections to human culture, like games with historical settings or realistic settings, the literate reaches a level of “unistructural” understandings of games as cultural artifacts. The next level the literate reaches, allow the literate to describe different cultural aspects of games, like cross cultural aspect of games, for example, how Star Wars games both incorporate and expand the Star Wars story. Continuing on, the literate can analyze games from a cultural perspective like using a Western capitalist approach to understand *The Sims* consumer behavior model. Finally the literate can hypothesize on the effect digital games can have on culture and create cultural loops of which affect culture and itself again. For instance, the effect that the Lara Croft-character from the Tomb Raider-games had, and made it possible to make

movies out of games, following in the footsteps of the Street Fighter-games and movies, etc.

The taxonomy can be extended into coverage of all aspects of game literacies like the abilities to play game thus covering the procedural knowledgebase that play means. The abilities may range from “newbie”, “intermediate”, “Pro” (Aarseth, 2003), “Transgressive play”, “Speedruns”, “Tool-Assisted Speedrun” but also cognitive levels of play, from an initial phase when the player probes and explores mechanics, tries hypotheses and reflects on his own play (Gee, 2003: 90). The transition from initial levels to higher levels may be done in a faster pace, if the player has prior knowledge of games in the same functional genre or setting, but only if the games are similar enough. The play abilities should also be divided into game modes that may affect the level of play ability. Play modes may include single-player, co-op play, multiplayer, team based, etc.

4.1.3 Further work on the Game literacy concept

The discourse of game literacy would benefit from a thorough study of the need for the ability to be able to make games in order to be game literate. Is it really necessary to be developing games to be able to express oneself in a game literacy? Could not other means of expression be enough? Expressing oneself in a game context could be covered by, skinning[v], modding[vi], performing speedruns[vii], using level editors[viii] and if the game is open enough – when games allow enough actions that can be varied on an individually unique level; like decorating your home or designing your own T-shirt in *Animal Crossing: Wild World (Nintendo, 2005)*. The freedom that sandbox games[ix], give their players are almost endless, observe, for instance, what players do when they are using cars to do car stunts in gangster games like *Grand Theft Auto IV*, (Rockstar, 2008), when they explore every inch of the virtual environment in MMOs (Massive Multiplayer Online games) and their creativity when configuring their virtual dollhouse game.

5 STUDYING EXPERTS USING A SOCIO-TECHNICAL SYSTEM

Digital game research with a sociological perspective (e.g. on interaction between players through a game) are commonly describing games with a large player based culture, typically for games like Massive Multiplayer Online Games (MMOGs) (Taylor, 2006). Other research studies show how children play computer games, like Sims or SimCity (Nilsson & Jakobsson, in press), with the purpose of exploring the pedagogical value of using videogames as a learning tool (Nilsson & Svingby, in press). Not all games are online nor are they played for pedagogic reasons. In this study we will use a different but common arena of situated play. We will explore the console based, co-located offline game where only two persons are engaged in play.

MMOGs and offline single or two player games share similarities but differences also exist. Taylor (2006: 36) notes that MMOGs have "an emergent culture in the game that has, over time, formulated norms around social behavior, how favors are given out, how killing is handled, and how help is requested" as part of the play culture. These emergent cultures are based on the social norms and behavior of players, a feature definitely not designed as part of the game, but rather developed and upheld by players. For a game to be able to evolve into a game with a large player based culture, the players need time to do so. One common way is to use a persistent game world. For multiple user online games with non-persistent game worlds, like games with instances of the game world which are reset on given intervals, the players usually use a game forum or something similar to build a kind of metaworld for the game with the traits of a persistent game world. For offline console play, the evolution of rules and norms for playing the game is different. There is no persistent world or community to learn from since you usually play the game over a series of independent sessions. Only the save file is persistent and the players can only bring their own skills into each session. For offline play, where no large persistent world, metaworld or striving game culture exists, the time spent playing together is more focused on how to play according to the rules of the game and on how the players play together, rather than on playing according to a norm established by a surrounding community. One rationale to do so could be linked to the more explicit ending of an offline game (a MMOG usually does not have an end at all, the players of a MMOG continue to play the game for other reasons) or as Juul puts it: "a game has multiple outcomes, the player must expend effort trying to reach as positive an outcome as possible" (2005: 56). A more explicit outcome of a game will demand that more effort is focused on the progression of completing the game, rather than perfecting a move or fine tune an action in the game.

5.1 Learning to Play

To be able to play a game the players must learn them, or at least have a rudimentary notion on how they function. The skill of using games or what Gee calls "game literacy", and also recognize it as a different and sometimes difficult skill to master is a useful standpoint when engaging in the case study (Gee, 2003: 13). (Gaming) literacy can be viewed as Kellner does, "gaining competencies in effectively using socially constructed forms of communication and representation" by "gaining the skills and knowledge to read and interpret the text of the world" (2002: 91). For players becoming game literate, it would mean reading and interpreting a game world as well as performing in a way that is more advantageous or effective, something other than that of the illiterate player can do. The knowledge of literate players can be viewed as empowerment, and gives the player freedom to perform in a game or any games since games share common traits, e.g. the ability to navigate a 3D-space and

connected spacious abilities are useful all 3D-games. Some research has been done in this area, but the study of Sjöblom (2008) has different scope; the players are co-located and have at least some knowledge of the MMOG used in the study. Unlike Bennerstedt's study (2007) of how novice players engage their first (or almost first) digital game and starts to become literate players, our study is looking into how already knowledgeable players explore a game which previously is not is a part of their repertoire of game skills. We also intend to identify the players' position in the Game Literacy Taxonomy where applicable. It should be noted that due to the limitations in context (one game on one platform) we will not be able to identify where the players stand on the technological dimension due to the fact that the players never discuss that aspect during the recorded play session. By doing so we intend to show the usefulness of the taxonomy and tie the learning perspective and literacy perspective together.

5.2 Revisiting the player's repertoire

We revisit Juul's concept of the player's repertoire in order to discuss skill and knowledge in games. Juul's concept of the player's repertoire is described as two sets of knowledge, where one is the subset of the other. Let us begin by looking at the smaller, least inclusive of the two sets. Here the player repertoire is viewed as the knowledge learnt and needed to play a single game:

> "Games are learning experiences, where the player improves his or her skills at playing the game. At any given point, the player will have a specific repertoire of skills and methods for overcoming the challenges of the game. Part of the attraction of a good game is that it continually challenges and makes new demands on the player's repertoire" (Juul, 2005: 56).

Here Juul presents the repertoire as a notion of specific skills for a single game. However, the repertoire usually holds more than a single game, at least for the literate player. Juul describes the second, larger set as follows:

> "Though games may be different in structure, a player approaches every game with whatever repertoire of skills he or she has, and then improves these skills in the course of playing the game. To play a game is to improve your repertoire of skills, and the challenge of game design is to work with the skill set of the player through the game" (Juul, 2005: 5).

The former should be viewed as a subset of the latter one. When the player extends the knowledge of a game, the repertoire for this game grows and thus the superset repertoire, the total game oriented knowledge, grows.

5.3 The research question and its context

Based on the previous studies that cover either social interaction in MMOGs, studying digital games pedagogic value or examining how previously non-experienced players become more experienced with games, we feel that there is a knowledge gap to fill. We are studying how an experienced player learns to play a game, in order to establish an understanding for how the repertoire concept works in correlation with reality. By focusing on the experienced player we hope to minimize factors that exist outside the game space and player, problems like interaction with the game software and hardware with a controller, understanding of 3D-space, etc. We approach the

research question from the field of usability. Usability is concerned with the production of usable and safe systems. Usability is positioned in the boundary between human and an artifact and the field borrows from other research areas like interaction design, social interaction and cognitive science in order to understand both the human and the machine. We therefore formulate the research question as – how does an experienced player learn to play a game.

The research question is founded in a will to understand how the players interact in order understand the game as well as how to play together. For this purpose we will analyze the interaction between player and game as well as player and player.

5.4 The case study and its method

The method used for the case study is the interaction analysis method as described by Jordan and Henderson (1995). Interaction analysis is an interdisciplinary method that involves ethnography, conversation analysis, proxemics and kinesics. The method has been used to study games and players several times cf. Linderoth (2004), Bennerstedt (2007) and Sjöblom (2008). The interaction analysis is relevant to our study because of its ability to recognize that the expert knowledge in a social situation is not only located in the heads of individuals but also "situated in the interactions between members of a particular community engaged with the material world" (Jordan and Henderson, 1995: 2). Furthermore, Jordan and Henderson are stating, "knowledge and action are fundamentally social in origin, organization, and use, and are situated in particular social and material ecologies" (Jordan and Henderson, ibid). To be able to draw any conclusion on one individual player's action we have to observe the player's interaction with the other players, with the gamepad and more importantly with the immaterial artifact, i.e. the digital game. The interaction analysis is our preferred choice over other methods like direct observation, video recording, and verbal protocol (Ericsson and Simon, 1985) because it incorporates many of the advantages the individual techniques have.

This study where players learn game rules together is set in an environment where the players are co-located in a physical room with a dedicated game system. This playing environment consists of two players, playing the same game, at the same time, on the same game console in front of the same screen, using the same type of controller in order to be able to exchange information on what actions different buttons initiate. The set up of the environment thus mimic a plausible and natural socio-technical system of two players playing a game with physical artifacts like a game console and TV similar to those existing in many western households. By having the players in the same room supports the interaction analysis method where body language and gestures and interaction between users and with the artifact are not hindered by distances, limiting communication channels or possibly failing electronic equipment.

The material gathered for the larger project is approximately 15 hours long, of which 7 hours are especially suited for the observations of patterns in learning, communication and negotiation of the meaning of the rules, because in these sessions the players have not before encountered the game system other than by reading about the game in magazines.

The players in the large project are both male and female and are in the ages between 19 and 35 years. The players were 28 students expressing an interest in digital games and were divided into groups of two players. All pairs were created so that all players were playing with someone they had met prior to the play session. By grouping the players with an acquaintance or friend we aimed to limit the problems of players not knowing ones playing partner. The 28 players stated that they had a prior digital

game experience ranging between five and 24 years and they play digital games 1-70 hours per week (the average value for the group is 15 years of experience and 17 hours of play per week). By using players that are literate players we set a different scope for this study than previous studies that explore how novice players engage their first digital game and to become literate players and also limit simple problems that can occur in play sessions like how the gamepad work etc.

The audio and video material was recorded by one camera. In order to properly do the interaction analysis we need to observe both the players and the screen at the same time. To do so we placed a mirror on top of the screen and placed the camera so that it is filming the screen in the lower part of the picture and the mirror in the upper part of the picture. This modus operandi allows the analyst to observe fewer data sources to save time and limits the possibility of timing problems when synchronizing several audio and video data sources.

The interaction analysis is conducted in three phases namely; 1) digital recording of players during play (audio and video) where the observer takes notes when interesting situations occur, 2) actual interaction analysis with the aid of audio and video where body language, conversation, etc. is analyzed, and transcribing and finally 3) review of notes together with video and audio material to certify the correlation between material. During the first and second phase analysis of the data was conducted both with help of the recorded audio and video data but also during real time. In essence the material was analyzed at least three times; 1) in real time during recording of data, 2) during the initial viewing of the recorded data, and 3) during reruns of interesting sections of the material. The first and second step was a run-through of the recorded material in order to compare and choose observations that could be either recurring during play sessions or appearing in different play sessions. The third step initiated thorough transcription and detailed analysis of principle situations. Principle situations are mainly situations where players perform actions that follow a recurring pattern with respect to either communications on rules, coordination of play or where players play differently than optimal play performance. A principle situation typically starts with a player hesitate or initiate communication with the other player.

For the purpose of tying in with the previously mentioned taxonomy in this thesis we have chosen to follow a particular play session and a pair of players that we can follow in their progression in the taxonomy and plays in a representative way for other pairs. An advantage by following a single pair and not several ones is that the events taking place follow a logical and continuous order.

Throughout the interaction analysis part of this study, much effort is given to the aspect of the special case of players and digital games. Interaction analysis is not always a simple method to apply since it is sometimes hard to know whether the interaction is performed between a single player, two players, the physical interface, the graphical user interface, the avatar, the game world or different combinations of them. A player can interact with the other player by using physical world or by using the non-physical world or a combination of both. Traditional interaction analysis usually focuses on how the humans interact with an artifact or each other with oral communication and body language. When applying interaction analysis in the context of digital games and players we must realize that body language is seldom represented as an object for analysis since the players are more or less static in their posture and they focus mainly on what is taken place on screen. Instead they are using the avatar in the game world for interaction with the other player or using the avatar as a marker for pointing at something in the game world when it would be possible to use an index finger, etc.

5.4.1 The Game

The digital game used in this particular play session was LEGO Star Wars II (Traveller's Tale, 2006). The game is an action and platform game, where the avatars can engage in actions like shooting, wielding a light saber, building LEGO objects and jumping. The game uses objects that are made from LEGO bricks in the Star Wars setting. Apart from the setting, the narrative from the Star Wars movies has been adopted, but not completely. The developers have approached the Star Wars universe from a humorous point of view, which is visible both during game play (e.g. Obi-Wan Kenobi uses the force on Stormtroopers to turn their helmets around) and cut-scenes (e.g. during the "I am your father"-scene Darth Vader does not say anything but instead shows a picture of Anakin Skywalker and Amidala).

The game has drop-in and drop-out co-operative functions so that the game can be played by one or two players. The game can either be played in story mode, where only the preset characters are available, or in free play mode, where the players can choose different characters and even switch between them. The play sessions in this case study used only the story mode with two players playing co-operatively.

5.5 Preparing the study

In order to be able to use the interaction analysis as a tool to understand what the players are doing the analyst need to prepare oneself with the game. To do so there is a clear need for knowledge about the game and its rules. Following Aarseth's discussion on the expertise of the researcher as the playing analyst, game researcher can categorize oneself as either newbie, casual or hardcore (Aarseth, 2003: 6). For this case study, to be able to carry out the interaction analysis as fast as possible and not to have to return to the game too often, the author of the article played the game through with different characters in all modes (single and two player, both in story and in free play) spending more than 60 hours unlocking all characters, all extras and almost all canisters and completing the game to over 90% (according to the game). For purpose of analysis we used walkthroughs as well as drawing maps over the different levels the players were to play in order to identify where rules were used the first time and where player actions would be needed the first time. Another source of information on the game and its rules was the instruction booklet inside the digital game packaging (Traveller's Tales, 2006). Several pieces of valuable information on how to perform moves with the player avatar were provided in the instruction booklet, but during the recording of the case study only one out of 28 players used the accompanying game documentation, even though it was left clearly visible, on top of or to the left of the Xbox 360 console, it did not seem that the players viewed it as a practical source of information when playing the digital game.

5.6 The play session

The excerpts in this article are taken from a session with two male players (pair #4). One of the players is 32 years old (player right, PR) and the other one is 35 years old (player left, PL). Both players have a vast experience of playing digital games, 23 and 24 years respectively. When asked, the players state that they play about 10 hours per week in average. Both players stated that they enjoyed the game because of the social aspect of being co-located as well as the feeling of co-operation.

The reason for following these two players during their first encounter with LEGO Star Wars II (Traveller's Tale, 2006) and not to alternate between different pairs is because this pair's performance represents an average play session in the case study. The other players basically encounter similar situations, not always in the same order or position in the game space, but close enough to portray the majority of play sessions

recorded for this case study. What is common in all play sessions is the way the players communicate and how they deal with different situations, be it using newly introduced rules and mechanics or how they attempt to solve problems.

One of the first things the players do, often individually, is to explore what actions their avatar can perform. A common strategy is to use the interface - in our case the Xbox 360 gamepad, to extract this simple knowledge. By pressing different buttons individually and observe their avatar they deduce the different possible actions. The only problem with this strategy is when using contextualized controls and interaction as in LEGO Star Wars II (Traveller's Tales, 2006) where the same button is used both to engage in hand to hand combat and to fire your avatar's blaster. For this particular session both players have stated that they have played other games on the Xbox 360 before and should therefore be comfortable with the standardized gamepad.

Excerpt 1[x]:

```
Player Left: [player moves avatar around trying different
buttons]
PL: You can't jump.
PL: [presses the X-button]
PL: Yes - you can!
Player Right: A?
PL: X!
```

As the players try to establish how to play, they usually tell the other player as they realize which actions triggers which results. Sometimes the findings are described as what to do and how to do it and sometimes the other player (as in our excerpt) has to ask for more explicit information. This type of knowledge is a procedural skill, which incorporates controlling an avatar as well as localizing your own, and your partner's avatar (Bennerstedt, 2007: 55). Such procedural skills are typically enhanced when faced with greater challenges and repeated activity.

In demanding situations the players need to know and learn particular knowledge fast (e.g. how to jump, shoot or open a door). When such situations arise, a player may pose a question for either player to answer and thus the player initiates a dialogue (even though it may be in a stressed and loud tone of voice).

Excerpt 2:

```
[Stormtroopers appear from an opening at the far end of the room
just entered and begin to fire their weapons, aiming at the
players' avatars]
PL: Let's fire! How do you do that? [Starts jumping - hoping to
find a button.]
PR: You can fight with X. [PR has now moved so close that his
avatar is engaged in hand to hand combat with the Stormtroopers]
PL: [The left player's avatar Princess Leia falls to pieces after
a number of hits]
PL: Ah, yes. I was that one! [The left player realize that the
avatar he observed was the other player's]
PR: Ha ha - did you think that you were my guy?
```

Several players in the larger study do repeatedly the same mistake and mix up their avatar with their playing partner's avatar. This is an unexpected behavior since the avatars usually have a distinct difference in their appearance, either the clothing or color differ and even though the avatars are made to resemble LEGO figures, one can easily see if the avatar is to resemble Luke Skywalker or Han Solo for instance. The behavior is even more unexpected if we consider that our players in this study have an extended experience with games according to themselves, more than 20 years and they are playing a game with a label stating that it is in the intended user span from three

years and above, at least according to PEGI (Pan-European Game Information). For the LEGO Star Wars II game with a shared screen it is not always easy to establish which avatar a particular player controls (see excerpts 2 and 4).

Excerpt 3:

```
PR: How do you put your weapon away? [The player is under the
impression that you have to put your weapon away in order to be
able to pull a lever.]
PL: [The responding player does not know but supplies with known
information about the subject at hand – weapons.] It comes out
with X.
```

For the players to be able to formulate a hypothesis on "how to put the weapon away", the other player helps with information on how not to do it. Sometimes the players actively take turn in the formulation and test of the hypothesis actively.

Excerpt 4:

```
PR: Stand over here! We're supposed to press these buttons,
right? [When trying to perform an action that needs both avatars
performing the same action, almost simultaneously, it might be
rude not to ask for confirmation since the players are not used
to playing with each other.]
PL: Yes, yes - I was just mixing up me with you [PL tries to
apologize for the strange behavior and was going to help out but
didn't realize that he was following the action of the other
player's avatar.]
PR: You think you are me!
PL: Yes.
PR: B? [PL is seeking confirmation on the needed knowledge in
order to perform the right action with "right" avatar.]
[The players manage to open a protecting 'door' for a window and
a lot of 'studs' falls out.]
PL: Damn, that's nice!
PR: Let's take the other side! [Walking on indicators in the
floor]
PR: Something happened there now. Did you see it? Something
flashed there!
PL: This? [PL stands on one of the indicators.]
PR: It was something green. [When PR is recalling something in
the game world which is not understood.]
```

It seems that the players feel safer communicating their thoughts when they play together. When PR is trying test his hypothesis, he needs PL to cooperate and starts to direct PL's moves. In this excerpt both players are engaged with the controllers and the game play but interestingly enough they do not point on what happens on the screen, instead they use their characters to indicate what they are talking about. The interaction is taking place in both the physical world and the game world at the same time. The players actively take turn in the formulation and test of the hypothesis actively as in excerpt 4 and sometimes one player is the driving force behind the knowledge creation as in the last third of excerpt 5.

Excerpt 5:

[The digital game gives an instruction on screen: “You can push objects that have black and yellow stripes”]
PL: [Reads instructions.] These ones right? [Uses his avatar to push crate-like objects.]
PR: Ok. The right one. This one should go here - what button to move… [Moves the other crate.]
PL: I think that you only walk into them? [PL does so.]Yeah!
PL: Now, why don't I do this? Aha! [PL keeps pushing the crate until it drops into a hole in the floor.]
PL: Really nice that this takes...Oh shit [Door opens – the Stormtroopers on the other side of the door start to shoot at the players’ avatars.]
PL: [Shoots back.] Arrgh.
PR: Sweet! [Complementing on well performed shooting.]
PR: We shouldn't kill him [PR recognizes C3PO as a friendly character standing behind the Stormtroopers.]
PR: You can take control of him. Some kind of code here? [Looking at a panel beside a door that has the face of C3PO.]
PL: ‘Walk up to friendly character and press Y to take control' [Quotes the instructions given in the digital game.] - Henchmen!
PR: Now I got him. I got him, now. Now I AM him. [PR tries to do what PL reads out loud.]
PL: But you are. You are? [Misses PR taking control of C3PO.]
PR: 'Droids can operate LEGO panels. Press B to activate them.’ [PR stands close to the panel again and quotes the instructions given in the digital game.]
PR: Ah – it’s that one. [PR is realizing that C3PO can do something with the door or panel.]
[Cut-scene in the digital game. The cut-scene shows Princess Leia handing over the Death Star blueprints to R2-D2.]
PR: Mhum.
PL: Hmn, what happened there?
PR: Now, she disappeared! [Princess Leia has disappeared, which is problematic since up until now one player has been playing this avatar and the digital game switches avatars for the players.] Now I became him [C3PO]. You became my guy, I guess.
PR: Ai, I didn't manage to read [Instructions from the digital game disappeared from screen.]
PL: You became boosted? [The animation that shows when the players change avatars could be interpreted as an energy boost, but this is not the case.]
PR: So was he. [Continues switching avatars, this time from C3PO to R2D2, and accepts the other player’s interpretation as something possible.]
PR: Let us go forward. To here and check it out! [PR starts to move to the far end of the room with R2D2-avatar which uses wheels.]
PL: Wait. I wonder what to...
PR: You should also become a droid? Maybe, I don't know?
PL: Damn you can't choose!
PR: Come here now! [PR enters the next room, dragging PL with him.]

In this excerpt the players seem to be attached to “their” avatar and when the Princess Leia-avatar disappears this confuses the player that controlled that avatar. In different play sessions other players seem to have grown even more attached to Princess Leia and start to look for her. The confused player becomes more passive than the partner.

Excerpt 6:

```
PR: I can shoot with something? [PR tries the X-button with the
R2D2-avatar. R2D2 is only armed with a stun gun, which has a
totally different look and function than the ordinary blaster
that other avatars carry.]
PR: That's not so good. I can't destroy boxes with this guy. [PR
tries to understand the function of the stun gun and does so by
trying to blow up boxes with the stun gun.]
PL: What use are you then? [PL only recognizing the usefulness of
common avatars armed with blasters for combat.]
PR: I don't know? [Even though the droid avatars proved their
value valuable in opening doors, PR cannot disagree on the
usefulness of common avatars.]
PR: Now I'm him again. [PR switches to the C3PO-avatar.]
PL: I probably have to choose him. [Since they seem to be unable
to progress with the current avatar – 'Captain Antilles', PL
hypothesizes that he should change avatar to make some progress.]
PR: Is it that one we should pull down. The elevator over there?
It looks like a thing we should use.
```

In excerpt 6 the players do not engage themselves in reflective learning activities. Possibly because of what is happening at the far end of the room (rebels and Stormtroopers are engaged in combat with each other) or because of the prior confusion on the switching of avatars. The players are safe but feel stressed because of the shooting and they focus on the preferred abilities of their first avatars which could shoot with blasters – an ability needed if they encounter Stormtroopers. It could also mean that the players feel more attached to a specific avatar rather than the abilities of an avatar.

Excerpt 7:

```
PR: What happens if you do that thing? No. It did not work. That
thing. There is a button over there. Should one pull down that
one?
PL: Right.
PR: Should we run back? All the way to that room… Is it supposed
to be that…?
PL: That we have gone too far?
PR: Too far? I don't know.
```

Continuing within the same room as before (see excerpt 6), the players have used "a vehicle" (a crane) to solve a puzzle and to progress further in the game. The players do not solve this puzzle as fast as previous puzzles. In fact, they spend more than four minutes to produce an idea, but rather than focusing on a solution within the room, which all progress based puzzles in LEGO Star Wars II have, they start to question their knowledge of the game and they begin to formulate a strategy that comes from other games. The players are either not incorporating the knowledge of this game to their total skill repertoire or internalizing it. The player's repertoire does not seem to be entirely context based but rather universal for all games, so much that even when the current game is more important, other games takes precedence.

They other players (in the other sessions) perform similarly, not always at the same position or for the same reason in the same position but more than one play group tries the "Should we run back?"-strategy. If we compare all player groups that play a LEGO game for the first time (groups 1-12) it seem to be a common, but not an universal strategy for solving in game problems.

Table 1 – The utilization of "Should we run back?"-strategy by group.

Pair	Goes back	P1 gender	P1 age & experience	P1 play h/week	P2 gender	P2 age & experience	P2 play h/week
1[xi]	Yes	Male	33 (20)	15	-	-	-
2	No	Male	24 (15)	10	Male	19 (5)	10
3[xii]	-	Male	-	-	Male	-	-
4[xiii]	Yes	Male	35 (24)	10	Male	32 (23)	10
5	Yes	Male	19 (?)	?	Female	21 (?)	?
6	Yes	Male	27 (17)	10	Male	21 (11)	15
7	Yes	Female	19 (10)	6	Female	30 (20)	3
8	Yes[xiv]	Male	19 (10)	20	Male	23 (20)	10
9	Yes	Male	25 (20)	17	Male	25 (20)	20
10	Yes	Male	20 (14)	14	Male	18 (10)	20
11	No	Male	24 (19)	15	Female	19 (10)	1
12	No	Male	21 (10)	38	Male	20 (15)	28

Excerpt 8:

```
PR: [Swings a light saber with the avatar Obi-Wan Kenobi.] Ooops.
We are a team. I can hurt you. Damn.
PL: You can? Oopf. [PL is a bit startled and when his avatar
takes damage from the wielding of the light saber promptly
verbalizes that his avatar is taking damage.]
PL: [Tries to shoot with no enemy present and hits PR's avatar.]
PR: You can hurt me too! [A bit chocked that PL fires his blaster
at his avatar.]
PL: Wait. Come back here. We need to have good field of vision.
PR: [Moves back.] I don't know. How should we do if… If you fire…
We will have to try to keep out of each others way when this
happens.
```

Here the players realize something that other players realize earlier on. Almost 27 minutes into their play session they realize that they can harm each other's avatars. The interesting part is that they try to formulate a policy to follow a norm from real life," do not harm the ones you cooperate with". The norm they try to uphold is not really needed in or a part of LEGO Star Wars II since the avatars respawns instantly and the penalty for losing an instance of your avatar is minimal; it only affects the number of studs you have collected.

Excerpt 9:

```
PL: [Grapples with Luke Skywalker-avatar.]
PR: What button was that?
PL: Jump-button.
PR: I can't use that one. Only you can do that.
[The players continue to play for another 5 minutes with
intensified use of different abilities of the avatars of
different types until]
PL: So cool, that we have different…
PR: …different things. Yeah. [Talking about different abilities
but focusing on the materialization of the actions of the avatars
– Obi-Wan has a light saber and Luke a blaster.]
```

Here we can see that the players use a reflective process in their learning of the game play. The reflective process in digital game learning is a notable one (Gee, 2003) but it is not always an active or present one as this excerpt shows. Bennerstedt states that for some games the reflective process is initiated by force and one of the advantaged of the use of digital games as a medium for learning processes (2007: 64).

6 INTERPRETATION OF RESULTS

The players participate in five types of learning situations; 1) trying-observation (excerpt 1), 2) observation-sharing (excerpt 1), 3) turn-taking formulate-try-observe (excerpt 4), 4) observation-reflective (excerpt 8) and 5) reflective (excerpt 9).

These situations do not vary much from previous findings (Bennerstedt, 2007) except for the amount of time the stand-alone reflection takes to make. The experienced player behaves in principally the same way as the inexperienced player except in one aspect. Previous findings show that a game and its theme can send different messages and thus obstruct the player's possibility to perform or progress:

> "These observations shows that a central learning process during play is to go from the starting point where the game works in analogy with its theme (doors are possible to open, it is possible to fall of ledges) to learn the rules of the game in question (only certain doors, with specific looks, are possible to open, avatars cannot fall of ledges)", Linderoth (2004: 249).

The game LEGO Star Wars II is a game where the players are spared from the problematic mismatch of theme and rules. However, watching the players performing we can clearly see that something else is not working smoothly. The player's own repertoire sometimes hinders them in their learning and their progress through the game (see excerpt 7). When the players are challenged with a puzzle and cannot solve it and continue their progression of the game within a comfortable timeframe, they start to adopt a strategy of going back to previous areas, which is a common solution in other games but have not been used in this game at all. Instead of just trying all the objects in a room the players think they have forgotten something in a prior room. The players are either not incorporating the knowledge of this game to their total skill repertoire or internalizing it. The player's repertoire does not seem to be entirely context based but rather universal for all games, so much that even when the current game is more important, other games takes precedence. This suggests a high generalization of game knowledge (see the Game Literacy Taxonomy level of extended abstract) in experienced players.

The learning process of video gaming is viewed by Gee (2003: 90) as a situated activity with a reflective process. The reflective process contains creation, testing and retesting of hypotheses as we have seen in the excerpts. However, sometimes the testing and retesting of hypotheses seem less important and the players fall back on their prior repertoire. This becomes a problem when trying to learn a new game as the previous knowledge of how to play games builds on a repertoire that conflict with the new game. The old repertoire works as a mental block or obstacle for the players to incorporate the specific game knowledge in the specific context. We conclude that this [re-]learning obstacle is related to cognitive schemas. A (cognitive) schema is a concept that supports us to structure and interpret information. By using schemas, it is possible for a human to take shortcuts in the interpretation of information. However, these mental solution patterns also cause humans to exclude new relevant information and instead keep old information that confirms our pre-existing beliefs and ideas and thus hinder the extension of the player's repertoire.

Scripts in cognitive schemas are structures that help us to enact and understand behavioral patterns. A traditional example of scripts in cognitive schemas is the "restaurant script" which shows the users' enacting of the entering of a restaurant, order food, pays and leaves in a correct manner (Shank & Abelson, 1977). As a game

application Lindley and Sennersten describe “game play schemas” and scripts that the player follows, for instance in a combat engagement with an enemy (Lindley & Sennersten, 2006). By focusing on a higher level of knowledge, like cognitive processes, rather than interaction semantics, which is only valuable when direct resemblances between interaction patterns exists (e.g. using ‘w’, ‘a’, ‘d’ and ‘s’ keys on the keyboard to move an avatar up, left, right and down, respectively) we can help players or users to learn other operations. Such cognitive process like “sense -> model -> evaluate ->act” sequences are useful when they can be transferred to other contexts (Lindley & Sennersten, 2008).

Therefore the problem of reaching a higher level in the play behavior that allows for a reflective process is perhaps one of the largest obstacles when using games for learning. New players that cannot learn in such a situation will perhaps quit playing instead of learn anything more in order to progress further into the game. Developers of commercial or serious games cannot base central game knowledge or concepts entirely on an in-game reflective learning situation, because it takes more than repetition and simple instructions to invoke them. In our case it takes the players more than 30 minutes to formulate a hypothesis on the use of different avatars which the game designers tries to learn them after 10 minutes (see excerpt 5). All actors in the digital game development should question the learning potential for their game, especially when the industry is hoping to reach a larger market with less literate players than the current market exists of.

6.1 Tying in the theory and the empiric data

If we analyze and compare the different situations in the different excerpts to our Game Literacy Taxonomy we can see how the experienced players of our case study move from the unistructural (excerpt 1-6) to the multistructural (excerpt 8-9, with 7 on the verge between both levels) dimension of context of other games as they internalize yet another game into their player’s repertoire. The movement from the previously mentioned levels cannot happen until the players are in a position to start reflect on their playing. To be able to move further on the taxonomy’s levels cannot happen until we bring in other games as reference to allow for the players to relate to other games or generalize on their play session.

On the dimension of context of human culture in the Game Literacy Taxonomy we also need to relate to external references outside of the game. The references are typically of social cultural in their nature (like society, architecture, other people, movies or literature). The players’ demonstrate this only in excerpt 5 where they bring in the games relation to the movie.

Unfortunately the dimension of context of technological platform falls outside of the play session due to the fact that they never discuss anything remotely concerned with the technology. This is possibly because of the familiarity the both players have with the platform at hand. The players use short and correct references to the names of the buttons like “A”, “X” and “B” without examining the game pads beforehand as well as in excerpt 1 try basic movement in the game space with the game pads without reflecting on their mechanical activation of the game pad artifacts. It is almost like they are trying on their new digital embodiment as a routine instead of becoming hindered by transition to the new context. This intrigued state of mind can allow us to conclude that the players are beyond the initial level in the Game Literacy Taxonomy; prestructural.

6.1.1 Comparing with previous findings

In order to explain this study’s contribution will we relate our findings of “how experienced players learn to play a game” to previous studies. Previous studies with

learning aspects in games with similar methods (interaction analysis and conversation analysis) where cooperation and collaboration are present are for instance; informal learning of game's rules, Sjöblom (2008), children's use and learning with digital games (Linderoth, 2004) and how two game illiterates become literate by adopting (Bennerstedt, 2007).

During the in depth study of the related previous work mentioned above we will focus our comparisons on Bennerstedt's study (2007) because Sjöblom (2008) does not provide an analysis of learning situations and Linderoth (2004) used children, neither Sjöblom or Linderoth provides information of how experienced their players are. For instance, Linderoth's players range from 6 to 11 years of age, leaving us with a possible previous game knowledge of at least 5 years, suggesting that all players begun playing games and even these specific games when they were 6 years of age. However, Bennerstedt's study where two female and inexperienced players, of 23 and 25 years of age respectively, play *Timesplitters 2* (Free Radical Design, 2002) in "story co-op" seem to correlate well on the following criteria; method, players' age, but is also interesting to compare with since they are on the other end of the game experience spectrum, since our study's players are experienced. Due to the fact that we use a different game and do not have the data that Bennerstedt bases the excerpts on we cannot compare the players' results quantitative, however, we can compare them qualitatively.

In our study they players' experienced the following learning situations; trying-observation, observation-sharing, turn-taking formulate-try-observe, observation-reflective and reflective, which the inexperienced players of Bennerstedt's study also does. But according to Bennerstedt "…[the players] have moved on from not noticing buildings' doors and levers and buttons as relevant for their game interaction, [but instead] … starting to see them as … units that have a function in the game itself"[xv]. When we re-assess the video and audio material from our pair, we possibly are noticing a difference in behavior – the experienced players seem to be actively looking for these "units" (buttons, door and helping objects) right from the start. Their previous game "training" has rewarded this type of behavior. The experienced players are more interested to find these "units" as fast as possible – not to learn their usage and meaning in the game model by formulating and trying hypothesis to their success or failure. The inexperienced players, on the other hand, are forced to change or adopt their actions and reflect more on how the game model functions. When the inexperienced players are struggling to handle both the game and understand the model that the game functions according to "…the pair's interaction with the game … forces the players to think in new ways and challenge their previous knowledge"[xvi]. The experienced players demotes the importance of learning of how the games model function to a more procedural level or in other words, they are not as interested to learn the true functioning of the game initially – they will only adopt the more costly learning situation; reflection, when it is absolutely needed or when it is valuable enough. The experienced players seem keener to adopt trial-and-error instead of more reflective approach. The inexperienced players handling of the game and understanding of the game's model follow in parallel and thus become a resource to formulate hypothesis' to extend their understanding of the game model.

6.2 Validity and research design

Since our study observes a socio-technical system in use we will discuss the validity threats to this study from a social research perspective. Before we explore the validity viewpoints we intend to lay the foundation of the terms we will use and relate it to our study context. We begin by dividing the research into two dimensions, namely; 1) theory and 2) observation. In the first dimension we – the researchers,

construct ideas and models of how the world function and in the second one we, the researchers, translate our model of the world into a program, measures and observations. Throughout the study we move between these two dimensions. We are trying to perform a descriptive study where we have a theory that the players learn to play a game during a series of learning situations. However, we do not know which types of learning situations that arise.

6.2.1 Validity review

In this section we attempt to review the research made in this thesis by going through four steps; 1) what is the research question, 2) does the research design match the research question, 3) how was the study conducted and finally 4) are there rival explanations for the results?

6.2.1.1 What is the research question?

For descriptive research to be valid the study must be design to answer the type of question asked. Descriptive research can ask the following questions; 1) what is happening, 2) how and/or 3) why is something happening.

Our study aims to answer the question “how an experienced player learns to play a game” which corresponds to the second type.

6.2.1.2 Does the research design match the research question?

For research to be valid the research design must match the research question. The interaction analysis is a descriptive method. We could have chosen to use other descriptive methods like walkthroughs, protocol analysis, think aloud protocol or with possible problems content analysis (Babbie, 2010).

The method and research design match prior studies with similar artifacts and the interaction between people to people and people to artifact (Linderoth, 2004; Bennerstedt, 2007; Sjöblom, 2008).

6.2.1.3 How was the study conducted?

The study’s participants are described with characteristics as well as how they were chosen (strong play experience). No treatment was used. The data collection was made as an observation by a video camera (including audio) and a mirror to minimized synchronization errors between two cameras. Since technical instruments can be faulty calibrated the use of the cameras audio and video was checked before each play session during the study.

The data analysis was performed with narrative descriptions and observations. It is possible that we could have extended the categorization and coding of the data more but neither of the prior usage (Linderoth, 2004; Bennerstedt, 2007; Sjöblom, 2008) in the same domain suggested in what way.

6.2.1.4 Are there rival explanations for the results?

It would be to the study’s advantage if other sources of data could be used. Possible sources are interviews and other observational methods whereas documents are ruled out. Instead of using multiple data sources, other data was collected with other pairs. We choose the most experienced pair in order to have as little background noise as possible to thwart our analysis.

6.2.2 Validity of the study

When conducting research an important aspect of the results are the validity of them. In the field of software engineering, Wohlin et al discuss the validity threats to experiments (2000). Even though the validity threats suggested by Wohlin et al are

related to experiments, some of the threats are food for thought for our case study (ibid). Campbell & Stanley define two types of threats; the internal and the external validity (1963) which Cook & Campbell later extend into four types; conclusion, internal, construct and external validity (1979). Out of the latter four, the conclusion validity could be divided into seven different issues;

1) Low statistical power
2) Violated assumptions of statistical tests
3) Fishing and the error rate
4) Reliability of measures
5) Reliability of treatment implementation
6) Random irrelevancies in experimental setting
7) Random heterogeneity of subjects. (Wohlin et al 2000)

Since these conclusion validity threats are connected with experiments and often concern sources of error that lie in the realm of quantitative methods rather than the qualitative method that we used, we instead intend to discuss the issues from our point of view. For instance the third issue; "Fishing and the error rate" could be discussed since it is applicable to any study where the data is interpreted. In our case the "Should we run back?"-strategy that we believe the players rely on could from an external observer be affected by our searching for a specific result. However, the "Should we run back?"-strategy ought to be valid due to the effects of the advantages of the interaction analysis due to the following arguments; 1) the players' behavior is documented by audio and 2) video recording, 3) and the behavior was not something we set out to find and thus we were not able to "fish for it".

The issue of "Random heterogeneity of subjects" as a validity threat could perhaps quickly be set aside as a none threat for our case study but if we inverse the threat and formulate it as "/random/ homogeneity of subjects" it is worth discussing. When we put together the subjects they are very alike; they are all students, mostly male, fairly young adults with several years of digital games experience and brought up in a western culture (except for a few individuals) also ethnical Swedes. This homogeneity of the subjects is all fair when generalizing the results matching a population of male westerners with access to technology and a medium to vast knowledge experience in games but what are the effects of an upbringing outside the western hemisphere?

The next type of validity threats, i.e. the internal threat type consists of 13 different ones:

1) History
2) Maturation
3) Testing
4) Instrumentation
5) Statistical regression
6) Selection
7) Mortality
8) Ambiguity about direction of causal influence
9) Interactions with selection
10) Diffusion or imitation of treatments
11) Compensatory equalization of treatments
12) Compensatory rivalry
13) Resentful demoralization. (Wohlin et al, 2000)

Similarly, most of these threats are applicable to experimentation but with our viewpoint some of them could be applied to case studies as well. For instance the maturation threat where the subjects react differently due to tiredness, boredom or learning (as a positive effect) we have tried to counter by using a limitation of the time

spent by the subjects to one hour. Likewise the aspect of instrumentation where the effects are affected by how artifacts involved in the experiment execution and in our case the case study set up. For our case study we tried to create an environment where the subjects could feel comfortable in a non-familiar environment. By placing the mirror and camera outside the players' focus and use similar equipment that one would use at home (an Xbox 360 and a TV-set) we tried to limit the instrumentations' effects on the subjects.

The selection aspect is of greater concern due to the fact that in our case study the subjects were all volunteers, which might affect the case study since volunteers generally are more motivated. However, by choosing a digital game where the players had previously no experience but greater game experience the setup is more similar to reality than an artificial setup since experienced players very often are in such situation with a similar level of motivation.

The construct validity threats, i.e. the threats that are connected with the design and of experiments and in our case the case study are in total 10 different ones:

1) Inadequate preoperational explication of constructs
2) Mono-operation bias
3) Mono-method bias
4) Confounding constructs and levels of constructs
5) Interaction of different treatments
6) Interaction of testing and treatment
7) Restricted generalization across constructs
8) Hypothesis guessing
9) Evaluation apprehension
10) Experimenter expectancies

For this type the three last validity threats are especial interesting since they are connected with the social situation our case study take place in. However, since our case study utilizes a digital game the immersion quality of the software take presence over any hypothesis guessing or even the evaluation apprehension. In other words, the subjects are too preoccupied with the main activity of play which blocks out other, unwanted behavior.

Continuing with the external validity threats that are the conditions that limits our ability to make generalizations to the reality are:

1) Interaction of selection and treatment
2) Interaction of setting and treatment
3) Interaction of history and treatment

Even though our case study does not apply treatments as controlled experiments do we can discuss these aspects from a more common aspect of how interaction of selection and generalization instead of interaction of selection and treatment. As such the selection could be extended in future case studies where this study's finding are related to selections with fewer males or included younger or older persons. Even though our selection matches the intended consumers of digital software for entertainment purposes by being able to use another selection other interesting aspects might be found. The aspect of setting could perhaps with mobile recording equipment be even more efficient if the researchers gather data in the subjects own home environment.

7 CONCLUSIONS

In order to function in today's information intense society we need more competences than just to be able to read and write in order to be literate - a term signaling our ability to function together with (previously) written information. Our daily usage of information for both professional and recreational use is intertwined with our ability to use information systems. A modern approach to understanding literacy should therefore include our ability to interact with these systems. Common successful applications of information systems are digital games. These systems are complex but still their users are able to function very well, even in stressful situations.

We have explored digital games usage with the intent to understand the concept of a basic knowledge to use games. This digital games usage is explored by observing how literate players learn to use a game and the problems they encounter. Such problems seem to be a manifestation of “cognitive friction” or, as Cooper puts it, “the resistance by a human intellect when it engages with a complex system of rules that change as the problem changes” (Cooper, 2004). By adopting context based controls within a game or a system we move away from a narrow range of states into to a much larger solution space than physical objects allows for. The system becomes complex, not because of its technical construction but rather the endless range of opportunities its delivers. The user will engage with the system in a way the user seem possible not what the system actually is capable of. We conclude that the user’s mental model of how the system works limits the user’s view of how the system could be used. We suggest that the users’ mental model of how the system works should be more explored during the system development process rather than focusing our development resources and effort to find new ways of interacting with these new systems. By inventing new ways to interact with the system the developer might risk an alienation of the users rather than incorporating them into the socio-technical system as intended.

If we are effectively going to build on a literacy for information systems we need to appreciate the players' ability to build a model of how the system works and allow the user to play and experiment with the system and its boundaries to become expert users. However we will have to acknowledge that prior systems have trained our users so that if we intend to make the user use the system in a new way we have to steer clear of schemas previously used. In praxis this means that we have to follow a consistent "look-and-feel", present a cognitive model of how the system is intended to work according to "affordances".

A basic system competence - or information systems literacy would incorporate interaction models similar to web browsers. And to make a short allegory - the popularity of the iPhone and its "apps" is perhaps of its limitations rather than its possibilities. A limited solution space in every application, window or view is successful due to its simplicity based on the small screen, the touch interface and the initiated "iPhone"-based interaction model. It is hard to make the user use a manual and even harder if you cannot send it through the “AppStore” so why do we not approach user training as game designers do? Players are learning games through tutorials within the system and their abilities are confined to a limited solution space that is extended step-by-step with the users’ ability to comprehend it.

If we, as software developers, understand the users, by acknowledging the fact that the users are trying to make sense of the information system at hand by building their understanding on their prior user experience (i.e. the repertoire or literacy). Hence the users will be able to make informed choices in their use of the system because the users share the mental model of how the system works with the developer.

7.1 Ending words on Literacy

Game literacy, as previously noted, is a term that has been used with different scopes, based on the different backgrounds that digital literacies and media literacy respectively provide. From a digital literacies perspective the foundation lies in the ability to understand and decode content whereas the media literacy perspective have to take into account for the platform as well as a critical language for the use of the content and medium. Both views are troubled with a lack of understanding of the problematic nature of games – games share to large extent aspects with each other, but games are still unique artifacts that make them hard to group as a single literacy. By recognizing the two different views; 1) media literacy and 2) digital literacy, during exploration of the literacy discourse in game studies, the explorer will understand each contribution's advantages and limitations.

By presenting the weaknesses of the previously suggested Games Literacy Framework by Zagal (2008), and most importantly, the problem with the digital (only one level) representation of literacy it has, our solution the multiple level taxonomy for Game Literacy help mirror the different qualities and aspects of the literacy term as well as its meaning. The fact that Zagal's suggested framework works as a state-of-the-art of how game literacy functions is with our attempt both a critique and a instrument for other software engineers to suggest literacy-models for their specific domain.

7.2 End words on Game Literacy Taxonomy and the case study

The Game Literacy Taxonomy seems to connect fairly well with the behavior the players present during the play session. We suggest that further studies of a possible practical use of the taxonomies are made in a wider game context; i.e. in discussions in under graduate digital games' programs.

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TABLE OF FIGURES

[i] The desktop metaphor is a metaphor used in graphical user interfaces. The graphical user interface treats the monitor as a desktop the user sees and interacts with. The desktop usually contains traditional office accessories like notepads, binders, a waste bin and a calculator. The desktop metaphor was introduced by Xerox PARC in the seventies and was made popular with the introduction of the Macintosh computer from Apple.

[ii] Today's work environment has changed to incorporate collaboration, multitasking, multiple roles, technologies and information objects (laptops, PDAs, URLs, email, the iPad, surfpads, smartphones, the Blackberry, etc.). The desktop metaphor has limitations (e.g. conflict between access and display and user multitasking and collaboration) and user interfaces are nowadays designed to handle that and thus the interaction goes beyond the desktop metaphor into a post-desktop metaphor paradigm (Kaptelinin & Czerwinski, 2007).

[iii] Sommerville mentions the likelihood of an operator making an error by providing the wrong input and how likely the system is unable to detect and propagate the mistake. (Sommerville, 2011)

[iv] http://www.youtube.com/watch?v=r7ttRaXlnfs (Retrieved December 13th 2010)

[v] Skinning (or actually reskinning) is the process of changing the appearance of an application, a website or, more commonly, in the digital games domain in-game graphics like avatars.

[vi] An expression initially derived from the term "modify". Commonly used when modifying hardware or software to do things not intended by the developer. In the digital game domain it is usually used to describe the generation and alteration of in-game content and publically shared over the Internet.

[vii] A specific form of playing a digital game or a part of a digital game (e.g. a level) where the player add an extra goal of completing it as fast as possible. Racing games cannot be used to perform speedruns with. Sometime tools are used to support this activity and consequently described as "tool asisted speedruns".

[viii] A level editor is a software tool used to design and modify levels in digital games.

[ix] A sandbox game is a digital game based on a level design concept where the player can move freely in the game world. The sandbox games allow the player to play creatively without artificial constraints and therefore the game does not have a "correct" way to play it.

[x] The excerpts are translated from Swedish to English by the thesis' author.

[xi] This is not a pair since one of the players did not show up for the case study. The data is omitted from this table.

[xii] Videodata unviewable.

[xiii] These are the players in the excerpts.

[xiv] This pair engages in extensive play activity outside the level where the others played and goes back when they realize that the game (in the classical sense) has not started.

[xv] Translated from Swedish to English by the thesis' author.

[xvi] Translated from Swedish to English by the thesis' author.