

Beyond Rules of Play: Rethinking Play in Serious Game Design Assessment Frameworks

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Abstract

It is widely acknowledged that video games can provide an engaging, motivating, and fun experience, but their capacity to constitute learning experiences is less known and their learning experiences are usually an accidental side effect. The digital gaming community has branched over to games that aim to leverage the power of play to support specific activities, such as therapeutic, educational, or organizational training activities; called serious games. After reviewing underpinning theories, key literatures, and challenges and issues involved in the process of serious game design; it is quickly recognized that there are necessary conditions that should be present and active for play to occur, be sustained, and have a positive impact. To guide the possibilities offered by serious games, experts have developed theoretical frameworks, which balance theories from human development and game design, to underpin effective serious game design and development by structuring their formal components and the relationship between the components. These frameworks help draw out useful interpretations and limitations of a serious game's design. Suspiciously, however, research that gives support to the impact of serious games has received less attention. Through a closer look at play in these frameworks, it is uncovered that they focus on in-game components and serious game requirements, but lack a player-centric approach to play. To enhance the analysis of how a serious game connects its purpose with in-game components or how it combines entertainment and learning objectives, a conceptual framework called the Player-Centric Approach to Serious Game Design Assessment (PCASGDA) is synthesized. The PCASGDA model supports a systematic and detailed representation of serious games, depicting the ways that game elements are connected to each other throughout this type of game and how these elements contribute to the realization of the serious game's purpose. Five case studies (Re-mission, SPARX, Elude, Sym and The Everyday Adventures of Samantha Browne) appraise the PCASGDA model's ability to argue a serious game's impact through a more exhaustive decomposition of its formal components.

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Introduction

Games designed for specific purposes were played since a time before the Egyptian pyramids stood (McGonigal, 2011), but they have attracted increased interest in recent times due to the exponential rise of digital gaming in popular culture and claims regarding the potential of games for sprucing up mundane activities. This has led to the coinage of the term “serious games”, which is a term subject to conceptual debate, used in this thesis to denote digital games that have non-entertainment motives. The term “serious game” may seem to be a new phenomenon that appeared out of nowhere, but the idea of using games to deal with serious matters is very old. The use of this term can be traced back to the Renaissance. Neo-platonists used the term “serio ludere” to refer to the use of light hearted humor in literature that deals with serious matters. The current wave of “serious games” reappeared starting in 2002 as a label to emphasize the difference between entertainment games and games designed for serious purposes (Djaouti & all, 2011), changing a game’s image from a “toy” to a “serious tool”. Games designed to provide support for behavior change have received a lot of past interest, especially in therapy (Scafer & Cangelosi, 2002) and a wide range of digital games have been designed and developed for personal care. The serious game movement has re-emerged from academic communities, leveraging the power of play to support educational, training, and therapeutic activities.

0.1 Field and Subject of Study

Serious games are the result of several fields employed, such as game and media studies, education, and psychology. The power of games to engage and motivate has attracted interest

from many institutions, leading to a reconceptualization of what play is and approaches developed to explain serious games and how they can be designed to support specific objectives.

Approaches to serious game design have improved over the years, but serious games in general have not reached a level of success comparable to their commercial counterparts (Kemble, 2014). As yet, entertainment game experiences have established their ability to give their players an engaging learning experience, while purposeful digital games sometimes create what Seymour Papert (1998) refers to as Shavian Reversals, which in biology indicates an offspring that inherits the worst characteristics of both parents. These games are not primarily pleasurable and instead privilege content over the play experience. In a Shavian Reversal, the psychological and sociological values of play, such as affording a dynamic individual language that is needed in order to express subjective feelings that ordinary collective language cannot express adequately or facilitating the development of a sense of self through learning to interact with a cultural environment, are weakened, rendering the potential benefits of play impaired. Some experts argue that serious games do not need to balance objectives with the entertainment value of commercial computer games (Frasca, 2003; Michael and Chen, 2005; Sawyer, 2007). However serious games, like Remission and SPARX, have proved otherwise. Research studying the impact of the serious games Remission (Kato & all, 2008) and SPARX (Merry & all, 2012) that are designed to enhance treatment adherence reveal that they were successful; validating that it is possible to design serious games with unvitiated values of play towards intended purposes.

Several authors support a digital environment's ability to provide enhanced experiences compared to traditional psychotherapy (Gamberini & all, 2008; Homles, 2009; McCallum, 2012; McGonigal, 2011; Riva & all, 2015), but how this actually happens is still not fully answered. Some proponents in the field of using games in health research claim that they can effectively

engage players by applying a formula for adding points, achievements, feedback, social challenges, and leader boards. The derogatory term coined by Margaret Robertson (2010) for this reductionist approach is “pointification”. This approach to serious game design is criticized as reductionist, because a game is an integrated system which requires that its elements are balanced and cannot be considered a collection of parts, especially when the purpose of a game is to act as a tool for behavioral change. Robertson (2010) laments that this approach does not explain how to incorporate principles of play towards a purpose in a way that preserves its value.

Serious games are considered to have serious potential as a tool for instruction and intervention, but a recurring critique in the field is whether a serious game’s purpose is delivered. This raises questions regarding their usefulness. Since serious games will be a part of the future of personalized and participatory healthcare, serious game designers are presented with the opportunity to develop better games and provide evidence of their quality in terms of their impact or effect. To support the design and assessment of serious games, one of the most important solutions arising is the development of guidelines and frameworks. Research is conducted towards the development of frameworks and approaches to uncover and analyze the reasons behind a serious game’s success or failure (Kemble, 2014; Mitgutsch & Alvarado, 2012; Winn, 2009). These works provide interpretations of the possibilities and limitations offered by serious games and explain, at a formal level, why serious games are motivating and enable learning by doing. However, they do not fully answer questions about how the formal components of the serious game have to be structured to support learning. In other words, existing serious game design frameworks do not incorporate a methodology of play that can be used to study the interface and interactions afforded between a player and a serious game. They

leave out an important component of how serious games build discourses of aesthetic value: active player participation (Sicart, 2011).

To fill this gap, this study encompasses the synthesis of a conceptual tool to aid serious game analysis and design, linking entertainment objectives with learning objectives. The framework, named Player-Centric Approach to Serious Game Design Assessment (PCASGDA), is based on theories of play which consider games not as an isolated tool, but as part of a complex system that includes human actors and the motives driving player interaction with a serious game. This framework can be referred to when trying to identify the various components that constitute serious games and how they are linked. Compared to existing frameworks, the PCASGDA model offers a more inclusive structure for the analysis of the learning and gaming components of a game, allowing designers to perform a more exhaustive decomposition of a serious game's components and to link these components to the serious game's purpose.

0.3 General Hypothesis

If a serious game's design balances the elements of games, play, and learning; it can encourage embodied player participation and consequently become a more effective form of play. This thesis argues that if serious games are designed to be purposeful by design and intend to impact their players, their purpose needs to be reflected in all design components, including play to argue a serious game's ability to cast a player in the role of active participant and its effectiveness as a form of play.

0.4 Methodology

There are a lot of variables to consider in the design and development of serious games. Since it is argued that a combination of educational and entertainment experiences is both possible and

necessary, this should be reflected in existing serious game design frameworks. Through an iterative process that alternated between literature review and practical testing of the concepts of serious games, points for refinement were identified in Chapter Three. It is argued that existing serious game design frameworks lack a player-centric approach to play and can benefit from integrating a critical component of how serious games build discourses of aesthetic value: active player participation.

By combining the literature on play therapy techniques, principles of player-centric games, and serious games, a model that can be to enhance the assessment and design of serious games is synthesized in Chapter Four. The PCASGDA framework includes a play component taxonomy, based on existing player-centric approaches to game design (Calleja, 2011; Hunicke & all, 2004; McGonigal, 2011; Squire, 2006), and a serious game component taxonomy, based on an established serious game design assessment framework (Mitgutsch & Alvarado, 2013), to cover instructional design and serious game design components. In order to ensure the link between serious game components and their impact while eliminating the influence of other variables and substantiate the claim of this thesis, the synthesized model, the PCASDGA framework, is used to evaluate five serious games: Re-mission (2006), SPARX (2009), Elude (2010), Sym (2015), and The Everyday Adventures of Samantha Browne (2016). In the following sections, the game analysis methods and the reasons behind the selection of the serious games studied are detailed.

0.4.1 Game Analysis

The study of digital game aesthetics is a very recent practice, spanning less than two decades (Aarseth, 2003). The ubiquity of digital games inspired their subjection to humanistic study,

where digital games are placed closer to works of arts than traditional games. By carefully considering digital games as a new phenomenon, Aarseth (2003) outlines and promotes a methodology for the aesthetic study of digital games, explained below. This method is selected, because it is not limited to any particular theoretical result or model and is an empirical approach. It is used to provide insight for the study of each serious game's design components structured by the PCASGDA model.

According to Aarseth, there are typically three dimensions that characterize every digital game: gameplay (the player's actions, strategies, motives, and communication), game structure (the rules of the game, including the simulation of rules), and game world (fictional content, topology, level design, textures, etc.). By focusing on each of these three levels, three different types of game research perspectives can be identified: gameplay (sociological, ethnological, psychological, etc.), game rules (game design, artificial intelligence), and game-world (art, aesthetics, history, cultural/media studies). These interdependent levels have different weights in each game. For example, in reaction-based games like Tetris, the rules dominate the game; but in games like Half Life, a world-exploration game, the world dominates the game. But, for any kind of game, there are three main ways an evaluator can produce general observations about its game and play components: study the design, rules, and mechanics of the game; observe others play; or play the game himself (superficially, lightly, partially, completely, repeatedly or innovatively). The third way is considered the best, especially when reinforced by the other two ways (Aarseth, 2003). There are also other ways to acquire knowledge about a game that include: previous knowledge of genre, previous knowledge of game system, other player's reports, reviews, walkthroughs, discussions, observing others play, interviewing players, game documentation, play testing reports, and interviews with game developers (Aarseth, 2003).

To analyze the serious games selected for this study, observations of game-rules are supported with other reviewers (Cwalbrid, 2012; Donnelly, 2015; Holtreman, 2015; Hughes, 2014; Kato & all, 2008; Kemble, 2004; Mader, 2002; Mariko, 2016; Merry & all, 2012; Miller, 2015; Owen, 2013; Steam 2015; Steam, 2016; Szalavitz, 2012; Tech.Mic, 2015). Each serious game is studied by the evaluator through 6 sessions of repeated, partial, and light play of 20-minute periods, because it is the average amount of time people are able to fully concentrate on a task (Ross & Nilsen, 2013) to procure knowledge about the game design components. In addition, videos featuring the serious games' gameplay from youtube channels were used to observe others play (Youtube, 2012; Youtube 2013a; Youtube 2013b; Youtube, 2014; Youtube, 2015a; Youtube, 2015b; Youtube, 2016a; Youtube, 2016b; Youtube Gaming, 2009; Youtube Gaming; 2012a; Youtube Gaming, 2012b). In this way, a balance between free play, analytical play, and non-play can be achieved to inform each game analysis.

0.4.2 Game Selection

In order to investigate the concrete possibilities that have been or could be realized in play in serious games, serious games are analyzed to substantiate that a combination of educational and entertainment experiences is both possible and necessary. To demonstrate the PCASGDA framework's efficiency, it will be used to guide the evaluation of five indirectly therapeutic serious games: Re-Mission (2006), SPARX (2012), Elude (2010), Sym (2015), and The Average Everyday Adventures of Samantha Browne (2016), in Chapter Five. Re-Mission and SPARX are control-cases. Elude, Sym, and The Average Everyday Adventures of Samantha Browne are comparison-cases. The primary hypothesis is that Re-Mission and SPARX, which are revealed successful by empirical validation (Kato & all, 2008; Merry & all, 2012), will have a high play

score and game system coherence. The secondary hypothesis is that “good” games, which have not been empirically authenticated; *Elude*, *Sym*, and *The Average Everyday Adventures of Samantha Browne*; will have a high play score and a coherent game system, like the empirically validated serious games *Remission* and *SPARX*. These serious games will demonstrate the PCASGDA framework’s ability to pinpoint areas of strengths and weaknesses in a serious game’s design, which is used to infer the impact of a serious game. The results of the case analyses will demonstrate the PCASGDA model’s effectiveness as an evaluation tool. The serious games selected and the reason behind their selection is detailed below:

1. Re-mission (2006)

Re-mission serves as a therapeutic serious game with demonstrated success and effectiveness in helping chronically ill players change their health behavior towards better treatment results. HopeLab conducted a randomized control trial to study the efficacy of *Re-mission* (Kato & all, 2008). About 375 cancer patients, aged 19-29, received either computers with commercial video games pre-loaded or computers with *Re-mission* pre-loaded. The results of the study indicated that playing *Re-mission* led to more consistent treatment adherence, a faster rate of cancer knowledge retention, and a faster rate of increased self-efficacy in patients. To establish treatment compliance, researchers used objective blood tests to measure levels of medication, prescribed chemotherapy or antibiotics, in the bodies of the study participants rather than simply relying on subjective self-report questionnaires. This research concluded that *Remission* significantly improved treatment adherence and self-efficacy in young adults who were undergoing cancer therapy. It was selected as a control game for this study, because it is regarded as the standard serious games should attempt to achieve in game, play, and learning. Using the synthesized model for serious game design evaluation, *Re-mission* should collect a high play

score and reveal a coherent game system, reflecting how a balance between learning and play components creates an effective serious play experience in a serious game.

2. *SPARX (2012)*

SPARX (Smart, Positive, Active, Realistic, X-factor thoughts) serves as a therapeutic serious game with demonstrated success and effectiveness in helping young people (12-19) suffering from mild to moderate depression, anxiety, or higher levels of stress recover from their symptoms. It is one of the first scientifically-proven effective online therapies for depressed young people, won the World Summit Award, supervised by the United Nations in 2011, and was rewarded the 2013 International Award from Netexplo, hosted by UNESCO for being the first out of ten most innovative digital initiatives of the year (Merry & all, 2012). To measure its effectiveness as a form of play therapy, a randomized controlled trial was conducted to evaluate whether SPARX reduces depression symptoms as much or more than usual cognitive behavioral therapy interventions (Merry & all, 2012). About 187 adolescents deemed in need of treatment aged 12-19 were allocated either to SPARX or to treatment primarily comprising face-to-face counselling delivered by trained counsellors and clinical psychologists. 170 adolescents were assessed after the intervention and 168 were assessed at the three month follow-up point. The results indicated that SPARX was not inferior to usual treatment and the treatment effects persisted up to three months after the completion of the program. 44% of the young people who played SPARX were no longer depressed compared to 26% of the young people in the traditional psychotherapy treatment group (Szalavitz, 2012). This research concluded that SPARX is a viable alternative to traditional healthcare for young adults with depressive symptoms. It was selected as a control game for this study, because it is regarded as the standard serious games

should attempt to achieve in game, play, and learning¹. Using the PCASGDA model, SPARX should collect a high play score and reveal a coherent game system, reflecting how a balance between learning and play components creates an effective serious play experience in a serious game.

3. *Elude (2010)*

Developed by Singapore-MIT Gambit Lab, Elude serves as a popular therapeutic serious game for helping raise awareness and understanding of depression. There is currently no evidence to support this game's intended impact to argue if a player's awareness of how he affects those suffering depression is affected or if his understanding of what depression actually entails actually expands. However, it is sited as a chief game for depression on several websites that promote these games' usage (Tech.Mic, 2015; Owen, 2013; Hughes, 2014). Using the PCASGDA framework, Elude, a "good" serious game, should collect a high play score and reveal a coherent system, like the empirically validated and successful therapeutic serious games, Remission and SPARX.

4. *Sym (2015)*

Sym is a therapeutic serious game that's success has not yet been empirically reviewed, though it is a popular serious game, selected to be compared to the control cases: Remission and SPARX. It has received mixed reviews from players (Steam, 2015) but other reviewers (Cwalbrid, 2012; Donnelly, 2015; Holtreman, 2015), consider it to be a successful game. Sym acts as a way to appraise the PCASGDA model's ability to argue a serious game's impact. Using the PCASGDA framework, it should collect a high play score and reveal a coherent system, like the empirically validated and successful therapeutic serious games, Remission and SPARX.

¹ Because SPARX is only available for play in New Zealand, this study relies on observations of play made through videos found on Youtube to study the game's design components (Youtube, 2012; Youtube, 2013).

5. *The Average Everyday Adventures of Samantha Browne (2016)*

The Average Everyday Adventures of Samantha Browne serves as a therapeutic serious game that's success has not been empirically reviewed to be compared to Remission and SPARX. 75% of the 571 user reviews were positive (Steam, 2016), but it has received negative comments from its players. This therapeutic serious game serves as a way to evaluate the PCASGDA framework's ability to argue a serious game's impact. Using the PCASGDA framework, it should collect a high play score and reveal a coherent system, like the empirically validated and successful therapeutic serious games, Remission and SPARX.

0.5 Chapter Outline

In Chapter One, a background of play relevant to the study presented in this thesis is provided. In Chapter Two, game design principles, serious games in general, and serious games for personalized and participatory healthcare are explored. The interface and the interactions afforded between a player and a serious game is studied, taking a closer look at the element of play in existing serious game design approaches. In Chapter Three, the process of serious game design and development is explained, including some challenges and research opportunities in this research area, specifically addressing the surfaced issue with current serious game design evaluation frameworks, i.e. lacking a methodology to analyze the interface and the interactions afforded between a player and a serious game. Without this consideration, there is insufficient knowledge to evaluate a serious game's impact. Since questions regarding the quality of serious game's formal conceptual design in relation to their players, that provides evidence of a serious game's impact, remains unexplored; a new model is synthesized. In Chapter Four, by linking models and frameworks from game and serious game theorists, the model is identified,

synthesized, and summarized. In order to investigate the concrete possibilities that have been or could be realized in play in serious games, Chapter Five encompasses the application of the PCASGDA framework. These evaluations illustrate how a combination of educational and entertainment experiences in service of meeting therapeutic needs has been realized in serious games. In Chapter Six, the results and limitations of this study are summarized and possible directions for future research are suggested.

Chapter 1 – Play

Songs, dances, video games, theater, literature and sports are all forms that play takes. The forms of play tend to be cultural products and sociological agents, but its characteristics universal.

Engagement in play also seems to be universally true, though we do not know exactly what play is. The aim of this chapter is to provide a theoretical background of play relevant to understanding play in healthcare and its role in therapy, underlining how playing affects cognitive processes. The task of fully describing the history of play is beyond the scope of this thesis, so a brief outline is offered here. In order to draw different views of play, principles of play and play therapy and the darker side of playing games are explored.

1.1 Principles and the Study of Play

Historically, play was thought of as a relief from serious activities, therefore it was not necessarily considered important. But, psychologists are increasingly receptive to the idea of learning through play and many psychologists have explored play as the main way in which we learn.

The idea that play is not purely for leisure purposes dates back to ancient Greek philosophy. In Plato's "Laws and Republic", he formulates play as an important mediator for learning and development in the form of anticipatory socialization, i.e. if a child's aim is to become a constructor, his play should be guided toward construction (D'angour, 2013); i.e. Plato suggested assigning a role of control over child's play. Plato's distinction between desirable and undesirable play and regulated and unregulated play are repeated in subsequent discussions of play to this date.

In early classical nineteenth and twentieth century theories of play, which arose following Charles Darwin's *Origin of Species*, biological descriptions of unregulated play were emphasized. These theories of play began with observations that play is the result of surplus energy available to a child that has an inclination towards release in order to maintain life balance. The theories of play over the next years described play as a mode to replenish energy used for the purpose of learning new tasks, a pre-exercise for the development of skills and capabilities necessary later in life, a way to release primitive and unnecessary instinctual skills, a general drive for the growth and mastery of skills, and an exercise that facilitates the development of cognitive skills and the emergence of additional skills (CSUN, 2016). These views highlighted the value of play in developmental processes, but as separate from developmental processes.

Starting with John Locke and Jean-Jacque Rousseau, play, both regulated and unregulated, was held at the center of contributing the main objective of childhood - happiness. This view was ground-breaking, because it does not conceive unregulated play as dangerous, and instead unregulated play is viewed as crucial to psychological development and health. Later authors, like Freud, following this understanding of unregulated play, attempted to understand the psychology of an individual's emotional state through observations of his free play. Freud formulated the psychoanalytic theory of play emphasizing play's role in emotional development and described free play as "poetic creation". He theorized the cathartic function of play, i.e. a mode to express repressed feelings that might otherwise stay within and gain mastery over inner experiences of conflict. In this view, play is also important because if left unaddressed, repressed conflict leads to psycho-social difficulties (Scafer & Cangelosi, 2002). According to psychoanalytic theories, engagement in play requires freedom, something Plato was adverse to

since he understood unregulated play as having dire social and political consequences. Freud's argument of the cathartic function of free play or the integrative role of play is also underlined by later authors, such as Jean Piaget (1951) and Lev Vygotsky (1967).

Jean Piaget is the first author to study play scientifically and methodically to explain qualitative and quantitative improvements in child development (Scafer & Cangelosi, 2002). His approach sees types of play in cognitive developmental terms, i.e. if a child engages in "symbolic play", it is indicative of his stage of cognitive development (Cherry, 2016). Piaget's research maintains that children proceed in a predetermined order through four stages of development that correlate with stages of play: sensorimotor (0-2 years), preoperational (2-6/7 years), concrete operational (7-12 years), and formal operational (12 years-adult). The first stage of cognitive development, the sensorimotor stage, correlates to practice play, when the infant explores the world through direct sensory and motor contact and discovers object permanence. In the later part of this stage, the child becomes curious about the surrounding objects in his environment and begins manipulating them. Children try to master their fine motor skills (e.g. sucking, babbling, banging, shaking...etc.). In the second stage, the preoperational stage, the child uses symbols, including words and images, to represent objects; but cannot yet reason logically. For example, if a piece of clay is presented to a child and, in front of him, divided into two halves, where one half is rolled into a ball and another half is flattened into a rectangular shape; the child, when asked to pick the larger one, will pick the flattened rectangle. The third stage, the concrete operational stage, correlates to symbolic play, i.e. when a child engages in pretend play. In this stage of cognitive development, a child uses objects as something else, attributes properties to objects, and refers to invisible objects. By this stage, the child can think logically about concrete objects. In the fourth and final stage of development, the formal

operational stage, the adolescent can reason abstractly and think in hypothetical terms. This stage correlates to social play, when a child interacts with other children in recreational and learning activities, such as a group of children playing a game of tag. Adolescents try to master cooperative play.

In essence, cognitive theories of play explain that play provides a child with a dynamic individual language that is needed in order to express subjective feelings that ordinary collective language cannot express adequately, because children cannot yet integrate complex cognitive capacities easily into words. Piaget's cognitive theory of play has been very influential in guiding educational curricula and designing educational and therapeutic strategies. While Piaget's model sees types of play primarily in cognitive developmental terms, Lev Vygotsky, pioneering developmental psychologist, emphasized the idea of situated play, which describes that learning to play is learning how to relate to others, in socio-cognitive developmental terms.

Vygotsky explained that play is the leading source of the development of self-regulation, which is a cornerstone of development across all domains of behavior - social, emotional, cognitive, and physical (Zigler & all, 2004; Gaskill & Perry, 2014). Vygotsky's theories are compatible with recent brain research that indicates that self-regulation does not develop on its own, and instead depends on supportive experiences. In this view, interaction with a cultural environment; in the performance of cognitive tasks, with a variety of emotions arising from or associated with different elements of motivation, behavior, and well-being; is the prime factor of cognitive development, including imagination, imitation and understanding others' beliefs and intentions. Through play, children develop a sense of self and learn to interact with others. Like Plato, Vygotskian play draws that regulated play allows a child to learn by taking on an assigned

role that guides his play, but he cautions against making play a lesson and suggests guiding play towards remaining a cathartic activity (Bodrova & Leong, 2015).

These ideas of the integrative role of play are consistent with current brain research. The integrative role of play is understood to bring out disorganized sensations and action patterns, which have not been verbally integrated, due to a formed trauma (Van der Kolk, 1994). In other words, play activities help the brain move disorganized memory from the nonverbal parts of the brain into the frontal lobes, which is involved in motor function, problem solving, spontaneity, memory, language, initiation, judgment, impulse control, and social behavior. In order to regulate disorganized sensations and action patterns, the dynamic of play occurs to impart adaptive responses while weakening maladaptive stimulus-anxiety responses (Homeyer & Morrison, 2008).

These modern theories of play define play through the experience of it, rather than through its observation. They focus on how the individual feels during the activity, unlike earlier classical theories of play that focused on the activity itself. The relationship between creative expression and unconscious and conscious processes is widely acknowledged. The history of play theories illustrates that regulated or unregulated or directive and non-directive play have distinct social ramifications. As such, these consequences of play gave way to the development of different play techniques in educational and therapeutic methodologies. Since play was established as a natural medium employed for an individual's expression of blocked emotional experiences, many human service providers; occupational therapists, child-life specialists, speech therapists, and physical therapists; have used play as a mediator for therapy.

1.2 Techniques and Medium

Play therapy is a form of treatment that helps a child or an adult express his emotions, improve his communication, and solve problems. Each play therapy has a specific theoretical orientation and delivery through play, rather than strictly using words, and it has been helpful to distinguish between varieties of play therapy: directive and non-directive. This form of treatment can ameliorate the effects of trauma and loss, reduce anxiety and depression, improve behavior and facilitate social and academic development. The main aim of a play therapy is to equip a child with adaptive behaviors for everyday life. Since the latter part of the nineteenth century, the importance of play was thrust into the limelight of educational and therapeutic methodologies. The first child guidance clinics opened in the early 1920s and since, the use of play in psychotherapy has become widespread (Scafer & Cangelosi, 2002), seeking to leverage play's power to "help clients prevent or resolve psychosocial difficulties and achieve optimal growth and development" (Association for Play Therapy, 2016).

David Levy (1939) was among the first child clinicians to introduce a structured play technique, called Release Therapy. According to Levy; once the therapist is aware of the specific emotional difficulty experienced by the child; through symbolic play, the therapist can arrange dolls and play materials in a specific way for cathartic facilitation and insight. Like contemporary play theorists, Levy believed that subsequent relearning, through play, is important for restructuring areas of development that are blocked.

Levy's introduction of Release Therapy coincided with Margaret Lowenfeld's technique that was expanded by Buhler known as the World Technique, or projective sand technique (Scafer & Cangelosi, 2002). The technique makes use of a sandbox in which the child is asked to make a world from a variety of toys. The selection of toys and the world created serve as

symbolic representations of the child's inner world. Levy's approach is more structured and specific than the World Technique, but both focus on symbolic play (Scafer & Cangelosi, 2002). By 1946, Jacob Arlow and Asja Kadis introduced finger painting as a form of projective play and as a vehicle for the expression of fantasies and free associations (Scafer & Cangelosi, 2002). Since then, various other natural materials have been used in this play procedure, such as sand stones, palm leaves, ice...etc.; but rather conspicuously, despite the great appeal of games, there is no mention of their use in the earlier literature on play therapy. However, following Loomis' discussion of the game of Checkers and its use in therapy with younger patients in 1957, the literature on games in therapy proliferated.

In 1968, Winnicott developed the Squiggle Game to develop a relationship with his young patients as a projective tool (Scafer & Cangelosi, 2002). Winnicott would draw a squiggle and then ask the child to elaborate on the squiggle. Next, the child is asked to draw another squiggle that the therapist transforms into a drawing that is then used to facilitate the discussion of important issues. Variations of structured play therapy developed to include other games, like "the age game", devised by Newan and Stern in 1970 (Scafer & Cangelosi, 2002). It is a structured game in which the child chooses an age younger than his own and assumes the behavior of that age. Newman and Stern assert that the involvement in this activity makes it possible for the child to regress to and relive the feelings and actions of an earlier age, while allowing the child to appreciate his true age at the end of the session. Another variation of structured play therapy was introduced by Richard Gardner (Scafer & Cangelosi, 2002). He introduced the storytelling technique with children in order to elicit specific concerns and conflicts, based on role playing techniques already in use by adult therapists involved in Gestalt and behavioral therapies that enhance spontaneous expression vis-à-vis taking on a different role

or identity. This play procedure involves asking the young patient to make up a story. After which, the therapist interprets the story and builds on the story's development using the child's language, setting, and characters in order to foster the child's new understanding (Scafer & Cangelosi, 2002).

Over the years, play therapy techniques have introduced the use of puppets, building blocks, wild animal toys, toy knives, musical instruments, masks, costumes...etc. to foster symbolic play, which allow the player to reveal and work through his emotional life through play materials. A recent addition to traditional play therapy techniques is the use of computers. Computers provide a novel way of doing things that have customarily been done in art and play therapy (Scafer & Cangelosi, 2002). By using a graphics pad, computers have been employed as a creative medium in art therapy instead of traditional art media, to facilitate communication between the counselor and client. The counseling techniques used in the graphics art medium were taken from Nickerson and Winnicott who describe the use of art in therapy (Scafer & Cangelosi, 2002).

Turtle graphics in LOGO, a computer language suited for both young children and adults, was the first computer software used in clinical settings to help clients feel at ease, to facilitate communication with the counselors, and serve as a motivational agent for visiting the clinic. It involves drawing geometric figures and designs. Following the positive experience of LOGO, clinicians used graphic tablets for painting with the computer, allowing the computer user to draw in color on the screen using his fingers. The child is asked to draw a picture and then tell a story about it, helping the child and play therapist identify and discuss the child's feelings of inner conflict. Then he is asked to draw how he feels about a particular event or his current

mood. This technique helps draw out the child's emotional life through studying color associations with feelings.

Over the last two decades, there has been a growth in the use of digital games as another addition to previous play therapy materials. Digital games, like computers used as a creative medium, provide a novel way of doing things that have customarily been done in art and play therapy². Since the aforementioned play theories and techniques focus on the positive impact of play, the darker side of play is explored in the following section.

1.3 Considerations of Play's Unintentional Effects

It is important to note that play should not be idealized. Despite its rewards, there is a darker side of play that is epitomized in playground bullies. The negative effects of play on behavior, including addiction and violence, characterize a substantial portion of research on play. A brief description of the most cited negative effects of digital gameplay on behavior is described in this section.

Since digital games are so appealing, there is expressed concern that a player, some more susceptible than others, loses control over his ability to regulate the amount of time he spends playing despite negative consequences (Boyle & all, 2011). Another concern is that digital gameplay makes people more aggressive. Anderson and Bushman's (2002) analysis supports this claim. Using a General Aggression Model, based on psychological theories of aggression, the authors explain that exposure to these games leads to aggressive emotion, cognition, and behavior. Other researchers have argued that violent digital games encourage aggression,

² The literature on the use of digital games to meet therapeutic needs is reserved for the following chapter in section 2.3.

because they systematically incorporate well established principles of effective learning and consequently teach players to think and behave more aggressively (Connolly & all, 2012).

However, while these researchers make an interesting connection between digital games and violence, they also make the connection between digital games and learning more evident. Other researchers, based on psychological theories of video games, have explained that the main attraction of digital games, including violent digital games, is that they provide a safe environment for a player to explore his self-identity (Klimmt & all, 2009). As such, violent digital games are alternatively understood to enable opportunities to engage in activities which support learning that is active, experiential, and situated, which is consistent with socio-cognitive theories of play.

1.4 Conclusion

There is a cornucopia of research indicating that play is a suitable medium for positive socio-cognitive development, because it can facilitate the expression of emotional experiences. Several techniques of play therapy have been developed to guide play therapists. Play is typically divided into categories; among them are social play, fantasy play, and play with toys or directive or non-directive play, but play therapy in general seeks to ameliorate the symptomatic relief of mental illness. Adaptations to the traditional practice and concept of play therapy have been seen in the last decade in the form of digital games that are used during therapy and digital games designed for therapeutic purposes. Despite the debates regarding digital game experiences, they are increasingly considered a new way of helping people learn, grow, and change. Attention is given to computer game principles, serious game principles, the rise of games designed for play therapy, and how that has affected play in serious games in the following chapter.

Chapter 2 – Serious Games

As early as just fifty years ago, bringing games and learning together was received with a healthy dose of skepticism. However, recent studies have supported deep and interconnected relations between playing digital games and training cognitive processes. These studies explain that learning vis-à-vis digital game experiences is consistent with constructivist theories of learning which emphasize learning as an active process in which a learner constructs new ideas or concepts based on his current or past knowledge (Lindley & all, 2008; McClarty & all, 2012). The effects of digital game experiences on cognitive processes has been widely confirmed, but the studies report results of improved cognitive functions due to accidental side effects of commercial digital games. The high interest in these games is not limited to entertainment purposes as is attested by the development of economic sectors dedicated to digital games specifically designed in service of serious purposes like product advertisement and therapeutic needs. In this chapter, the literature concerning characteristics of digital games is drawn in order to explain the concepts central to the design of “good” digital games. Then, the literature concerning the use of digital games designed for specific purposes and specifically digital games designed to meet therapeutic needs is drawn, followed by contemporary discussions of play in serious games. The interface and the interactions afforded between a player and a serious game is focused on, to take a closer look at the play approaches in existing serious game design approaches.

2.1 Game Design Principles

People play to enjoy themselves, but this enjoyment has been difficult to explain. In order to understand the enjoyment found in play, theoretical constructs such as flow, motivation, fun and presence have been proposed to explain the subjective feelings experienced while engaged in play. In this section, these constructs are explored and how the entertainment gaming community creates really engaging games is deconstructed. In addition to the constructs formed to explain the subjective feelings of play, there are also game elements listed in this section that characterize games. A “good” digital game is generally understood to be entertaining by default, so it includes one or more of the entertaining attributes and characteristics described in this section. Understanding how these concepts work together within established psychological theory helps unravel the science of why people become engaged and the most effective techniques used to engage a player.

2.1.1 Flow

The concept of flow is explicitly developed by Csikszentmihalyi (1975), author of *Beyond Boredom and Anxiety*, to explain the experience of participating in favored work and play activities. He describes play as the flow experience par excellence. His model can be a useful diagnostic tool in the process of designing play (Jennett & all, 2008). In his description of what it feels like to be in flow, he describes seven universal conditions (Csikszentmihalyi, 2004):

- Complete involvement in what one is doing; focused, concentrated.
- A sense of ecstasy; of being outside everyday reality.
- Great inner clarity; knowing what needs to be done, getting immediate feedback.

- Knowing that the activity is achievable, even though difficult; i.e. one's skills are adequate to the task.
- A sense of serenity; no worries about oneself and a feeling of growing beyond the boundaries of the ego, feeling part of something larger.
- Timelessness; thoroughly focused on the present, hours seem to pass by in minutes.
- Intrinsic motivation; performing actions because one enjoys the activity itself.

Sherry (2004) applied flow theory to explain enjoyment in entertainment digital games and explains that flow focuses on the cognitive features of an experience highlighting the suitability between the challenge of a task and the skills of a player, but also including complete focus and concentration, a sense of ecstasy; of being outside everyday reality, great inner clarity; goals and feedback, control, a sense of serenity; transformation of time and the feeling that the activity has become autotelic; performing actions because one enjoys the activity itself. To promote flow, game designers need to use clear tasks, provide feedback, balance challenges with player skill and time, and minimize distractions (Murphy & all, 2013).

2.1.2 Motivation

Motivation is a powerful tool, generally understood to persuade, convince, and drive people to act (Murphy & all, 2013). Nearly all actions made consciously by an individual are motivated. For example, the need for food results into hunger and one is motivated to eat. It is the will to act. Willingness is conditioned by the efforts and ability to satisfy individual needs, i.e. the concept of motivation is situational, because the level of motivation can vary between different individuals and at different times and spaces (Murphy & all, 2013). Both external and internal stimuli can act as carriers of either demotivation or motivation which in turn results into

dissatisfaction or satisfaction depending upon the existing situations (Murphy & all, 2013). The individual evaluates his options and decides whether to act in order to relieve the tension so that satisfaction can be attained. Motivation is an extremely powerful force and a key part of flow (Csikszentmihalyi, 1975). According to many authors explored here, entertainment digital games have the potential to meet most of the characteristics of intrinsic motivation that can help the individual evaluate his options in a new light, facilitating a choice of action rather than a choice of sedimentation. In this section, the myriad of ways that entertainment digital games motivate players are explored.

Motivating factors explaining play components constitute the development of frameworks. One framework used Ryan and Deci's (2000) self-determination theory to explain a player's motives for playing games (Przybylski & all, 2009). This theory explains that general needs for autonomy, competence, and relatedness drive human behavior and suggests that people enjoy activities more if the activities meet intrinsic rather than extrinsic needs: autonomy refers to the ability to take part in self-initiated activities and is similar to the need for control described in theories of fun, in the following section; competence refers to the ability to interact proficiently or effectively with the environment; and relatedness refers to the feelings of closeness and belonging to a social group. Playing games to address a general need for competence is consistent with the theories of flow, explained in the previous section, and immersion, explained in section 2.1.4 below, which identify challenge as an important feature of an entertainment game's enjoyment. Lucas and Sherry (2004) applied Uses and Gratification³ theory to playing games and found that a player plays games for an assortment of reasons besides challenge; such as emotional arousal and relaxation, to compete against other players, for the

³ Uses and Gratifications theory was developed as a theory of communication which looks at consumers' specific media based needs.

ability to take part in fantasy activities which would not normally be possible, and to interact socially with other players. Kellar and all (2005), investigating motivation in entertainment digital game players, highlight the relevance of some factors of these games that motivate players: possibilities for control (supporting self-regulation, autonomy, initiative); context awareness (including rationale, feedback, storyline); competency (involving appropriate and performable tasks and challenges); and engagement (involving personalization, role-playing, rewards, communication, social interactions). Another researcher highlights that multiplayer possibilities offered by the Internet represent one of the most effective motivators in today's player (Yee, 2007). Networked game environments offer contexts to support communication among players and to develop relationships with emotional investment. In these environments cooperation and competition are primary factors that determine motivation and engagement levels, because they act on several social extrinsic motivators, e.g. the desire for/rejection of potential affiliations with other players (O'Connor & Menaker, 2008).

2.1.3 Fun

Moreover, research on the motivational characteristics common to all intrinsically motivating learning environments explain classifications of game pleasures. These models are useful for organizing observations about the kinds of pleasures entertainment digital games deliver.

According to Malone (1981), players seek: challenge, curiosity, control, and fantasy. LeBlanc distinguishes eight categories of experiential pleasure players get from "fun": sensation (sense of pleasure); fantasy (make-believe); narrative (drama); challenge (obstacle course); fellowship (as social framework); discovery (uncharted territory); expression (self-discovery); and submission (which refers to the hypnotic pleasure that comes from the ritualized act of

behaving in a rule-based manner) (Hunicke & all, 2004). Just as Leblanc's model, psychologist Michael Apter (1991) provides another framework to consider pleasure in entertainment digital games. Apter emphasizes the cognitive arousal play provides and compiles a list of these in his essay "A Structural-Phenomenology of Play" comprising seven categories: exposure to arousing stimulation, fiction and narrative, challenge, exploration, negativism (breaking rules on purpose), cognitive synergy (imaginative play), and facing danger (within the "protective frame" of play). Another framework explains that the pleasures play constitutes are: effectance (empowerment), closures, flow, episodes, and escape (Lindley & all, 2008).

2.1.4 Presence/Immersion

Games are capable of engaging players in a cognitive, sensory-motoric, and affective fashion (Malaby, 2007). This engagement involves a player's attention and since our nervous system has a focus limit, a player's ability to monitor how his own body feels, his hunger or tiredness, or his problems is greatly compromised. Attention and concentration are important cognitive constructs in explaining both immersion and flow. Attention determines what is within the player's awareness and is related to the feeling of being present in the game. As a result, during play, the player's body and identity temporarily disappear from his consciousness – a state referred to as immersion. Some researchers define immersion in terms of the physical and technological features of the game, such as virtual reality headsets, while others define immersion in terms of psychological features, such as vividness and interactivity (Steuer, 1993). Ermi and Marya (2005) presented a gameplay experience model, where they analyzed different aspects of immersion, underscoring the complex dynamics that that are involved in the interaction between a player and a game. The authors distinguish three dimensions of game experience, which are:

sensory immersion (which includes the audiovisual content of the games, like three dimensional graphics and stereophonic sound); challenge-based immersion (which is based on interaction and includes the completion of goals and the acquirement of abilities); and imaginative immersion (which is when a player can use his imagination, empathize with the characters or generally be immersed by the fantasy aspects of the game). Presence can be experienced in virtual environments and it can reshape the context of gaming radically.

The engagement and motivation dimension is linked with the sense of presence (Lombard & Ditton, 1997; Retaux, 2003). Employing narrative in games also has the goal to drive relations between players and the virtual environment. Schneider and all (2004) observed the effects of the narrative dimension on several aspects of the gaming experience and found that story-based games enhanced presence, engagement, and psychological arousal at an unconscious level. Rambusch (2006) linked engagement to the embodied and situated nature of digital game experiences, highlighting the role of the interaction between a player and complex settings. She describes the gaming environment as a setting composed of both a real world and a virtual world connected thanks to affordances exploited by the gamer. In this way, play is understood as a socially embodied and situated activity, which is constantly shaped by the physical experience emerging from the interaction between a player and a game.

2.1.5 Game Elements

Besides constructs that explain engagement or pleasure attributes, there are some core characteristics that game designers take into account. These characteristics are:

- Rules, to limit the player's actions and describe how the game works (Salen & Zimmerman, 2004)

- Goals, to motivate a player and allow him to judge his performance (McGonigal, 2011).
- Challenges, to create a dynamic that is neither too boring nor too difficult to accomplish (Malone, 1981). The balance between skills and challenges is described by flow theory (Csikszentmihalyi, 1975).
- Feedback, feedback should be clear and on time, responding to a player's performance (McGonigal, 2011).

2.2 Serious Games

With the establishment that video games are very engaging and motivating; the military, health providers, governments, and educators leveraged the power of computer games for specific objectives. The added value of digital game solutions resides on two aspects. First, digital games have the power to motivate and engage players. Secondly, they provide game-worlds (fictional content, topology, level-design, textures), which can be shaped according to the needs of the game-structure (rules) and gameplay (players actions, strategies, and motives); to facilitate the development of behaviors transferable into the real world. Moreover, when trying to change any behavior, Debra Thompson, a professor and pediatrics specialist at the Baylor College of Medicine, recommends self-regulating skills; goal setting, goal monitoring, and problem solving; to increase self-efficacy⁴ (Kemble, 2014), which are considered in principles of play and games. Self-efficacy translates into confidence, which in turn translates into behavior change and a pursuit of higher goals. Creating an environment that facilitates self-regulating activities increases the likelihood that players will make necessary changes and do so consistently in the

⁴ Bandura's theory of self-efficacy predicts that failures overcome with a person's effort will strengthen his involvement and persistence.

future. The goal of the playing process, therefore, is transformation; through which the values of play become internalized and a part of a player's wider social behavior.

Early serious games included computer games designed for research in computer science, to train professionals, and to broadcast messages. Today, even a brief survey of the literature reveals that there is a wide diversity of games and digital mediums designed and developed for specific purposes. Games with an agenda include activism games, advergaming, business games, exergaming, health and medicine games, news games, political games, realistic games, core competency games, repurposed commercial off-the-shelf (COTS) games, and modified games (mods) to name a few. As a result, there are related and sometimes overlapping domains, such as e-learning, edutainment, game-based learning, digital game based learning, gamification, and computer-based learning (Alvarez & all, 2008).

The term "Serious Game" with a meaning closest to its current use was first used by Clark Abt (1970), social theorist. He defines serious games, whether it is a computer game or board game, as "games that have an explicit and carefully thought-out educational purpose and are not intended to be played primarily for amusement" (Abt, 1970: 9). In order to encapsulate emerging experiential environments and digital media (mixed reality, virtual reality, cinema) as serious games, in which the purpose is to provide experience and emotion and convey meaning, they are identified along a continuum from games⁵ for purpose at one end, to experiential environments with minimal or no gaming characteristics on the other end (Marsh, 2011).

According to this definition, serious games are digital games, websites, simulations, virtual

⁵ As defined by Salen and Zimmerman (2004: 80), games are defined as "a system in which players engage in artificial conflict, defined by rules, that results in a quantifiable outcome". Simulation and augmented reality fall within this definition, however, purely virtual worlds, such as Second Life, would not be games, because there is no quantifiable outcome. Also, within this definition, gamification (the use of game like mechanisms applied to increase motivation or engagement or simply as an extrinsic reward system) is not a game. But, as defined by Marsh (2011), even social worlds, such as Second life, are games.

environments and mixed realities that provide players with opportunities to engage in activities not otherwise possible towards a desired objective.

Moreover, due to the great diversity of serious games, they have been categorized in a number of different ways. A serious game is categorized according to the game discipline/function of the game (games for health, education, business etc.); according to the game's application areas (government and defense, healthcare, advertising, education, industry etc.) (Alvarez & all, 2008) or according to the type of change (games for prevention, harm reduction, training, exercise and fitness, social dialects, health support, special needs, clinical adherence and monitoring, psychological therapy, and motor and cognitive training) (Gamberini & all, 2008). Since this thesis is about serious games for personalized healthcare, the following section locates and highlights this concept.

2.3 Serious Games for Personalized Healthcare

In chapter one, a history of play and play therapy was briefly outlined, indicating the establishment of play's role in healthcare. Recently, serious games for personalized healthcare, is becoming an important line of research due to the observation that personalized healthcare and digital games share the ability to place the individual in the center of the action (McCallum, 2012). In other words, the sense of control experienced is one of the primary motivators in personalized healthcare and it is also one of the primary motivators in digital games. In this section, serious games for personalized healthcare is pinpointed within the space of serious game applications and categorizations.

Digital serious games designed to provide support for behavior change can be traced back to as early as the 1990s, paralleling the popularity of the Super Nintendo Entertainment System

(SNES). One of the initial games with the most promising results was Packy and Marlon, designed to improve self-care behavior in children with diabetes (Brown & Lieberman, 1997). Playing a diabetic elephant, the player has to successfully manage the elephant's diabetes by finding the food and medical supplies that have been stolen by a gang of rats. Children diagnosed with diabetes responded positively to this game. Self-care and parent communication improved as well as self-efficacy. Children playing Packy and Marlon were 77% less likely to require an urgent healthcare hospital visit, as compared to children playing a different popular game. Not only did children enjoy playing the game, they also experienced positive health outcomes. Today, there is a wide range of games designed and developed for personalized healthcare and there are different categories of these serious games.

McCallum (2012) categorizes serious games according to the area of health being affected: physical, cognitive, and social/emotional health. Within the area of serious games for health activity, there are different categories of change, e.g. prevention, therapy, assessment, educational or information (table 2.3) (McCallum, 2012). With the help of these taxonomies, it is identified that therapeutic serious games are classified as Serious Games for Health.

Area of health activity	Personal	Professional practice	Research and academia	Public health
Preventive	"Exergaming" Stress	Patient Communication	Data Collection	Public health Messages
Therapeutic	"Rehabitainment" Disease management	Pain distraction Cyberpsychology Disease management	Virtual humans	First responders
Assessment	Self-ranking	Measurement	Inducement	Interface and visualization
Educational	First Aid Medical information	Skills and training	Recruitment	Management simulations
Informatics	Personal health records	Electronic medical records	Visualization	Epidemiology

Table 2.3 - Games for health taxonomy (McCallum, 2012)

In another body of literature, serious games for personalized healthcare are organized in one of three categories of experience: informative game playing, therapeutic game designing, and therapeutic game playing (Miller, 2015). The primary focus of a serious game for mental health treatment is either to inform the player, serve as a form of therapy for the game designer, or as a form of therapy for the game player (an overlap between the categories is possible).

The first category, informative game playing, encapsulates serious games that represent the experience of living with a mental illness so that players can vicariously learn and understand the experience of and the stigma for mental illness (Miller, 2015). Metaphor is often employed to portray the internal experiences that are otherwise invisible to people who are less sensitive to the experience of mental illness. Informative games that inform players of what it is like to experience depression include *Elude* and *Depression Quest* (Miller, 2015). Game titles that inform players of various other mental health issues; like *Obsessive Compulsive Disorder*, *Attention-Deficit/Hyperactivity Disorder (ADHD)*, *Social Anxiety Disorder*, and *Anorexia Nervosa*; include *Into Darkness*, *It's for the best*, *Sym*, and *Perfection* respectively (Miller, 2015).

The second category, therapeutic game designing, is similar to informative game playing, because these games often recreate the experience of living with a mental illness, but it differs to informative game playing, because the purpose of these games are for the creators, i.e. via the action of designing a game, the creator supplements his therapeutic healing process (Miller, 2015). The creator can experience catharsis or a sense of closure. These games are considered an important form of art therapy. Game designer Jane McGonigal, used this form of therapy for her own mental health (Miller, 2015). While dealing with the restrictions and symptoms that accompany a severe concussion, she became depressed and noticed that the psychological stress

impeded her physiological healing process. She created SuperBetter to expedite her own recovery from both the depression and concussion. Essentially, it is a goal-tracking game which requires that a player identify challenges that he faces in the real world. Allies and boosts help the player actualize his achievements. It is designed to build a player's personal resilience, helping him achieve his life goals. Since this game served as therapy for the designer as well as other players, it can also be seen as part of the third category, therapeutic game playing (Miller, 2015).

Therapeutic game playing, captures games played to provide players with therapy (Miller, 2015). Entertainment digital games can have unintentional positive therapeutic results. For example, Tetris is useful in the treatment of post-traumatic stress disorder (PTSD), because the player is focused on visuospatial cognitive tasks which disrupt the formation of involuntary mental image flashbacks (Holmes & all, 2009). But, there are also games that aim for therapeutic game playing produced by researching treatments for people with a mental illness and creating a game that incorporates the treatment methods in some way (Miller, 2015). The player navigates the game's world to consciously or unconsciously receive treatment. One such game is Social Clues, a game designed for children with Autism Spectrum Disorder (ASD). It incorporates evidence-based practices such as Social Narrative, Discrete Trial Training, Applied Behavioral Analysis, and Errorless Learning, into the gameplay and design; embedding the science into the game (Miller, 2015). There have also been several projects that use virtual and mixed reality environments for creating opportunities to engage in activities not otherwise possible towards a desired impact through therapeutic game playing, which were followed by studies on their effectiveness in the treatment of several disorders (Gamberini & all, 2008; Riva & all, 2015).

Beginning in 2001, the European union funded projects for dealing with several clinical disorders; including social phobia, panic disorder and agoraphobia, obesity, bulimia, and binge-eating disorders; by employing virtual reality and the principles of exposure therapy (Gamberini & all, 200; Riva & all, 2015). Virtual Reality is purposed to be an “advanced imaginal system: an experiential form of imagery that is as effective as reality (traditional approaches) in inducing emotional responses” (Riva & all, 2015: 288). Yet, many authors have reviewed the advantages of Virtual reality as compared to traditional therapies. Some of the highlighted advantages include that it allows structuring therapy within a “magic circle” or in a “safe” environment, allowing the participant to act in a different state of mind than he would in real interactions; it allows the participant participation in incremental levels of difficulty (scaffolding the coping skills), allowing the participant to familiarize himself with the feared situation; it allows the participant contemplated self-efficacy; it allows the construction of “as if” contexts, which can be less threatening; it allows great control of the situation; it allows the person to go beyond reality; and it offers the participant a higher degree of confidentiality (Riva & all, 2015). Researchers have also applied virtual reality for experiential cognitive therapy to modify body image perceptions; male impotence and premature ejaculation, taking a psychodynamic approach through immersive virtual realities (Gamberini & all, 2008). For these reasons, virtual environments are considered “empowering environments” that are contemporarily essential in innovative therapeutic processes. However, while studies validate that virtual reality interventions have positive therapeutic outcomes, the results from longitudinal studies reveal that the effects of these interventions are only short-lived for a large portion of virtual reality users (Riva, 2005). Though virtual reality systems are advanced in technological features, vividness and interactivity can be achieved through psychological approaches with less technologically

advanced games, like computer games which are also more accessible than virtual reality experiences.

Mader and all (2002) analyzed therapeutic digital games and identified that some therapeutic games are directly therapeutic while others are indirectly therapeutic. For example, Brick is a direct therapeutic game, because it aims to improve the particular condition of having lost motor control in upper limbs after a stroke. Equally, Virtual Iraq directly alleviates or suppresses the post-traumatic stress of soldiers (Mader & all, 2002). Unlike directly therapeutic games, indirectly therapeutic games cannot improve the particular conditions of a client alone. Instead, they improve the player's attitude or observance. The most relevant purpose of indirectly therapeutic games is the broadcast of a persuasive message (Mader & all, 2002). For example, Re-mission is a game for patients that have cancer. This game provides knowledge about the disease, its treatment, and ways to alleviate its adverse effects. As a result, the player becomes more critical with his therapy protocol, which makes the main therapy more efficient. Other indirectly therapeutic games include FoldIt and Phylo, which help scientific research develop with the help of a community (Mader & all, 2002). Indirectly therapeutic games have also been designed to target the patient's relatives, rather than the patient. For example, Elude helps the patient's relatives understand what it means to be depressive while engaging the relatives in the patient's recovery process, through informative gameplay.

Moreover, the author explains that these different therapeutic uses of serious games do not require the same design methods. The design of persuasive games or indirectly therapeutic games is not the same as the design of directly therapeutic games that provide training that improves the patient's condition directly (Mader & all, 2002). Indirectly therapeutic games can be designed with existing game approaches, while directly therapeutic games require a specific

design process which is unique to each training requirement. In the following section, in order to inspect existing game approaches that are useful for the design of indirectly therapeutic serious games; the history regarding the complexities of play and games is briefly described, a closer look at the element of play in a leading approach to serious game design, the procedural rhetoric approach, is taken, emphasizing its approach to the design of the interface and the interactions afforded between a player and a serious game; and another approach to game design, the player-centric approach, that considers the complexities of play, is also described.

2.4 Existing Game Approaches: Modern Arguments of Play in Serious Games

Going back to the history of play arguments in computer games, prominent figures in game studies explain that the boundaries between the serious and the playful are actually very blurry – it is hard not to take play seriously. Arguments of play in games is remembered with Johan Huizinga and Roger Caillois and arguments of play in digital games is remembered with Gonzalo Frasca, Katie Salen and Eric Zimmerman, and Ian Bogost (Rodriguez, 2006).

Johan Huizinga's (1955) seminal text *Homo Ludens* remains a standard reference in game design books, although it focuses on play. It has become a landmark in the growing literature on the concepts of play and games. Huizinga's main contribution is tracing play to the origin of art, religion, politics, philosophy, and the law. Huizinga defines games as: "a free activity standing quite consciously outside 'ordinary' life as being 'not serious', but at the same time absorbing the player intensely and utterly" (Rodriguez, 2006). According to Huizinga, play is often defined as temporarily tossing aside the rules of "daily life" to allow for new rules. Since this publication, a number of theorists from a wide range of disciplines have contested and

confirmed Huizinga's ideas that the boundary between play and serious activity is blurry, while others argue for a clear distinction between seriousness and playfulness.

Roger Caillois (1962), author of the influential book *Man, Play, and Games* mostly reinforces Huizinga's notion that play is free, uncertain, make believe and governed by rules, extrinsic and intrinsic, but he also adds a useful model for classifying four fundamental categories of play:

1. Agon; which refers to adversarial or competitive play in which equality of chance is artificially created, as in Chess or sports.
2. Alea; which denotes chance-based play that is based on a decision independent of the player and in which fate is the decider of the victor.
3. Mimicry; referring to role-playing and make-believe play that consists of a player's exercise of the imagination, which consists of deploying actions, submitting to his fate in an imaginary milieu, and becoming an illusory character, where he forgets, disguises, or temporarily sheds his personality in order to simulate another.
4. Illinx; denoting playing with the physical sensations of vertigo, based on the pursuit of vertigo, and consists of the attempt to temporarily upset the stability of perception to induce a panic on an otherwise lucid mind, such as twirling in circles.

Caillois' four fundamental categories are enriched by his two concepts *Paida*, which represents free-form and improvisational play, and *Ludus*, which represents rule-bound and regulated play, most commonly found in the form of games (Salen & Zimmerman, 2003). He crosses his four fundamental categories of play with these concepts and charts a wide variety of ludic activities. Such that, Roulette would fall into the alea/ludus section of his model and wearing a mask would fall under mimicry/paida. Caillois defines play on a continuum of

relationships between unregulated and regulated play rather than on clearly delineated categories. More recently, play is being discussed by video game theorists such as Gonzalo Frasca (2003), Katie Salen and Eric Zimmerman (2004), and Ian Bogost (2006).

Both Salen and Zimmerman (2004) and Bogost (2006) describe *paida* and *ludus* as forces that exist on a continuum that are in constant tension, which create possibility spaces. Possibility spaces or what is commonly denoted by the term used by Huizinga (1955:10) “magic circles”, are paradoxical spaces that delineate “temporary worlds within the ordinary world”. For both Bogost (2008) and Salen and Zimmerman (2004) possibility spaces are what make play possible. But while Salen and Zimmerman (2003) focus on the creativity of meanings of play, Frasca (2003) and Bogost’s (2006) models of play limit spaces of possibility (Sicart, 2011).

Frasca (2003) distinguishes Caillois’ terms *paida* and *ludus* into clearly delineated categories, unlike others (Salen & Zimmerman, 2003; Bogost, 2008). According to Frasca (2003), play can be distinguished from games; because play can entail the incorporation of rules, but it does not provide us with a winner and loser scenario or clear cut endings; while games provide us with the two possible endings scenario: winner or loser (Rodriguez, 2006). However, rules of play can be defined in games either explicitly by the game designer or implicitly by the players. Therefore, by distinguishing play from games, the player’s participatory capacity goes unacknowledged. In addition, according to Bogost’s (2006; 2007) procedural rhetoric approach to games, the meaning of games is contained exclusively in the formal system of the game, which also limits considerations of what a player brings into the meaning of a game (Sicart, 2011); described in section 2.4.1 below.

As such, the underlying play principles in serious games in general are understood in two ways. One viewpoint regards serious games as training and teaching tools whose main purpose is

to make the learning process enjoyable, appealing, or accessible. In this case, the game has a predefined goal, usually a transmission of knowledge. Playing is treated as a vehicle to enhance the effectiveness of teaching, but it is not viewed as an integrated part of the learning process. This viewpoint is shared by Sawyer (2007) and Michael and Chen (2005). Sawyer (2007) defines serious games as any meaningful use of computerized game resources whose chief mission is not entertainment. Michael and Chen (2005) similarly define these games as games that are not primarily fun but teach, train, and inform. However, other authors consider that enhancing the player's motivation is the main advantage of serious games. In this approach, Prensky (2002) views that serious games should be fun primarily and then encourage learning. Similarly, Zyda (2005: 25), defines serious games as, "a mental contest, played with a computer in accordance with specific rules; that uses entertainment, to further government or corporate training, education, health, public policy, and strategic communication objectives". The latter's approach to understanding serious game experiences commits to characterizing a serious game by its ability to afford a pleasurable and seamless learning experience. As earlier described in Chapter One and in this chapter, there are different necessary conditions that should be present for play to occur, be sustained, and have a positive serious impact. Currently, there are different ways of understanding game experiences in serious game design. Two modern arguments of play in serious game design include: procedural rhetoric and player-centric game approaches to game design, which are explained in terms of the interface and the interactions afforded between a player and a serious game to highlight how serious game design approaches affect play in the following section. Do these approaches risk vitiating a serious game's transformational impact?

2.4.1 Procedural Rhetoric Game Approach as Instrumental Play

Proceduralism is remembered with award winning game theorist and designer Ian Bogost (Sicart, 2011). In his books *Unit Operations* (2006) and *Persuasive Games* (2007), Bogost characterizes games as a mode to provide a genuinely new way of communication since their procedurality involves interaction. The proceduralist argumentation for the analysis and design of video games is understood as the specific way in which video games build discourses of aesthetic value. Just as verbal rhetoric is a means of presenting verbal arguments with the aim of influencing other people's opinions; procedural rhetoric is a powerful new, visually based means of presenting arguments in a procedural, rule-based, or active way of persuading other people. This is fundamental to the proceduralists' understanding of the expressive capacities of games. Proceduralism is interested in the ways that arguments are embedded in the rules of a game and how the rules are expressed, communicated to, and understood by the player; combining design approaches with a humanist discourse (Sicart, 2011). One example that Bogost (2007) uses to illustrate a game's ability to express ideas is *September 12*. The game illustrates how firing missiles at terrorists leads to more citizen casualties, which leads to more citizens becoming terrorists. The game's purpose is to present its idea by using less direct ways to express ideas and more poetic treatments of expression.

Sicart (2011) describes proceduralism as an approach that provides opportunities of instrumental play. According to Sicart, instrumental play is a take on the concept of instrumental rationality, which is an argument used in the critique of modernity and despite its faith as being a model of reason that focuses on proof and evidence, is still deeply rooted in myth. The author introduces key aspects of critical theory relevant for defining the type of instrumentality that explains how proceduralists understand play. Using Horkheimer and Adorno's critique of

enlightenment, Sicart claims proceduralism a determinist and even totalitarian approach to play: “proceduralism is an approach that defines the action prior to its existence, and denies the importance of anything that was not determined before the act of play, in the system design of the game.” He argues that the problem with this understanding is that it is used to substitute the myth and ritual of culture and encourage an instrumental approach to games that is guided by rules or processes embedded in the game system. Proceduralism calls for systems at the core of the essence of games, placing play external to the player and the play context.

As described in this chapter, unlike other media, games have the unique capacity to immerse players by making them active agents of games. Although players are considered in the proceduralist approach, they are only considered as activators of the rule, i.e. the meaning of the game is not conveyed in the act of play (Sicart, 2011). Instead, the meaning of a game lies in its rules that players complete using their repertoire. Proceduralists take a designer-dominant perspective focusing on rules and systems and their meaning, contradicting the creative understanding of play and inhibiting the player’s ability to involve themselves in the game world. In other words, play is subordinate to reason externally determined by the designer. Therefore, proceduralist games shy away from what cannot be reasoned, allowing it to fall prey to the myth of the scientific that Adorno and Horkheimer used to critique the enlightenment project. Persuasive games become an instrument for reason and not play.

Consequently, proceduralism enforces a type of instrumental play that eliminates the need of a player as an active configurator of the meaning of the game. However, when a player engages with a game, they want to enter into a mode of play where rules are a dialogue rather than a message. So, as play is theorized as an activity between rationality and emotion, it ought

not to be instrumentalized. By avoiding instrumentalized play, designers can enhance the impact of a serious game by designing serious fun.

In other words, the proceduralist model of play explains that it is the formal system of the game that creates meaning and helps us anchor experiences and action in technologies, but justifying the aesthetic capacity of games by means of instrumentality leaves aside the complexities of play. As such, the importance of creative play and players in the configuration of the ludic experience is not central to understanding the meanings created by game experiences, leaving immersion out of the design analysis (Sicart, 2011). The domain of instrumental play puts play as negotiation, appropriation, configuration, and expression to the side; which puts important discussions of immersive possibilities in a serious game to the side. But, play cannot be limited and bound to the processes delimited by designers, because these games have a very limited space of possibility in which players can express themselves. Consequently, to expand spaces of possibility, the author explains that “for each procedural analysis there must be an orthogonal analysis of play that completes the arguments of meaning by means of accounting the play experience.” Since immersion is a key to defining any game in experiential terms, the author denotes that the procedural approach can be enhanced by an orthogonal study of play that considers the complexities of play, which is consistent with contemporary approaches to play in entertainment digital games, explained below.

2.4.2 Player-Centric Game Approach to Play in Games

Because game interfaces are highly graphical, it may seem that its design should be left to the artists in the development team, but the user interface is more than just the graphics on a screen. The interface is the boundary at which form and function can provide phenomenal play or a

confusing experience. In the past, it was accepted that exceptional graphics propel a great interface, but recent discussions in interaction design shift from usability to user experience informing foundational elements for experience and emotion in serious games.

A good game interface aims to create emotional empathetic responses, because unempathetic play can have an effect that is far from what designers hope to achieve: boredom or confusion. There are six tiers of the interface hierarchy: emotionally intelligent interface (modification of player behavior through bond formation), intelligent interface (pattern recognition and simulation), emotional interface (elicitation of emotions in players), logical interface (rules and guidelines of interactivity), graphical interface (what is usually considered *the* interface), and physical interface – the physical interface (including the auditory and tactile interfaces) being the most primitive interface and the emotional intelligent interface being the most advanced (Bergeron, 2006). The emotional intelligent interface establishes a bond with players and does so in a way that respects the player's intelligence, needs, and time.

Work in HCI has shifted focus from being informed by usability-centered engineering perspectives, towards a user-centered design perspective. The notion of user experience is now widely adopted in HCI. Similarly, the notion of player experience is now adopted in game research. For example, for massively multiplayer online role playing games (MMORPGs) like World of Warcraft, a player can install “mods” to modify the game to include specific on-screen information or new items, weapons, characters, or storylines.

In recent approaches to game design, the core characteristic of games is considered to be that they are organized around doing. Player-centric approaches to games consider players methodically. In these approaches, games are considered as spaces for participation in ideological worlds, shifting the focus to how games create and mobilize hybrid identities for

players and how these identities are enacted across contexts (Squire, 2006). The player's actions are his interface with the world (Clinton, 2004).

Past game studies focused on representations in the game or on the game's surface features, without examining gaming practices or experiences or the game's meaning for players. Traditional critiques of games focused on text, image, animations, but since games can only be enacted through the player, theoretical models underpinning games needed to span its contexts of consumption. Increasingly, designers have come to see games as vehicles for player experience, thinking of game design as the choreography of rules, representations and roles for players in which players can generate meaning.

2.5 Conclusion

Game designers have embraced psychological concepts such as flow, motivation, engagement, fun, and immersion in order to understand how these concepts work together to create effective games. Since entertainment digital games have the power to motivate and engage players through play, several digital games have been designed for specific purposes called serious games. Serious games is the term used to describe the development of games specifically designed to achieve some change, in knowledge, attitude, physical ability, cognitive ability, health, or mental wellbeing, in the player. This makes the distinction between entertainment digital games, where changes are merely side effects, and serious games, where the effects are the purpose of their development and design. Serious game design is the art of applying design and aesthetics to create goals, rules, feedback and challenges that improve the play experience of a digital game towards a specific purpose. It was identified that there are two types of therapeutic serious games, indirectly therapeutics serious games and directly therapeutic serious games, each

having distinct design implications. The literature indicates that indirectly therapeutic serious game design, classified as Serious Games for Health, can be informed by current digital game approaches and that there are ways to understanding play in serious games: procedural rhetoric and player-centric game approaches. It was argued that the proceduralist model helps designers anchor experiences and action but, since this approach justifies the aesthetic capacity of a serious game by means of instrumentality it leaves aside the complexities of play: active player participation. Since, any theoretical approach to game aesthetics, implies a methodology of play, which, if not considered, becomes suspect; the procedural rhetoric's approach to game design can be enhanced by thinking about games by considering players methodically, with a player-centric approach. Since there has been a shift in focus in current game approaches, where the complexities of play are reconsidered; in the following chapter, attention is given to how serious games are designed and developed to determine if the complexities of play are considered in current serious game design evaluation models.

Chapter 3 – Serious Game Design and Development

In the previous chapter the range of areas and approaches to developing Games for Health were explored, highlighting existing play and game approaches. Serious play is incredibly powerful, but serious games are complicated systems and designing them can be tricky, because serious games need to maintain spontaneous imaginative physiological participation so that reflection becomes possible and meaningful outside the context of the game session. There is a myriad of ways that digital games can enthrall us, but designing serious games can be a chaotic and menacing process. None of the central ideas in modern arguments of play in digital games and serious games undermine the legitimacy of serious game designs that can be both fun and purposeful - we should be able to design serious fun. In other words, we engage in play naturally, but there are a number of necessary conditions that need to be present and active for play to occur, be sustained, and have a positive impact. This chapter serves to explain the process of designing and developing serious games and present some challenges and research opportunities in this area. Focusing on the quality of serious game design, the issue of providing evidence for a serious game's impact is described and whether existing models for the evaluation of serious game design follow recent player-centric approaches to play or not is resolved.

3.1 Serious Game Development

Without the appropriate tools, designing and developing a quality serious game on time and on budget is impossible. There are several tools, techniques, and principles defining and giving structure to serious game design and development to enhance the desired impact of serious games. Serious game developers have numerous technologies (table 3.1) that are available to

them to save time and reduce the complexity of game development and design. There are design software, hardware platforms (computer hardware, video hardware, and asset acquisition hardware), middleware (Game engines, connectivity, utilities), and management software (business strategies, business technologies, and development technologies) (Bergeron, 2006).

Hardware and Software Tools for Serious Games Development	
HARDWARE	SOFTWARE
Audio Equipment	2D Art/Image Manipulation
Data Storage	3D Rendering/Modeling/Animation
Deployment Platform	Asset Management
Desktops	Audio Utilities (Composition, Editing, Codecs)
Digitizing Equipment	Game Engines/Development Environments
Graphics Accelerator Cards	Middleware (AI, Physics, Networking, User Interface)
Laptops	Programming (Languages, Compilers, Debuggers)
Monitors	Assessment (Statistical Analysis, User Tracking)
Servers	Utilities (Installers, Security)
Workstations	Video (Editing, Codecs)
SPECIALIZED HARDWARE	SPECIALIZED SOFTWARE
Electronic Test Equipment	Electronic Distribution
Embedded Microprocessors	Hardware Emulators & Cross Compilers
Prototyping Boards	Mobile Programming Libraries

Table 3.1 - Hardware and software tools for serious games development (Bergeron, 2006)

3.1.1 Design Software

Creating a serious game design document (SGDD) is the first step in developing a serious game to give structure to the iterative processes of design development (Bergeron, 2006). It serves as a communication vehicle for the design and development team, the basis for fund raising, or as a marketing and sales tool. It also documents the important details of the development pipeline (figure 3.1.1). SGDDs are unique from game design documents in that they define entertainment attributes and how they are used to support the development of knowledge, skills, and attitudes in the player. Despite the available technology, the documentation of the design process of such

games has not changed and relies on tools like simple text editors and prototyping software systems (Bergeron, 2006). In order to facilitate this documentation there are several graphic packages that can be downloaded free of charge from the web, such as SmartDraw (www.smartdraw.com), and Microsoft Visio (www.mvp.org/visio). There is also an abundance of tutorials found online in order to teach developers how to use the design packages. In addition to data flow diagrams and other game design graphics, a serious game design document contains a compelling concept. To help create the story behind a serious game, there are tools available including: Idea Fisher, Dramatica Pro, and Power Structure (Bergeron, 2006). Idea Fisher is an outline and synonym generator that suggests catchy phrases, symbolism, and plot elements. Dramatica Pro is a storytelling and scene creation utility that helps developers create realistic scenes and dialogues. Power Structure is a general-purpose writing tool that supports character development, dialogue, and scene structure. The program's Conflict View option allows developers to assess the escalation of tension and conflict with game progress and another option, the Gestalt view, allows the developers to view the narrative according to Aristotle's three act model (beginning, middle, and end).

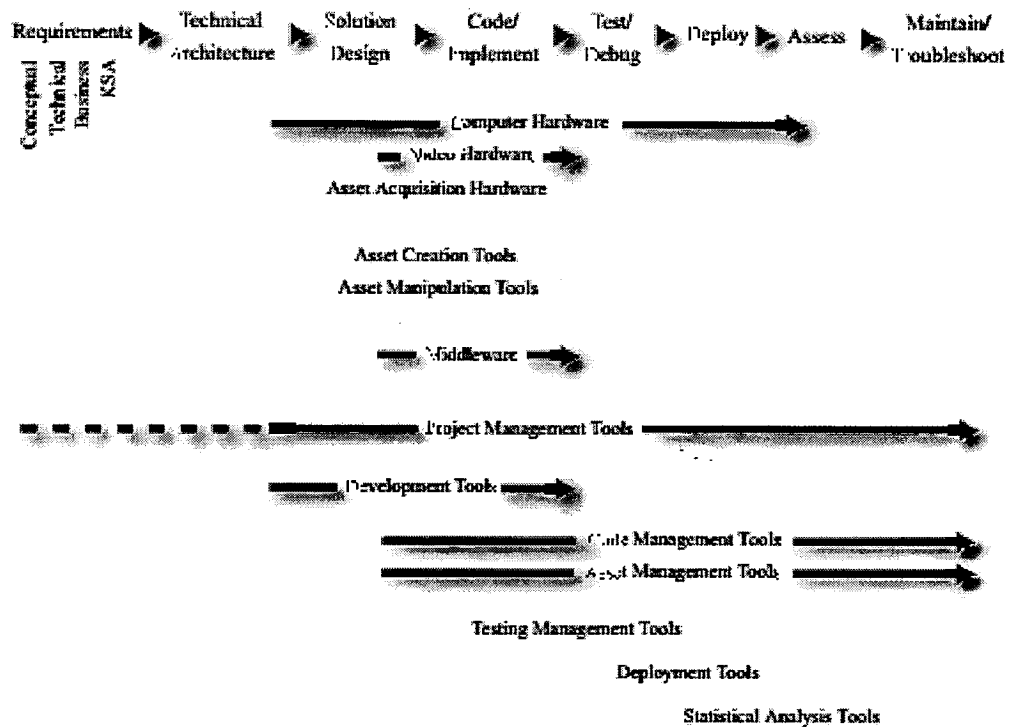


Figure 3.1.1 - Game development pipeline and the enabling technologies at the various stages of development (Bergeron, 2006: 81)

3.1.2 Hardware

There are different hardware available to developers to appropriately accommodate a serious game. These include, hardware for development, hardware for data acquisition, and embedded hardware systems (Bergeron, 2006). The wide range of software and hardware capable of supporting serious game development is a reflection of a serious game's application space.

3.1.2.1 Development Hardware

A serious game developer needs to appropriately select a programming workstation, art workstation, testing platform, server and network (Bergeron, 2006). They also utilize standard infrastructure technologies, such as uninterruptible power supplies (UPS) for the servers, keyboards, trackballs, and mice. Due to the developmental demand for hardware, even entry-

level computer systems are high-performance, but the difference in price from entry level to high end level computer systems can be considerable (Bergeron, 2006). Some hardware options such as a video card for a high-end level workstation, for example, an Alienware MJ12, is about the cost of an entry-level workstation, like the Dell Precision 670. Other hardware options, such as a network router, are inexpensive and there is no significant difference between high and low-end configurations. The added costs of higher-end hardware can be inconsequential, if developers and designers can create better graphics and gameplay quicker. For example, using testing platforms, developers can determine the source of a problem as they develop the serious game instead of trying to figure out the source of multiple problems at the end of the developmental process (Bergeron, 2006).

3.1.2.2 Data Acquisition Hardware

A serious game developer needs to appropriately select the hardware for acquiring data, such as images, video, and sound. Sometimes, the images, videos, and sounds; required for a serious game; can be purchased on the web. The easiest and least expensive way for obtaining quality captures is to make use of an array of affordable, textures, sound tracks and three dimensional models; but for most assets, developers turn to a wide variety of tools available for creation and manipulation (Bergeron, 2006). These include two dimensional image tools (Adobe Photoshop and Adobe Illustrator) and three dimensional image tools (3D Max, Maya, Lightwave 3D, PhotoModeler, Terrex).

Artists or the team working on a serious game may find a program like Photoshop suitable for creating certain graphical elements, but not for creating content that requires the power and versatility of a three dimensional modeling program like 3D Max. More often the

case, the development team needs to acquire content so that the art team can modify it to the desired style, resolution, or topic desired (Bergeron, 2006). Three dimensional video game designers need to create consistent and appropriate themes of color, lighting, and texture. As yet, digital cameras offer the quickest and most flexible solution to image acquisition, storage, and processing. Other hardware are used to acquire images, such as Flatbed scanners and digital microscopes (Bergeron, 2006).

Three dimensional video game designers need to use the most appropriate camera hardware for game development and this depends on the capture requirements. Moreover, the options for video capture are as much about the reflectors, backdrops, and lighting equipment as they are about the camera. To provide video cutscenes, a way to provide a game with an instant backstory and working context; often, designers make them from gameplay elements, but they can be made from external sources as well (Bergeron, 2006). Motion capture animation is an expensive proposition to create natural movement. The video is used to document character and object movement and complex procedures. The rendering of the captured scenes is a process that is a heavy load on any workstation, but a cost effective way to speed up rendering time is to distribute the rendering time to a network of PCS in the development shop (Bergeron, 2006).

Furthermore, for sound capture, there are dozens of hardware options for designers to consider (Bergeron, 2006). Developers working with sound need to consider how they hear the recording, using earphones or speakers. Basic computers have reasonable sound capture and good results can also be achieved with digital recorders and post processing computers (compression, equalization, and normalizing levels through digital manipulation). But, the better option to use for recording voice and sound effects is to use specialized hardware in a soundproof sound studio at a significant cost per day (Bergeron, 2006). Standard hardware can

be easier to use with an audio capture utility like Advanced MP3/WMA Recorder (www.auxaudiotools.com) or Total Recorder Pro (www.highcriteria.com). The problems with digital voice recorders include limited bandwidth and low signal-to-noise figures. Another way of capturing sounds is through the use of digital stethoscopes (Bergeron, 2006).

3.1.2.3 Embedded Hardware

Many serious games have an embedded hardware component that extends the functionality and learning value of stand-alone and PC-based serious games (Bergeron, 2006). A serious game developer needs to appropriately consider repurposed controllers, hardware modulators, microcontroller prototypes and test equipment. There are several approaches to providing alternative hardware interfaces to computer-based games. The easiest way is through repurposing controller's main circuit boards to instrument an appropriate device or object (Bergeron, 2006). A repurposed game controller can create much richer interfaces. Another inexpensive approach can be used to develop serious games by modifying consoles. For example, by using a balance board instead of a joystick playing Pacman can become a physically demanding exercise that develops the players' body balance and awareness (Bergeron, 2006). This modification in hardware can be used to rehabilitate clients with ankle injuries. Another method of interpreting game controller output signals is to use sensors and microcontrollers, self-contained computer systems on a chip optimized to control electronic devices, along with the controller hardware (Bergeron, 2006).

3.2 Challenges and Research Opportunities

Earlier serious games have served to illustrate issues common to several distinguishing characteristics of modern serious games: "an emphasis on content accuracy; a need for

developers with domain expertise; the need to follow design principles that consider the serious content and game components as a unified whole; staffing requirements that reflect the need for content accuracy and domain expertise; the need to incorporate techniques that might be specific to the serious content domain with what many game developers consider traditional techniques; the need to reflect the player's preferred learning style in the serious game design; variability in product mix and, therefore, what it means to be a serious games development shop; the importance of adhering to established standards for content and coding to facilitate sharing; the sizeable investment required to maintain momentum in the research and development of serious games; and the need to make provision for the inevitable evolution of hardware platforms and development tools" (Bergeron, 2006: 21). In addition, there are several other issues and challenges related to designing serious games, including: measuring effect, quality of games, extrinsic vs. intrinsic motivators, rhetoric and perception, player's meta-game, and ethics, clinical trials, and approval (McCallum, 2012).

Serious games are considered to have serious potential as a tool for instruction and intervention, but a recurring critique in the field of game and media studies, education, and psychology in the use of these games is whether their purpose is effective. This prompts questions about their usefulness. To validate any serious game design, four dimensions are considered: usability (functionality and accessibility), playability (regulated or unregulated), efficacy (the ability of a serious game's interaction to shape attitude, knowledge, skills, or behavior), and side-effects (unintentional effects of a serious game on a player) (Growing Games, 2015). Since learning is a complex construct, the purpose of serious games needs to be assessed in terms of its design and verified on an empirical basis. One of the important solutions arising from the relatively new technologies emerging is the development of consistent

guidelines and frameworks to support effective designs, because the quality of the serious game is vital to its effect. The purpose of these frameworks is explained below, with the intent to discover if existing serious game assessment frameworks integrate a critical methodology of play.

3.3 Serious Game Design and Assessment Frameworks

To provide structure to the creative part of serious game design, a common approach is the use of frameworks. Serious game design frameworks are formal approaches to understanding games and attempts to bridge the gap between design and development, game criticism, and technical game research that strengthens the iterative processes of developers, scholars and researchers. During the development process the decomposed components of a framework are used to analyze how the elements of a game work separately and how they work together to approach the game as a whole. The frameworks define how the characters, themes, and gameplay are used to support the development of knowledge, skills, and attitudes in players. These frameworks are the result of several fields employed and contain necessary elements of a serious game. Researchers have combined game design principles described in Chapter Two to build conceptual models that are currently utilized to design and evaluate components of serious games.

A serious game is a game explicitly designed with serious purposes, so it has most of the characteristics and elements of a game and all the principles from game design still apply, but serious games incorporate distinctive characteristics. As such, the models presented share many features, like game elements and learning elements. There are currently a number of frameworks and principles for serious game analysis and design that guide the possibilities offered by serious

games. These conceptual models are structured from five main concepts that were identified in the literature and the relationship between the components:

- Narrative elements; refers to the plot, characters, music, spectacle, narrative mechanics
- Game features; refers to the game mechanics, feedback, levels, challenge, goals
- Play attributes; refers to the fantasy, exploration
- Learning elements; refers to the motivation, reward/punishment, stimulus, repetition
- Aesthetic components; refers to the sensory phenomena, anticipation, memory

The following section presents the existing models and theoretical frameworks in the areas of entertainment digital games and serious games in order to evaluate how well they support recent understandings of the deeper relationships between a player and a serious game.

3.3.1 Mechanics, Dynamics, Aesthetics (MDA) Framework

The MDA framework depicts the player-designer relationship and has proven to be a useful approach to design “state machines” or entertainment digital games. Fundamental to this framework is the idea that the content of a game is its behavior and not the media that it streams out towards the player. The framework formalizes the consumption of games by breaking them down into their distinct components (rules, system, “fun”) and establishing their design counterparts (code, process, requirements) (Hunicke & all, 2004).

- The mechanics describe the components of a game at the level of data representation and algorithms (levels, assets and so on). They are the various actions, behaviors and control mechanisms that a player can take within the game’s context. The goal of this component is to define the game explicitly, in terms of computer applications.

- The dynamics describe the play-time behavior of the mechanics on the player's input and each other's outputs over time. For example, the mechanics of card games include shuffling and betting – from which dynamics like bluffing can emerge.
- The aesthetics describe the emotional responses generated in the player when interacting with the game.

The designer designs the rules or mechanics of a game that a player interacts with during run-time or play-time, forming the dynamics of the game. The dynamics work to create the aesthetic experiences, following game design principles. The aesthetics are the player's resulting emotional response when playing, which consequently influences the dynamics of the game. Game designers can modify the mechanics of the game to indirectly influence the game experience generated. As such, the game parts cannot be evaluated aside from its effects on the system's behavior and player experience. It is required to travel between all levels of abstraction so that the game's parts relate to each other as a whole. By moving between the three levels of abstraction, it is possible to conceptualize the dynamic behavior of the game system, which can be used to analyze how gameplay decisions impact the end user experience in order to better deconstruct that experience and use it to fuel new game designs, research, and criticism.



Figure 3.3.1 - MDA's structure, player perspective left to right and designer's perspective right to left (Roungas, 2015)

It was quickly observed that the MDA framework did not address aspects of game design beyond gameplay or game design for entertainment. In other words, the MDA framework does

not encompass the unique aspects of designing serious games, including storytelling, user experience, and the influence of technology on the design. As such, serious game development teams still did not have a unifying framework to bring the diverse components of game design and instructional design methodologies to help realize their designs, because the MDA framework does not incorporate unique aspects of designing serious games or specifically address what creates the mechanics, dynamics, or aesthetics the player interacts with (Winn & Heeter, 2006).

3.3.2 Design, Play, Experience (DPE) Framework

Winn and Heeter (2006) expanded the MDA framework to address shortcomings in the emerging discipline of serious game design by providing a language to discuss, methodology to analyze, and process to design serious games that is applicable to the entire spectrum of serious games. Fundamental to this approach is that game design features and content should be compatible and complimentary.

The DPE framework presents a method to analyze sub-components of serious games, which provides a formal approach to designing the learning, storytelling, gameplay, user experience, and technology components of a serious game. It has four layers of components, one of which is the MDA (gameplay layer). Each layer has subcomponents for each of the pillars of the DPE. In the learning layer, the designer designs the content and pedagogy, which results in teaching that imparts learning outcomes. The designer uses proven instructional design techniques when defining his learning outcomes. The learning goals form the basis of the content and pedagogy design and also form the basis for the assessment of the game's learning effectiveness on the player's experience. In the storytelling layer, the designer designs the

setting, character, and narrative. The storytelling that occurs during the game session is understood as a combination of the designer's story with the interactions and choices the player makes. The resulting experience is the player's story. Learning outcomes often complicate the storytelling in serious game design, because while fantasy can engage players, it may not facilitate the learning objectives. In the gameplay layer, the designer defines what the player does in the game. This is the layer that resembles the MDA framework, but the term 'aesthetics' which for most represents a visual arts term representing the beauty of something, is replaced with 'affect', a psychological term meaning emotion or desire. In the user experience layer, the game designer designs an interface that's purpose is to create a vehicle to realize the serious outcome. Another goal is to create an interface that immerses the player in a game world that engages him in the play experience. The authors highlight the tight ties between user experience and technology, where the capabilities and limitations of technology greatly influence the design and must be considered throughout the design process. Moreover, the vertical arrows shown in figure 3.3.2 reflect that each layer has an influence over the other layers. For example, the content and pedagogy will influence and be influenced by the character, setting and narrative; mechanics; and user interface.

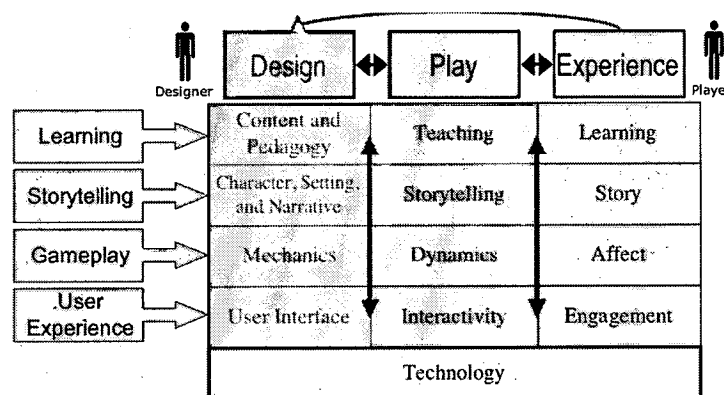


Figure 3.3.2 - Expanded DPE framework (Winn, 2009: 8)

Like the MDA framework, the DPE framework depicts the relationship between the designer and the player. The designer designs the game, the player plays the game, which results in the player's experience. Since play is a mediated experience, it is greatly influenced by both the design and the player, including his background. So, the designer comes up with the goals of the resulting experience and during the iterative process of game design the goals can be tested against the player's experience.

3.3.3 Serious Game Design Assessment (SGDA) Framework

Mitgutsch and Alvarado's (2013) SGDA framework builds on the DPE framework and integrates other serious game design and analysis frameworks: Annetta, Lamb, and Stone's method of evaluation (Annetta & Bronack, 2011), and Eric Sanchez's seven element framework (Sanchez, 2011). The authors, based on their experience of designing such games emphasize the importance of identifying coherent content in a serious game's formal design to effectively assess the game's objective's impact. This approach structures the different essential elements of the design to aid in the identification of the coherence between the design elements and the games' overall purpose to ensure that the purpose is reflected in the essential elements of the game's design: the content and information, the fiction and narrative, the game mechanics, the aesthetics and graphics, and the framing.

Serious game assessment was traditionally assessed in terms of the quality of their content, but the SGDA assesses a serious game in terms of their intention-based design. The SGDA framework structures the different formal elements of a serious game's design and facilitates the critical evaluation of the formal conceptual design in relation to the purpose in

order to detect a systematical conflict in design features. By studying the purpose's coherence in the formal elements of a game, the serious game's impact is inferred. The components are structured according to the following:

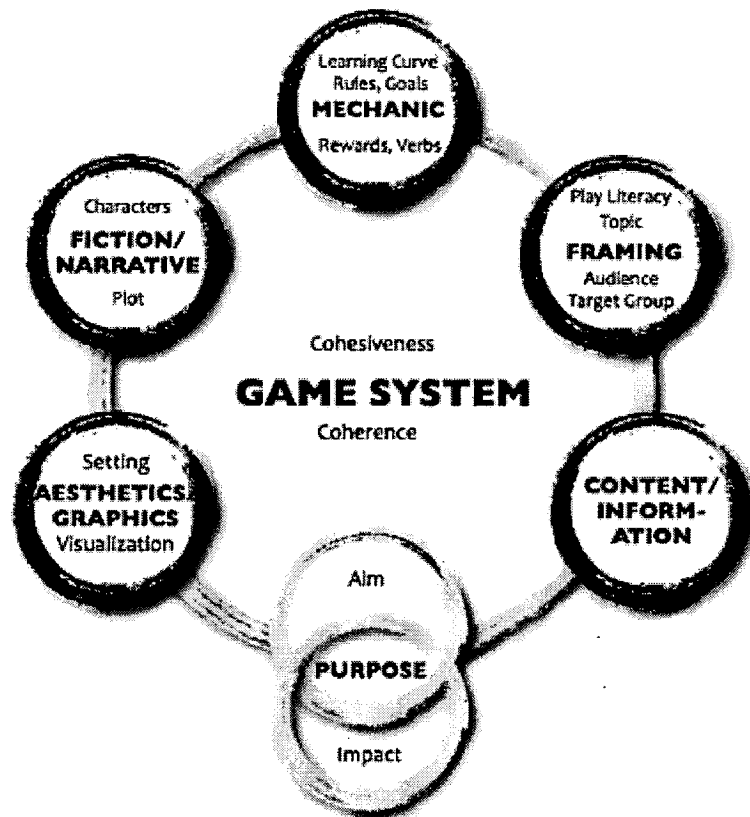


Figure 3.3.3 - SGDA framework (Mitgutsch & Alvarado, 2013: 3)

- Purpose; refers to the aim of the game and its impact on the players.
- Content and information; refers to the information, facts, and data offered and used in the game.
- Game mechanics; involves the establishment of rules that define the possibility space for operations in the game world.

- Fiction and narrative; refers to the fictional context involving the setting, narrative, story, scenario, characters, backstory, problem...etc. to provide a mechanics-based space that enables players to create their own stories.
- Aesthetics and graphics; refers to the audiovisual language (aesthetic characteristics, imagery, style, preferences, artistic media, and the computer graphic techniques).
- Framing; referring to the target audience's play literacy.

After evaluating the components, each component is inspected for its reflection of the serious game's purpose. In order to walk us through their framework, the authors apply the SGDA framework by decomposing and recomposing the design elements of two serious games targeting social change: the online game "Sweatshop" (2011) and "ICED" (2008) (an acronym for I Can End Deportation). They illustrate that it is possible to structure a discussion about the serious games' elements in relation to the games' purpose and reflect on the strengths and weaknesses of a game in terms of their purpose, so that the purpose is reflected in all design elements; increasing the serious game's prospective impact.

3.3.4 Summary and Criticism

The MDA framework provides an approach to game design that regards games as software that serves an emotional purpose for entertainment gains. It is a useful approach to designing and analyzing a game's design for many designers, but it does not incorporate unique aspects of designing serious games or specifically address what creates the mechanics, dynamics, or aesthetics the player interacts with (Winn & Heeter, 2006). On the other hand, the DPE framework provides a formal approach to designing the learning, storytelling, gameplay, and user experience, while taking technology components of a serious game into consideration. The

gameplay layer in the DPE framework most closely resembles the original MDA framework, except in the change of terminology from aesthetics to affect - it reads affect and aesthetics as something that happens or is done to the player, which limits the analysis of serious games' player experience (Rodriguez, 2006; Sicart, 2011). Similarly, since the SGDA framework is established from the DPE framework, it highlights the importance of reflecting a cohesive purpose in every aspect of a serious game to reduce systematic conflicts within a serious game design in order to create a coherent learning experience, but its interpretation of the aesthetic element of a serious game is the least developed of all. It limits aesthetic discussions within serious game analysis to graphic style analysis and places the aesthetic perspective within game studies to a marginal role.

From the analysis of existing serious game design and assessment frameworks, it was identified that they deal with the relationship between different layers of game implementation and contribute to the effort of creating precise and accessible descriptions of serious games and play. However, they are limited to describing serious games in general without incorporating a critical methodology of play that is attested to radically change a serious game's experience. Existing serious game design and assessment frameworks do not explicitly account for a player-centric approach to serious game design analysis that can be used to study the interface and the interactions afforded between a players and a serious game, instead they leave out an important component of how serious games build discourses of aesthetic value: active player participation.

3.4 Conclusion

In the previous chapter the topic of a serious game's expressive value was explored. In this chapter, the process of designing and developing serious games and some challenges and

research opportunities in this area of research were explored. The serious game movement has been facilitated and directed by the accessibility of various technologies which have developed to a point that games can be designed and developed independently, but design frameworks are used to guide the design process and provide evidence of a serious game's impact. Focusing on the interaction afforded between a player and a serious game, existing serious game design assessment frameworks were problematized: the kernel of the meaning of the play experience is not identified with design tactics that consider the influence of player participation, thereby radically weakening their ability to assess a serious game's impact. To enhance the assessment and design of serious games, a new model that maps essential criteria of game, play, and learning components, which are not fully integrated in existing models of serious game design frameworks, is identified and synthesized in the next chapter.

Chapter 4 – Re-Thinking Play in Serious Game Design

Assessment Frameworks

Research detailed in this thesis has indicated that if a serious game design balances the elements of games, play, and learning; it can encourage embodied player participation and become a more effective form of play. Through an iterative process that alternated between literature reviews and practical testing of the concepts of serious games, points for refinement were identified in existing serious game design assessment frameworks. The survey on methods and frameworks for game and serious game design evaluation models reveals that available design assessment frameworks lack a critical methodology of play. To provide insight into a serious game's impact, the dynamics of the internal world the player brings into game spaces need to be considered to validate how a serious game maintains the engagement of a player's spontaneous imaginative physiological participation, which is an integral component of learning that enhances the psychological and sociological values of play. As a constructive step towards addressing this issue in existing serious game design assessment frameworks, in this chapter, a new model is identified and synthesized to argue a serious game's ability to cast a player in the role of active participant and its effectiveness as a form of play.

4.1 Player-Centric Approach to Serious Game Design Assessment Framework

The SGDA framework highlights the importance of reflecting the serious game's purpose in every formal element of the serious game; including fiction/narrative (storytelling), aesthetics (graphics), content and information (visible content), framing (learning and usability), mechanics (learning and usability) to enhance the impact of a serious game. By critically evaluating the

reflection of a serious game's purpose in all of its design components, designers can detect systematical conflicts that weaken its impact. It has proven to be a good tool for evaluating a serious games' system coherence and therefore theoretical impact, but, according to player-centric approaches to game design, this model leaves an important element substantially unconsidered: players. However, player participation is fundamental to understanding creating an engaging experience. Therefore, the SGDA framework's interpretation of the aesthetic elements of a serious game can be enhanced by expanding aesthetic discussions within its design assessment beyond graphic style to include the play experience in the serious game's arguments of meaning.

To ensure that the most important aspects of the game experience are not lost during the design and development process, the new model uses the SGDA framework (Mitgutsch & Alvarado, 2013) to understand the structure of a serious game, providing a way to assess the relationship between serious game components and the serious game's purpose, and four existing framework player-centric frameworks (Calleja, 2011; Hunicke & all, 2004; McGonigal, 2011; Squire, 2006), providing a way to assess the relationship between the player and the serious game. Together, these models include components of serious game design and player-centric design approaches to games. Consequently, to establish play criteria that will be used to guide the analysis of a serious game, the items from the four player-centric models (Calleja, 2011; Hunicke & all, 2004; McGonigal, 2011; Squire, 2006) are first identified, summarized, synthesized, and then combined in new terms in the following sections to develop a play score

evaluation model, which is adapted from a proposed model for designing health-focused serious games⁶ (Kemble, 2014) and serves to supplement the SGDA framework.

4.1.1 Player-Centric Game Approaches Summarized

Traditional critiques of serious games focus on text, image, and animations, but recent arguments of play view games as vehicles for player experience. Increasingly, game design is conceptualized as the choreography of rules, representations and player's roles that allow players' to generate meaning. Consequently, there have been several frameworks developed that consider the game components that encourage player expression. Player-centric game models are developed as tools for game designers. For the purposes of this study, four player-centric approaches to game design (Hunicke & all, 2004; Squire, 2006; Calleja, 2011; McGonigal, 2011) are identified and summarized in this section.

Hunicke and all's (2004) MDA framework, previously described in section 3.3.1, regards that games serve an artistic purpose. It depicts the player-designer relationship to design "state machines". It is a useful approach to designing and depicting the relationship between a game's mechanics, aesthetics, and dynamics.

Kurt Squire's (2006) approach essentially reflects that the most successful game experiences integrate all aspects of a player's experience by engaging his mind, body, and spirit; since designed experiences occur at the intersection of design constraints and a player's

⁶ Kemble's (2014) model is not an established serious game design assessment framework and therefore was not included in the list of existing models in the previous chapter. Kemble's proposed model is composed of twelve existing models used in gaming, learning and usability that guide the development of a new 15-point model which is used to thoroughly assess the important design tactics used in serious games to predict the success of health-focused serious games throughout the game development process.

intention. He provides guidelines to help designers understand how to deeply appeal to a player, briefed in the following:

- Show empathy, by considering genuine needs and desires a game fulfills for the player and how these needs should be embedded into the game.
- Set the stage, a virtual world must be believable. This includes rules and implicit cultural ones.
- Roleplaying games, where a player can test and assume different identities for both his avatar and himself while learning the game's value.
- The player is the hero, the process of the experience should drive a game's design, not the content.
- Players need to be afforded action, to explore and learn through performing specific tasks.
- Construct learning environments, through social interaction.
- Games speak in images, graphics become another gaming language necessary for players to thrive in a game.
- Map a learning ideology or show the player what is important, by eliminating unnecessary or incoherent information.
- Provide enough information, to keep the player engaged.
- A game is what a player makes it, which details the explanation of transfer through player involvement.

The third model selected for this study is Gordan Calleja's (2011) six dimensional model of involvement. His research focuses on immersion in gameplay, which is known to aid in transfer and learning, and believes immersion to be a natural response of player involvement. His

model points to six dimensions of involvement which he argues build a player's sense of presence, summarized in the following:

- Kinesthetic involvement, referring to the ability to manipulate the game's actors and environment within the game, also referred to as interactive agency.
- Spatial involvement, referring to the ability to perceive, explore, and discover freely in a virtual environment.
- Shared involvement, referring to the player's ability to interact with other players or automated components.
- Narrative involvement, the ability of a player to affect a game's narrative through his actions and experience a unique story through feedback.
- Affective involvement, ability to engage a player emotionally through a series of feedback between player and game system.
- Ludic involvement, the ability to select, set, and achieve goals that leads to self-competency and mastery.

The fourth game experience model selected for this study is developed by Jane McGonigal (2011). She has contributed some of the most successful serious games of the last decade. From her extensive research, she has developed her own list of defining criteria of a successful game, summarized in the following:

- Clearly defined goals, giving players a sense of purpose.
- Rules and limitations to "unleash creativity and foster strategic thinking".
- A rapid feedback system that keeps players motivated and indicates progress towards achieving the goal.
- Voluntary participation, referring to a player's freedom to enter or leave a game at will.

4.1.2 Sorting Data: Synthesizing Play Criteria

To create an inclusive method of evaluating a serious game's impact, game experience guidelines are identified in Kemble's (2014) proposed model, synthesized, and defined in new terms that are defined by Kemble (2014) (table 4.1.2a). Then, corresponding guidelines from the different sources are sorted and combined (table 4.1.2b). The resulting criteria is then finalized (figure 4.1.2) as part of the PCASGDA framework.

Game Experience Guideline	Source	New Terms
Aesthetics	(Hunicke & all, 2004)	Agency and engagement
Dynamics	(Hunicke & all, 2004)	Facilitate flow
Mechanics	(Hunicke & all, 2004)	Custom content
Show empathy, by considering genuine needs and desires a game fulfills for the player and how these needs should be embedded into the game	(Squire, 2006)	Agency and engagement
Set the stage, a virtual world must be believable. This includes rules and implicit cultural ones	(Squire, 2006)	Intuitive integration
Roleplaying games	(Squire, 2006)	Realistic metaphors for transfer
The player is the hero, the process of the experience should drive a game's design, not the content	(Squire, 2006)	Agency and engagement
Players need to be afforded action	(Squire, 2006)	Agency and engagement
Construct learning environments, through social interaction	(Squire, 2006)	Modeling and mentorship
Games speak in images, graphics as gaming language	(Squire, 2006)	Agency and engagement
Map a learning ideology	(Squire, 2006)	Agency and engagement
Provide enough information	(Squire, 2006)	Agency and engagement
A game is what a player makes it, which details the explanation of transfer through player involvement	(Squire, 2006)	Flexible direction
Kinesthetic involvement	(Calleja, 2011)	Agency and engagement
Spatial involvement	(Calleja, 2011)	Culture and collective play
Shared involvement	(Calleja, 2011)	Agency and engagement

Narrative involvement	(Calleja, 2011)	Agency and engagement
Affective involvement	(Calleja, 2011)	Agency and engagement
Ludic involvement	(Calleja, 2011)	Agency and engagement
Clearly defined goals, giving players a sense of purpose	(McGonigal, 2011)	Goals and limits
Rules and limitations, to expand creativity and foster strategic thinking	(McGonigal, 2011)	Goals and limits
A rapid feedback system, that keeps players motivated and indicated progress towards achieving the goal	(McGonigal, 2011)	Communication
Voluntary participation, referring to a player's freedom to enter or leave a game at will	(McGonigal, 2011)	Culture and collective play

Table 4.1.2a – Summarized game experience guidelines defined in new terms

New Terms	Clustered Game Experience Guidelines
Goals and limits, motivate players to explore and learn.	– Games have clearly defined goals, giving players a sense of purpose (McGonigal, 2011).
	– Games have rules and limitations to expand creativity and foster strategic thinking (McGonigal, 2011).
Facilitate flow, engage players by immersing them in activities and/or a story.	– Dynamics (Hunicke & all, 2004).
	– Games speak in images (Squire, 2006).
	– Map a learning ideology or show the player what is important (Squire, 2006).
	– Provide enough information (Squire, 2006).
Agency and engagement, balance challenge and sense of achievement.	– Aesthetics (Hunicke & all, 2004).
	– Show empathy, by considering genuine needs and desires a game fulfills for the player and how these needs should be embedded into the game (Squire, 2006).
	– The player is the hero, the process of the experience should drive a game's design, not the content (Squire, 2006).
	– Players need to be afforded action (Squire, 2006).
	– Kinesthetic involvement (Calleja, 2011).
	– Shared involvement (Calleja, 2011).
	– Narrative involvement (Calleja, 2011).
	– Affective involvement (Calleja, 2011).
– Ludic involvement (Calleja, 2011).	
Culture and collective play, increase player's	– Spatial involvement (Calleja, 2011).
	– Voluntary participation, referring to a player's freedom to enter or leave a game at will (McGonigal, 2011).

understanding of game objectives.	
Intuitive integration, provide flexible play opportunities in a metaphorical, yet believable environment.	– Set the stage, a virtual world must be believable. This includes rules and implicit cultural ones (Squire, 2006).
Communication, help players track progress, allowing the player to orient their actions towards the goals.	– Games have a rapid feedback system that keeps players motivated and indicated progress towards achieving the goal (McGonigal, 2011).
Custom content, afford various options and paths to understanding and achieving goals while working toward increasing competency and mastery.	– Mechanics (Hunicke & all, 2004).
Realistic metaphors for Transfer, create parallels between problems in reality and learned in game skills, allowing players to learn how to adopt behavior or skills.	– Roleplaying games (Squire, 2006).
Behavior modeling and mentorship, map objectives into demonstrations through character interactions in game environments.	– Construct learning environments, through social interaction (Squire, 2006).
Flexible direction, allow ample opportunity to practice	– A game is what a player makes it, which details the explanation of transfer through player involvement (Squire, 2006).

Table 4.1.2b – Sorted and combined game experience guidelines

The guidelines of the four identified player-centric design models were summarized, defined in new terms, and then combined according to Kemble’s (2014) proposed model. The summary of play score evaluation guidelines are used for the synthesized model of serious game design assessment. These clusters made up ten guidelines defined in new terms, which serve as

key evaluation questions. The game experience guidelines that follow are finalized in figure 4.1.2 to serve as part of the synthesized tool for design guidance and evaluation of indirectly therapeutic serious games:

1. Goals and limits, motivate players to explore and learn
2. Facilitate flow, engage players by immersing them in activities and/or a story.
3. Agency and engagement, balance challenge and sense of achievement
4. Culture and collective play, increase player's understanding of game objectives.
5. Intuitive integration, provide flexible play opportunities in a metaphorical, yet believable environment.
6. Communication, help players track progress, allowing the player to orient their actions towards the goals.
7. Custom content, afford various options and paths to understanding and achieving goals while working toward increasing competency and mastery.
8. Realistic metaphors for transfer, create parallels between problems in reality and learned in game skills, allowing players to learn how to adopt behavior or skills.
9. Behavior modeling and mentorship, map objectives into demonstrations through character interactions in game environments.
10. Flexible direction, allow ample opportunity to practice.

Figure 4.1.2 – Summary of play evaluation guidelines

4.1.3 Establishing a Decision Guide for Play Score Evaluation

To ensure that the PCASGDA model can be used consistently, each game was given a play score based on the decision guide for scoring proposed by Kemble (2014). The method selected for play evaluation satisfaction is rule-based scoring, based on a qualitative research approach in social sciences (MacQueen, 2008), leading to the development of the following decision guide. Numbers range from 0 to 10, with one point given to each satisfied criterion. Each of the criteria may receive a maximum score of one (1). If a rule is satisfied, it is coded with a one (+1). If a rule is not satisfied, it is coded with a zero (0). The score is the sum of the ten satisfied play criteria, serving to indicate the quality of interaction afforded between a player and a serious game.

4.2 Player-Centric Approach to Serious Game Design Assessment Framework Summary

The SGDA framework's interpretations and limitations of the aesthetic elements of a serious game's design and analysis can be enriched by considering player participation through integrating play evaluation into its arguments of meaning, since it is fundamental to creating an engaging experience. To establish a model for the evaluation of indirectly therapeutic serious games; the serious game design assessment (SGDA) framework and four existing models (Calleja, 2011; Hunicke & all, 2004; McGonigal, 2011; Squire, 2006), that take a player-centric design approach were identified, summarized, and combined. Together, these models include approaches to serious game design assessment and player-centric game design; to ensure that the most important aspects of the game experience are not lost during the design and development process. The play evaluation guidelines (figure 4.1.2b), established in the previous section, serve to supplement the SGDA framework for design guidance and evaluation for indirectly therapeutic serious games. The PCASGDA framework is summarized in figure 4.2 below:

1. Purpose, refers to the aim of the game.
2. Aesthetics/graphics, refers to the audiovisual language: imagery, style, and computer graphic techniques.
3. Fiction/narrative, refers to the fictional context involving the setting, narrative story, scenario, characters, backstory, problem...etc.
4. Mechanics, refers to the rules that define the possibility space of operation in the game world.
5. Framing, refers to play literacy and game usability.
6. Content/information, refers to information, facts, and data offered and used in the game.
7. Play evaluation, refers to the ten player-centric criteria (figure 4.1.2) that involves the establishment of rules that define the possibility space for interactions in the game world: goals and limits, facilitate flow, agency and engagement, culture and collective play, intuitive integration, communication, custom content, realistic metaphors for transfer, behavior modeling and mentorship, and flexible direction. The play evaluation score is the sum of the satisfied play criteria and serves to indicate the quality of interaction afforded between a player and a serious game.

8. Coherence of game system, refers to the critical evaluation of the formal elements of a serious game's design in relation to the purpose in order to detect a systematical conflict in the formal design features.

Figure 4.2 – PCASGDA framework

The PCASGDA framework is a formative evaluation tool seeking to help designers improve the quality of indirectly therapeutic serious game design and development constituting the SGDA framework and a tool for play evaluation to include the encouragement of player participation into the arguments of meaning of a serious game. The play evaluation score is collected based on the decision guide score explained in the previous section, 4.1.3 - Establishing a Decision Guide for Play Score Evaluation. The major advantage of formative evaluation tools is that they can be used after the summative evaluation or on an interim basis. They may influence the summative evaluations used to determine overall efficacy, but they are not the final measure of success. These types of evaluations are intended to be flexible and responsive throughout the design and development process as a way to identify areas for improvement and growth in serious game design processes towards effective forms of play.

4.3 Conclusion

There are a lot of variables on a game designer's list to consider. They are all important pieces of the puzzle that serious game designers need to factor into their design to achieve rapport with players. All aspects need to be considered without disregarding others in order to evaluate a game system's success. By combining the literature on play therapy techniques, principles of serious games and player-centric game design, a model that can be used for the evaluation, guidance, and enhancement of therapeutic serious game design and development was synthesized in this chapter. The PCASGDA model (figure 4.2) integrates serious game design

and player-centric game design components and guidelines. The summary of play evaluation guidelines (figure 4.1.2) serves to supplement the SGDA framework, to enhance indirectly therapeutic serious game assessment. In the next chapter, the PCASGDA framework is applied to the selected serious games to substantiate the claim of this thesis.

Chapter 5 – Application of the Player-Centric Approach to Serious Game Design Assessment (PCASGDA) Framework

Since considering player participation is fundamental to creating an engaging experience, the critical assessment and design of a serious game can be enhanced by placing the aesthetic perspective within game studies in a central role vis-à-vis incorporating the play evaluation into the arguments of meaning. The SGDA framework and four existing models that take a player-centric design approach were identified, summarized, and synthesized in Chapter Four (figure 4.1.3). To authenticate if the synthesized model (figure 4.2) can be a useful evaluative tool for assessing serious games, it is used to guide the evaluation of five indirectly therapeutic serious games⁷: Re-Mission (2006), SPARX (2012), Elude (2010), Sym (2015), and The Average Everyday Adventures of Samantha Browne (2016) in the following pages. The results of these assessments are then evaluated to substantiate the framework's viability.

5.1 Game 1: Re-mission (2006)

1. Purpose: The topic of Re-mission is cancer treatment. It is a free online game designed by HopeLab in 2006 as a health improvement intervention for cancer patients, specifically designed for younger audiences (+13), to increase knowledge retention and encourage the importance of treatment adherence (Kato & all, 2008; Kemble, 2014, Youtube Gaming, 2009).

⁷ For the detailed establishment of play evaluation scores, see Appendix.

2. Aesthetics/Graphics: Re-mission is contextualized through a three dimensional third-person shooter with a realistic style of animation. Every level starts with a pseudo patient's medical profile (figure 5.1a). Due to the intrinsic characteristics of 3D graphics, the player is able to walk through the body of a patient while eradicating cancer cells (figure 5.1b). The audio language provides support to game actions, such as blasting and walking. Re-mission provides excellent auditory cues facilitating flow (Kemble, 2014).

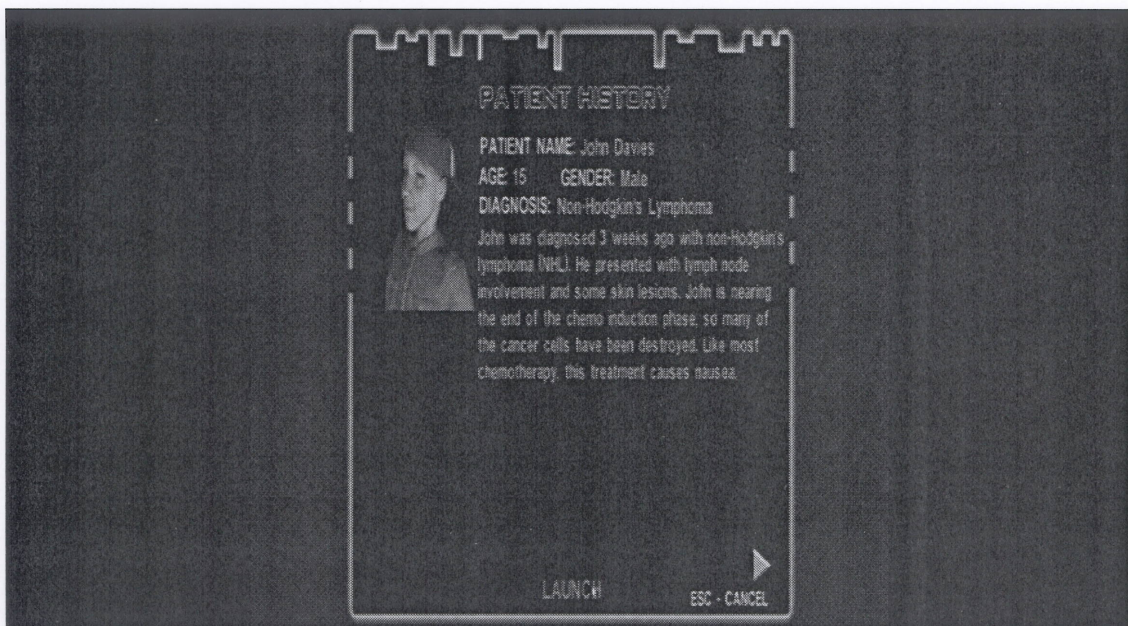


Figure 5.1a – Screenshot from Remission, the pseudo patient's medical profile.

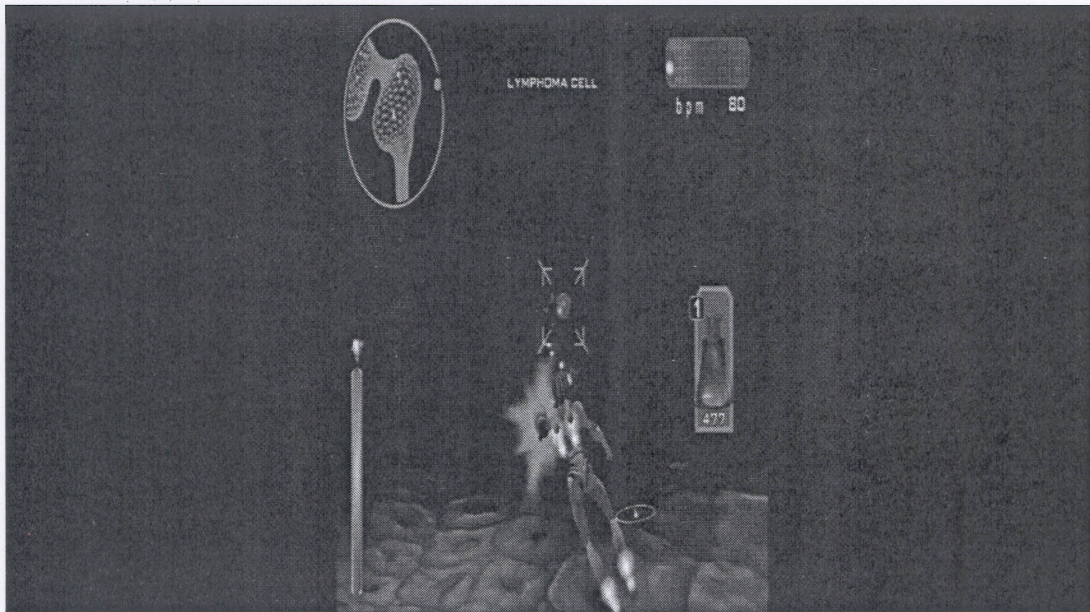


Figure 5.1b – Screenshot from Remission, the player walks through the body of a patient while eradicating cancer cells.

3. **Fiction/Narrative:** Players take on a character's role – Roxxie, a new generation nanobot; setting the game in the future in a time that nanotechnology has enabled the use of microscopic robots to fight diseases on a cellular level (Youtube Gaming, 2009). Roxxi is introduced to a patient's profile and his medical condition. The player is then ported inside of the patient's body as Roxxi, the nanobot. The game is structured so that the player is delivered information about the pseudo patient through the patient's lymph node in a narrative cut scene, framing the in-game goal. Once the cut scene is over, gameplay begins and the player must work to eradicate cancer cells, while learning about the different kinds of cancer treatments and the effects of treatment adherence.
4. **Mechanics:** Mechanically, it is a straight forward third-person shooter. The player holds a weapon, a chemoblaster, which needs to be refueled with appropriate chemo medication. The player blasts the cancer cells to help eradicate the disease (Youtube Gaming, 2009, Youtube Gaming, 2012a, Youtube Gaming, 2012b). Roxxi must learn how to administer

the correct medications to help kill off certain types of cancer cells in order to save the patient's life (Youtube Gaming, 2009). Onscreen indicators, like Roxxi's health bar (figure 5.1b, lower left corner) and the patient's health status (figure 5.1b upper right corner), serve to help the player track his progress, allowing the player to adjust his actions towards eradicating the disease. The player also receives feedback in the form of in-game goal communication (figure 5.1c). If the player does not blast them all they divide again and multiply. The in-game goal in Re-mission is to eradicate cancer cells by navigating in a patient's body with time and ammunition restrictions, while collecting points for eradicating cancer cells. Since the game requires the player to use specific weapons and ammunition to kill off certain types of cancer cells, it trains the player to use the right medicines to defeat cancer and creatively expresses how treatment will fail if the right medicine is not administered quickly enough (Youtube Gaming, 2009, Youtube Gaming, 2012a, Youtube Gaming, 2012b). The rules allow the player to either succeed or fail at curing the patient's illness. With 20 levels to go, the player takes a journey through the bodies of patients with different kinds of cancer.

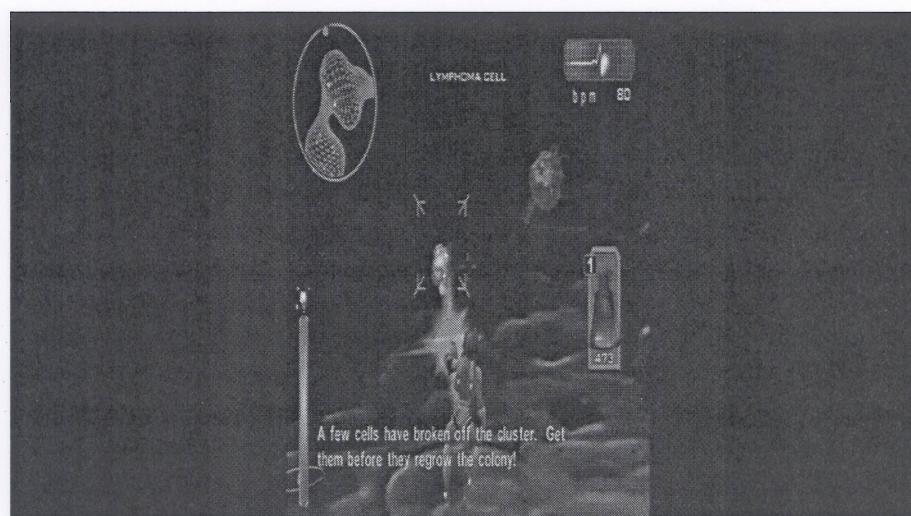


Figure 5.1c – Screenshot from Remission, in-game goal communication in lower left corner.

5. Framing: Re-mission focuses on a specific target audience: young adults. The play literacy of the target group is basic, compared to most casual games. The difficulty level is balanced (Kemble, 2014). Failing a level does not have consequences on the overall progress, fostering replayability (Youtube Gaming, 2009, Youtube Gaming, 2012a, Youtube Gaming, 2012b).
6. Content/Information: The topic of the game is addressed metaphorically (Kato & all, 2008; Kemble, 2014, Youtube Gaming, 2009). Re-mission provides in-game data on completed missions, on the medication available to battle each type of cancer, and pseudo patients' health status. The player acts out the contingencies that are associated with cancer treatment in real life, meaning the patient needs to take the appropriate medicine in order for treatment to be effective (Kato & all, 2008; Kemble, 2014, Youtube Gaming, 2009).
7. Play Evaluation:
 1. Goals and Limits (+1)
 2. Facilitate Flow (+1)
 3. Agency and Engagement (+1)
 4. Culture and Collective Play (+1)
 5. Intuitive integration (+1)
 6. Communication (+1)
 7. Custom content (+1)
 8. Realistic Metaphors for Transfer (+1)
 9. Behavior modeling and mentorship (+1)
 10. Flexible Direction (+1)

8. Coherence of Game System: The purpose of the game to offer a playful virtual environment where the contingencies of cancer treatment are represented as in real life strategies is coherent with the content, the narrative and the mechanics of the game. The game mechanics and the context take the player into the effects of proper treatment methods for different types of cancer. The game offers informative content regarding treatment indirectly through play. Its greatest strength is its use of metaphors that facilitates the transfer of knowledge and the dynamic between goals and challenges that enhances engagement (Kemble, 2014).

Re-mission serves as a therapeutic serious game with demonstrated effectiveness in helping chronically ill players change health behavior. It was selected, because it is regarded as the standard serious games should attempt to achieve in play, learning, and game experience. Using the PCASGDA model to evaluate the game system's coherence, it satisfied all the play criteria (+10) illustrating good active learning and play principles in the game's design and no systematical conflicts were detected. The evaluation collected a high play score and coherent game system reflecting the game's actual success, supporting the PCASGDA model's viability.

5.2 Game 2: SPARX (2012)

1. Purpose: SPARX is an online interactive fantasy role-playing game designed to deliver cognitive behavioral therapy⁸ by teaching young adults behaviors that can help them cope with feeling down or stressed for the treatment of mild-moderate depression: problem-solving, being active, dealing with negative thoughts, social skills and relaxation (Merry

⁸ CBT focuses on the links between how people think, what they do and how they feel. It teaches skills to deal with negative thoughts and feelings and helps people to think in a more balanced way (Merry & all, 2012).

& all, 2012). The idea of SPARX is to get therapeutic aid to those who need it using techniques ordinarily used in therapy through the fantasy game format so the player can chose an avatar, go into a fantasy world, and undertake a number of challenges (Youtube, 2012; Youtube, 2013a; Youtube, 2014). It was designed and developed by a University of Auckland in 2009 as a way for young adults to receive free therapy for mild to moderate depression, but is only available to people in New Zealand⁹ (Hughes, 2014; Merry & all, 2012; Szalavitz, 2013).

2. Aesthetics: SPARX is set in a three dimensional interactive fantasy game world, allowing the player to walk through the game world while fighting gloom. The world of SPARX is dark and gloomy, but as the player learns all the techniques, light returns to the world and the game world becomes brighter, reflecting how gloomy outlooks can be relieved with appropriate coping skills. The gameplay is framed by meditation music in the background, interactive sound effects, and vocal narration.
3. Fiction/Narrative: Based in an interactive three dimensional fantasy world, the player takes a journey to faraway lands, fights gloom, and overcomes obstacles in order to learn five behaviors that can help them cope with feeling down or stressed. In the beginning of SPARX, the player meets the guide who explains what SPARX is and how it intends to help a player relieve his symptoms (Youtube, 2012; Youtube, 2013a; Youtube, 2014). SPARX utilizes both first person instruction and a three dimensional interactive game in which the young person chooses an avatar and undertakes a series of challenges to restore the balance in a fantasy world dominated by GNATs (Gloomy Negative Automatic

⁹ Because SPARX is only available for play in New Zealand, this study relies on observations of play made through videos found on Youtube (Youtube, 2012; Youtube, 2013a) and other reviewers (Hughes, 2014; Merry & all, 2012; Szalavitz, 2013) to study SPARX.

Thoughts). The player customizes an avatar and starts to journey within seven realms, completed sequentially (Szalavitz, 2012) trying to “bring back the light” to the game-world. At the beginning and end of each mission, the player interacts in the first person with the guide, who puts the game into context, provides education, gauges mood, and sets and monitors real-life challenges, equivalent to homework (Merry & all, 2012). The player is tasked to solve the in-game challenges in third-person to be taught skills that are transferable to real life.

4. Mechanics: Through SPARX, the player is taught how to resolve his issues on his own, according to the talking psychotherapeutic approach called cognitive behavioral therapy (CBT) (Merry & all, 2012). Players complete one or two levels in the game each week, during three to seven weeks so that the player can practice the skills in between play sessions to increase knowledge retention in order to relieve the player’s symptoms of depression. The in-game challenge is to defeat the GNATS, while restoring light to the game-world. The player does this through journeying in the three dimensional fantasy world and eradicating GNATS with his “Staff of Ancestors” (Youtube, 2012; Youtube, 2013a; Youtube, 2014) (figure 5.2). As the game progresses, the player meets different characters, solves puzzles, and completes mini games. As soon as a quest is completed, the guide explains how to use new skills in order to feel better, solve problems, and enjoy real life. To win at SPARX, the player needs to explore thinking and doing skills to change how he feels to create a shield to protect himself against depression (Hughes, 2014; Szalavitz, 2012).

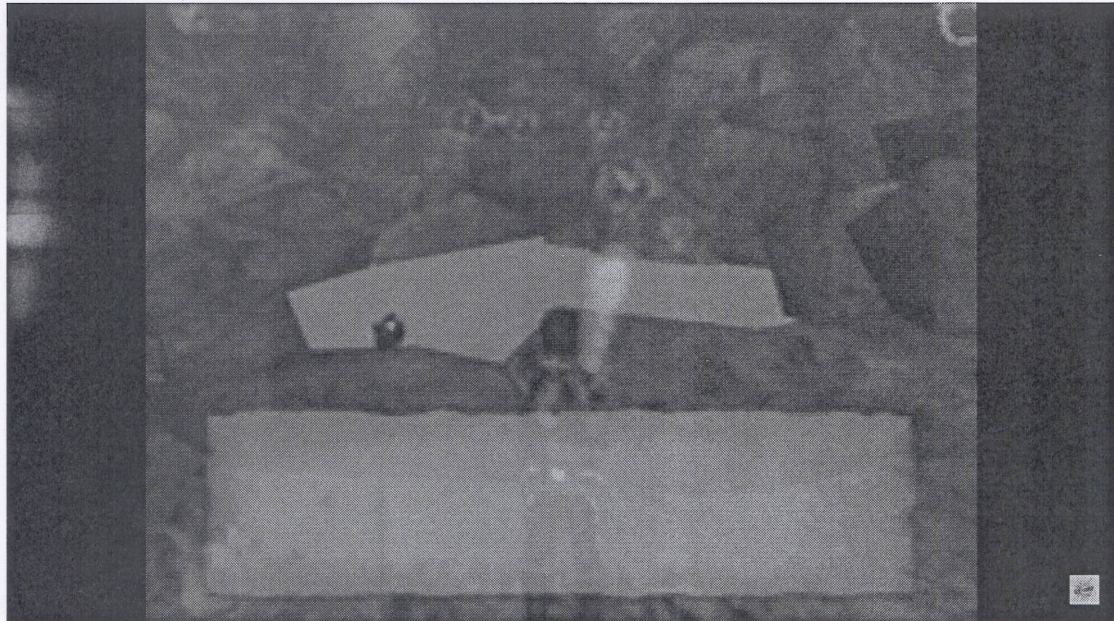


Figure 5.2 – Screenshot from SPARX, Hope guiding the player, the player shoots GNATS with the Staff of Ancestors.

5. **Framing:** SPARX targets a core audience of young adults aged 12-19 that have symptoms of mild to moderate depression (Hughes, 2014; Merry & all, 2012; Szalavitz, 2012). The play literacy of the target group is basic, compared to most casual games. The difficulty level is balanced (Merry & all, 2012). Failing a level does not have consequences on the overall progress, fostering replayability.
6. **Content/Information:** The topic of the game is addressed both directly and metaphorically (Hughes, 2014; Merry & all, 2012; Szalavitz, 2012). SPARX provides metaphoric in-game data as well as first person instruction (Merry & all, 2012). For example, the player's first journey entails finding a bird called Hope (Youtube, 2012; Youtube; 2013a). After getting rid of the GNATS guarding a treasure box that seems to cage Hope, the player unlocks the treasure box. Hope then acts as a guide for the player in the next levels (figure 5.2). After teaming up with Hope, the player meets a traveler who

expresses gratitude to the player for releasing Hope into their world and he says: “hope will attract good things. It’s a great sign that we could be on the way to getting rid of this gloom.” Then the traveler shares an ancient art to restore the mind: “Breathe slowly through your nose and feel the air going down towards your stomach.” Subsequently, the traveler warns the player to “beware, it seems easy, but to use it when you need it most takes talent”. As soon as a quest is completed, the guide explains how to use this new skill in order to feel better, solve problems, and enjoy real life. For examples, “this technique shields against depression. Just like a real shield, sometimes you will need to polish it and practice your skills.” In addition, SPARX is supplemented by a paper notebook with summaries of each module and spaces to add comments about the challenges completed (Merry & all, 2012).

7. Play Evaluation:

1. Goals and Limits (+1)
2. Facilitate Flow (+1)
3. Agency and Engagement (+1)
4. Culture and Collective Play (+1)
5. Intuitive integration (+1)
6. Communication (+1)
7. Custom content (+1)
8. Realistic Metaphors for Transfer (+1)
9. Behavior modeling and mentorship (+1)
10. Flexible Direction (+1)

8. Coherence of Game System: The purpose of the game to offer a playful form of cognitive behavioral therapy where the contingencies of treatment are represented in an interactive narrative form is coherent with the content, the narrative, and the mechanics of the game. The game mechanics and the context represent the treatment techniques available in usual psychotherapeutic interventions (Merry & all, 2012). Its strength is its ability to place the player at the center of action affording the player a sense of control (Merry & all, 2012).

SPARX serves as a therapeutic serious game with demonstrated effectiveness in helping a young adult reduce his symptoms of depression (Merry & all, 2012; Szalavitz, 2012). Since it is one of the few games that's effects have been empirically evaluated and has been proven as effective as face-to-face counselling in clinical trials, it serves as a control serious game to reflect the synthesized models' viability and compare its results with other serious game evaluations. Using the PCASGDA framework to evaluate the game system's coherence, it satisfied all of the play criteria (+10) and no systematical conflicts were detected, replicating the synthesized model's practicality.

5.3 Game 3: Elude (2010)

1. Purpose: Elude is a free online game designed by GAMBIT Game Lab in 2010 specifically to enhance friends and relatives' understanding of people suffering from depression (Cwalbrid, 2012; Hughes, 2014; Mader, 2002; Miller, 2015; Owen, 2013; Tech.Mic, 2015).
2. Aesthetics: Elude is set in a two dimensional interface in the style of cartoonish animation, where each mood, depression and fulfillment or passion, is represented in a metaphorical landscape that the player explores (Cwalbrid, 2012; Mader, 2002; Miller,

2015; Owen, 2013; Tech.Mic, 2015). The characters clothing, posture, and hair-style typically replicate clothing styles of depressed individuals. The gameplay is framed by background music that changes with each mood, up-beat during the stage where the player is bouncing on daisies, slow and dull during the stage when the player is in a dark forest jumping up giant stiff branches, or intense when the player is underground, going down a hill, and off a ridge. In this way, the player's meditation is guided by auditory cues expressing the emotional states of distinct moods.

3. Fiction/Narrative: Elude models what depression feels like by contrasting depression and happiness metaphorically, highlighting the mood cycles a depressed individual endures. Elude does not have a traditional narrative plot, allowing the player to explore the spaces of possibility through a series of metaphorical landscapes. Players take on a depressed, rumpled and unkempt, male character's role, set in metaphorical emotional landscapes to explore the mental illness and as a symbolic journey through the experience of depression (Cwalbrid, 2012; Hughes, 2014; Mader, 2002; Miller, 2015; Owen, 2013; Tech.Mic, 2015).
4. Mechanics: There is no obvious goal in Elude. The player learns through exploration by navigating and walking left and right and jumping or falling (Cwalbrid, 2012; Hughes, 2014; Owen, 2013; Tech.Mic, 2015). In this way, the player explores the game world's limits. The player can jump up a trees' bleak branches, can move through eerie woods, and look for 'passion objects' to boost his jump, serving as a meditation on the meaning of depression, passion, and fulfillment (figure 5.3a). After jumping up a tree, the player disappears into its top, where it is full of green leaves, and out again where he needs to navigate his way into the sky through targeting trampoline-like falling leaves and daisies,

until the leafs and daisies disappear. The player can only reach high enough before the supporting leafs and daisies disappear, forcing the player to plummet to the ground and start over. This can be repeated a couple of times before the player is transported into an underworld that eventually takes him towards a steep hill with no other paths available, except off of a red cliff, representing the more dangerous emotional state of the mood disorder (figure 5.3b).

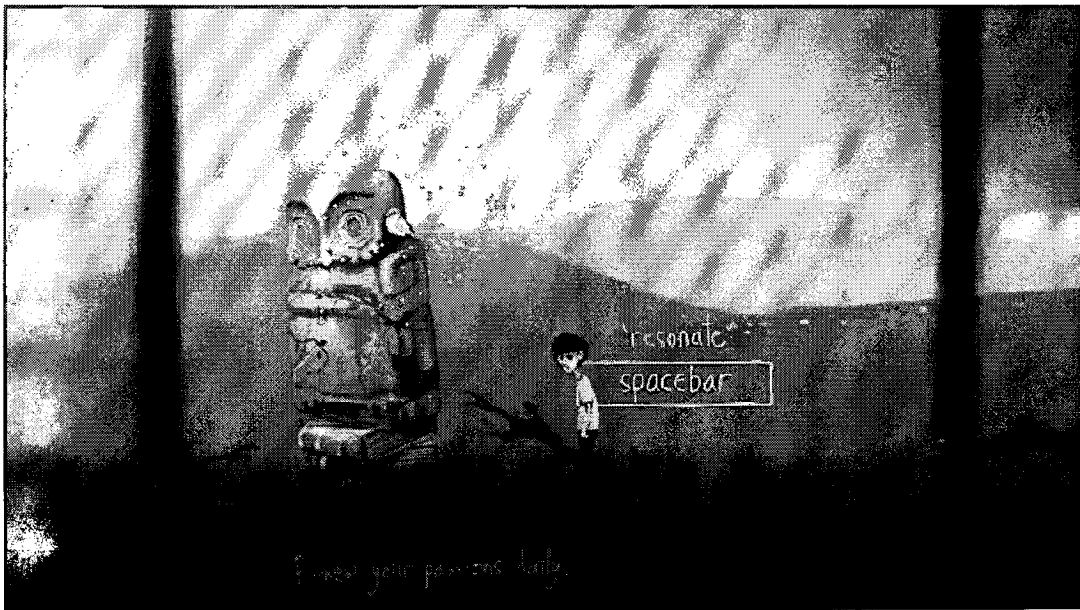


Figure 5.3a – Screenshot from Elude, resonating in order to boost the player's jump.

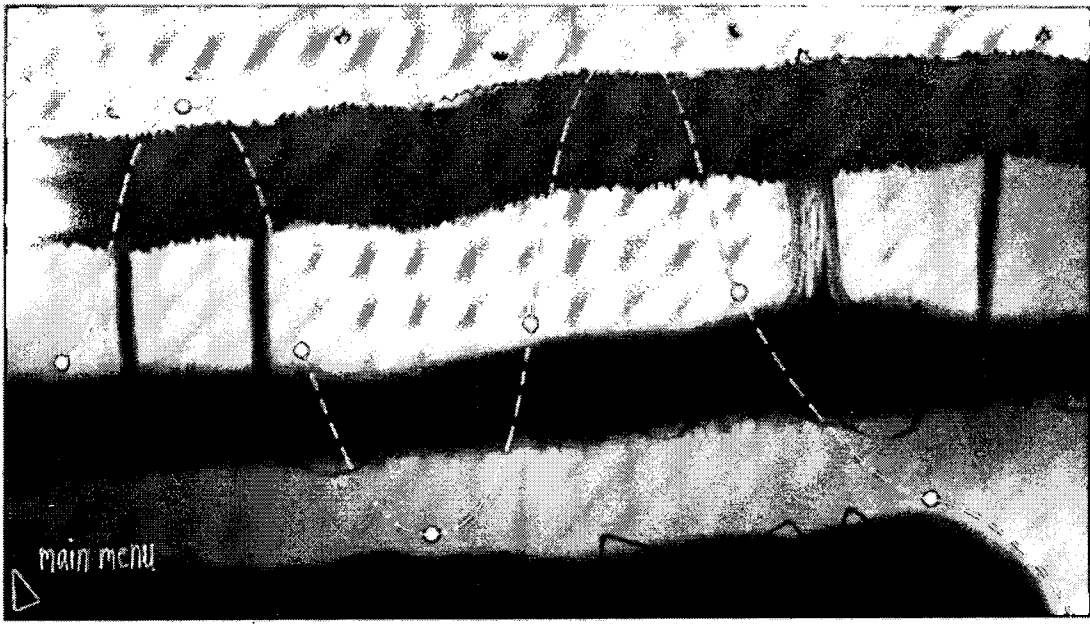


Figure 5.3b – Screenshot from Elude, the big picture of the mood disorder.

5. Framing: Elude focuses on a general audience, i.e. people who know someone dealing with depression or are dealing with depression themselves (Cwalbrid, 2012; Hughes, 2014; Owen, 2013; Tech.Mic, 2015). The play literacy is basic, compared to most casual games. Failing does not have consequences on the overall progress, encouraging exploration and replayability.
6. Content/Information: The topic of the game is addressed metaphorically (Cwalbrid, 2012; Hughes, 2014; Owen, 2013; Tech.Mic, 2015). Elude does not provide in-game data, but several meditative quotes are available in the game-world. The game does not bombard the player with knowledge transmission, but maps demonstrations of the mood disorder through the game-world and mechanics.
7. Play Evaluation:
 1. Goals and Limits (+1)

2. Facilitate Flow (+1)
 3. Agency and Engagement (+1)
 4. Culture and Collective Play (+1)
 5. Intuitive integration (0)
 6. Communication (0)
 7. Custom content (+1)
 8. Realistic Metaphors for Transfer (+1)
 9. Behavior modeling and mentorship (+1)
 10. Flexible Direction (+1)
8. Coherence of Game System: The purpose of the game to offer a playful virtual environment where the contingencies of symptoms of depression are represented metaphorically is coherent with the content, the narrative, and the mechanics of the game. The game mechanics and the context represent the helplessness a person feels during a depressed state (Cwalbrid, 2012; Hughes, 2014; Mader, 2002; Miller, 2015; Owen, 2013; Tech.Mic, 2015). Its strength is its use of metaphor that facilitates the transfer of knowledge and the dynamic between play and game limits, which enhances the player's meditation on the symptoms of depression. Since the game does not have any pre-determined goals, the player tries to interpret and understand depression-related states which can help him explain his own, relatives, or friends' depression-related behavior.

Elude serves as a popular therapeutic serious game to test the PCASGDA model's ability to pinpoint systematical issues and compare its results to Remission and SPARX. Using the PCASGDA framework to evaluate the game system's coherence, no systematical conflicts were detected and it satisfied most of the play criteria (+8) (see

Appendix). The PCASGDA model pinpointed game experience design areas that can be adjusted through considering features of interaction between a player and a serious game to improve Elude's prospective impact.

5.4 Game 4: Sym (2015)

1. Purpose: The topic of Sym is Social Anxiety. It is a computer game designed specifically by Atrax Games and Mastertronic in 2015 as a way to metaphorically represent social anxiety disorder (Donnelly, 2015; Holtreman, 2015; Steam, 2015).
2. Aesthetics: Sym is set in a two dimensional side-scroll puzzle game interface in a retro-style cartoonish animation, where each world, black or white, represents Josh's escapist reality and how he lives in the presence of others in order to model the duality faced by people enduring a social anxiety disorder (Donnelly, 2015; Holtreman, 2015; Steam, 2015; Youtube 2013b Youtube, 2015a; Youtube, 2015b). The character is a silhouette of a proud man when others are around and a fragile ghost when he is hiding. The gameplay is framed by a puzzle platform with intense instrumental background music, agitating the player as they progress through the game levels, representing how Josh feels when he is around people. By retreating into Josh's dark quiet cocoon like world, the instrumental music becomes less audible and different sounds play instead, such as retro-gaming jump-action audio feedback, representing how Josh feels when he is alone; allowing the player to contemplate the experience of the mental illness.
3. Fiction/Narrative: Sym is a two dimensional side-scroll puzzle game about Josh, a teenage boy who has to cope with his acute social anxiety (Donnelly, 2015; Holtreman, 2015; Steam, 2015). The game begins in a black and white puzzle platform that

represents Josh's perception of reality and his interior escapist world. In the white world, on the fringe of reality, he wants to overcome his fears. In the darkness, he wants to be alone. Josh exists in these worlds as alter egos (Donnelly, 2015; Holtreman, 2015).

Players take control of these egos and flip between realms to solve the puzzle and traverse obstacles to find a path to safety. Josh must find his way out of the maze of his worlds that coexist within the blank spaces of each other, representing the experience of social anxiety (Donnelly, 2015; Holtreman, 2015; Steam, 2015; Youtube 2013b Youtube, 2015a; Youtube, 2015b).

4. Mechanics: Josh has to complete 44 challenging levels of logic puzzles and mazes to gradually work through his disorder, framing the in-game goal (Donnelly, 2015; Holtreman, 2015). The in-game goal in Sym is to learn how to solve Josh's mind puzzle, through navigating through the experience of the mental illness by porting from one world to the other to avoid obstacles in both worlds (figure 5.4). If the player interacts or comes into contact with obstacles, the player is taken back to the beginning of the level as they are revived. In this way, failing a level does not have consequence on the overall progress, which fosters replayability. The in-game goals and limits motivate the player to learn and explore the game world and mechanics. The player is motivated by the balanced challenge, and rewarded with a sense of achievement when the game objectives are complete (Donnelly, 2015; Holtreman, 2015).

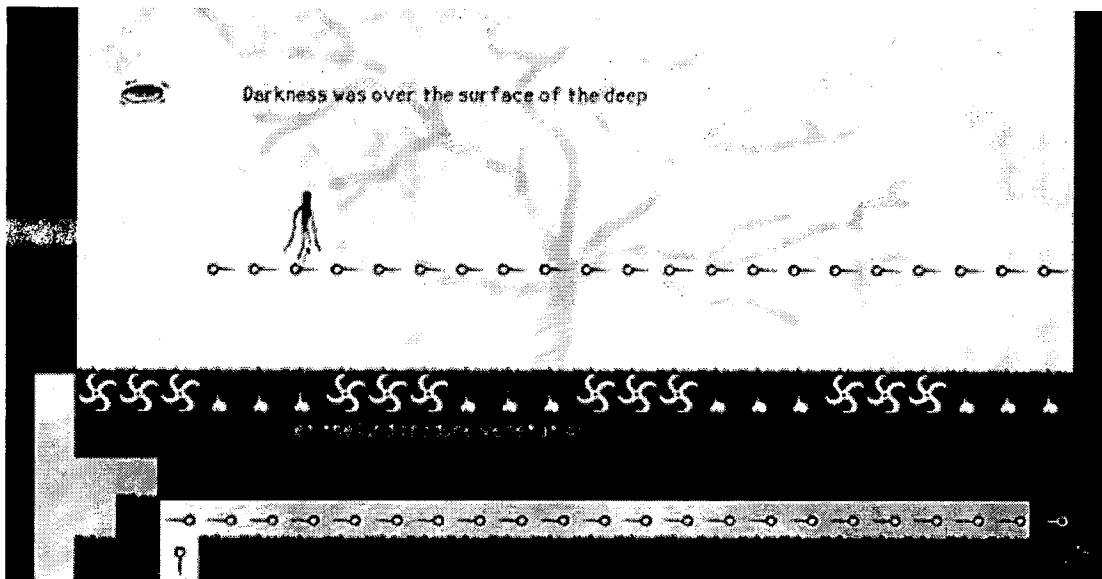


Figure 5.4 – Screenshot from *Sym*, the player needs to avoid the fans (obstacles) in the negative space and the seeds (obstacles) in the positive space.

5. Framing: *Sym* has a general audience (Donnelly, 2015; Holtreman, 2015; Steam, 2015). The play literacy is basic, compared to most casual games. The game’s difficulty increases incrementally, allowing the player to familiarize himself with game actions (Donnelly, 2015; Holtreman, 2015).
6. Content/Information: The topic of the game is expressed through the duality of the platform representing the experience of this disorder (Donnelly, 2015; Holtreman, 2015; Steam, 2015). *Sym* provides in-game data on Josh’s journey with social anxiety in the form of aggravated thoughts (Steam, 2015).
7. Play Evaluation:
 1. Goals and Limits (+1)
 2. Facilitate Flow (+1)
 3. Agency and Engagement (+1)
 4. Culture and Collective Play (+1)

5. Intuitive integration (+1)
 6. Communication (0)
 7. Custom content (+1)
 8. Realistic Metaphors for Transfer (0)
 9. Behavior modeling and mentorship (0)
 10. Flexible Direction (0)
8. Coherence of Game System: The purpose of the game to offer a playful virtual environment where the contingencies of social anxiety disorders are modeled metaphorically in Josh's dual world and thoughts written in the puzzle's platform is coherent with the content and the narrative, but not the game mechanics. If a player fails at a puzzle's challenges, the flow is obstructed with repeated gameplay. This core mechanic relates to the fictional context of games, but is not integrated with the immersive context. The core activities such as walk or jump do not directly relate to the serious content and do not help immerse players into Josh's thoughts. Likewise, the choice to transport from one world to the other does not reflect the involuntary shifts in emotional states that characterize the disorder. As such, the in-game goals do not support the learning objectives of the serious game's purpose.

Sym was selected for evaluation to compare its results with the results of the control cases: Remission and SPARX. Using the PCASGDA framework to evaluate the game system's coherence, some systematical conflicts were detected; indicating a weak balance between game, play, and learning. Sym's play evaluation indicates the satisfaction of several of the play criteria (+6) (see Appendix). Improvements in the

game's game experience can be made; suggesting the PCASGDA model's ability to pinpoint design areas that can be considered to enhance the impact of a serious game.

5.5 Game 5: The Everyday Adventures of Samantha Browne (2016)

1. Purpose: The Average Everyday Adventures of Samantha Brown is social anxiety disorder is a free game found online designed by Andrea Ayres of Lemonsucker Games in 2016 as a way for players, friends and relatives, to understand social anxiety disorder (SAD) (Couture, 2016; Mariko, 2016; Steam, 2016).
2. Aesthetics: The Average Everyday Adventures of Samantha Brown is a two dimensional visual novel with cartoonish animation, where the player is shown Samantha's inner monologue, her movements and pauses (Couture, 2016; Mariko, 2016). The world of Samantha is not subdued or dark, but is filled with bright colors and vibrant characters, but stresses lurk underneath the exterior (Couture, 2016). The character's face remains hidden to reflect an abstract character. The gameplay is enhanced with background music that exaggerates her mood. For example; when she explores the hall, there is intense music; when she is waiting for the kettle to heat up her water for her oatmeal, she hears game show music; and when she is overwhelmed, dark music is played.
3. Fiction/Narrative: As the game begins, players are introduced to Samantha Browne's issue. The player is tasked to help Samantha Browne make her way to make oatmeal in the communal kitchen of her dorm to satisfy her hunger, but due to her sense of misplacement, lack of confidence, mistrust, will of isolation, and her battle between running out or hiding and pursuing her goal to eat to satisfy her hunger; this ordinary task is made difficult (Couture, 2016; Steam, 2016). For players who have saved universes

from ancient evils, going down a hallway to make oatmeal should be easy, but since the game is about exploring the possibilities of how the player, who takes on the role of Samantha Browne, a painfully introverted young adult, set in a university dorm; a walk down the hall is made a difficult, uncomfortable, and negative experience that leaves Samantha on the verge of being overwhelmed and the player with a sense of failure (Couture, 2016; Mariko, 2016). The game starts with Samantha Browne waiting patiently in her dorm room for everyone else to fall asleep to go beyond the other side of her bedroom door (Couture, 2016; Mariko, 2016). Depending on what choices the player makes, there are ten possible endings: Abandoning the hallway and fainting from hunger; fainting after deciding not to eat today; running away from the kitchen, but realizing Samantha's bedroom keys were forgotten; spilling oatmeal while cleaning the kitchen; spilling oatmeal while taste-testing it; dropping half-cooked oatmeal; oatmeal overflowing from the mug it is being cooked in; burning Samantha's hands on the cooked oatmeal, causing it to be dropped; cooking the oatmeal, but realizing Samantha's bedroom keys were forgotten; and going back to Samantha's room with oatmeal (Steam, 2016).

4. Mechanics: Since the game is an adventure visual novel, the player tries to interpret and understand the best possible paths to take to help Samantha eat before she sleeps, the in-game goal, through choices that vary in degrees of displeasure to express how SAD complicates ordinary tasks (Couture, 2016; Mariko, 2016). Samantha's stress level is represented as a stress bar that fills up as the player progresses through the game (figure 5.5). Whatever decision the player makes, it is wrong and the stress bar indicates elevated levels of stress as the game progresses no matter the player's effort to brave Samantha

out of her safe space. Samantha stops to ask the player what to do frequently, which is useful for keeping the player engaged and shows how often people with SAD have to halt their actions and think them over, running over a torrent of ways that things can go wrong (Couture, 2016). There is no optimum path through the game that ends up with her stress-free, because had an optimum path been featured, it would convey that people with SAD need to make the right decision in order to get through it, but in reality the anxiety makes all options available to the person feel incorrect (Couture, 2016). There is no available option to make her stress levels decrease, only slightly better paths - still leaving Samantha on the brink of a fit.

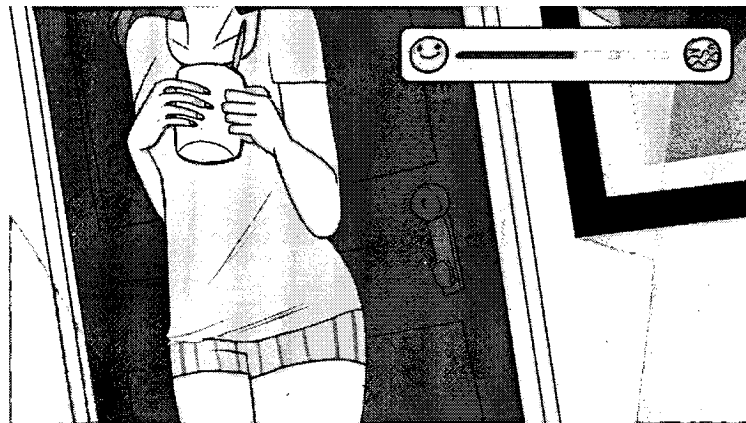


Figure 5.5 - Screenshot from The Everyday Adventures of Samantha Browne, stress bar in the upper right corner.

5. **Framing:** The Everyday Adventures of Samantha Browne targets a general audience, people who know someone dealing with SAD (Couture, 2016; Mariko, 2016; and Steam, 2016). The play literacy is basic point and clicking.
6. **Content/Information:** The topic of the game is addressed through decision-making and mechanics to help players feel what every day and every decision feels like for a person enduring a social anxiety disorder. The narrative aims to convey that people with SAD,

happy as they may appear, can be hiding some pain within them that makes ordinary tasks difficult (Couture, 2016; Mariko, 2016). The player acts out the contingencies that are associated with social anxiety, by focusing on how all choices seem wrong for people with social anxiety through the game mechanics (Couture, 2016).

7. Play Evaluation:

1. Goals and Limits (+1)
2. Facilitate Flow (+1)
3. Agency and Engagement (+1)
4. Culture and Collective Play (+1)
5. Intuitive integration (+1)
6. Communication (+1)
7. Custom content (+1)
8. Realistic Metaphors for Transfer (+1)
9. Behavior modeling and mentorship (+1)
10. Flexible Direction (+1)

8. Coherence of Game System: The purpose of the game to offer a playful virtual environment where the player can understand what social anxiety feels like is coherent with the content, the narrative, and the mechanics. The game's visuals, decision-making, and mechanics, all work to make the player feel the anxiety accompanying the experience of SAD. The player is frequently faced with choices that vary in degrees of displeasure which is used to convey how quickly people with SAD find small failures and how the tiniest decisions can lead to a culmination of fear (Couture, 2016; Mariko, 2016).

Using the PCASGDA framework to evaluate the game system's coherence, no systematical conflicts were detected. It satisfied all of the play criteria (+10). Its strength is its use of mechanics to facilitate the transfer of knowledge on SAD experiences. The play evaluation collected a high play score (+10), suggesting that The Everyday Adventures of Samantha Browne's purpose will be effective. However, a close revision of the comments on the game's website revealed that some players were unable to empathize with or like Samantha Browne, because she seemed rude and pretentious, indicating an issue with emotion and a sense of presence in the game's intended purpose that the PCASGDA model did not detect.

The game's intention to convey that social anxiety is the reason she is rude was unclear to all players. As a result, some players attributed Samantha as annoying rather than attributing her behavior to SAD experiences. The game makes formal attempts to make her likeable (in the beginning of the game, in the safety of her room, Samantha is shown chatting online with her friend in a friendly way and making the ordinary task of picking up a cup and spoon a delight), but a possible way to emphasize the intended attributed cause to her negativity, would have been to present to players more formal indications of Samantha's anxiety-free states, where she is trusting and friendly, in order to foster player empathy that will facilitate a clearer understanding of the mood shifts associated with SAD.

5.6 Evaluation of Results

It is argued that the designed game experience and learning objectives must be balanced, otherwise the serious game's designed system is conflicting and ineffective. This thesis argues

that incoherence and missing components constituting a player-centric approach to designing play experiences are signs of an inadequate serious game design assessment framework. Since the rhetoric of a game is not entirely determined by a designer and the player's experience of a game is determined by complex interactions between the player and the set of rules and world, a player centric approach to serious game evaluation was synthesized. The PCASGDA model provides a comprehensive way to investigate, in detail, how a serious game is structured. Compared to existing framework, the PCASGDA model offers a more inclusive structure for studying how learning and gaming components of a game are combined, allowing designers to perform a more exhaustive decomposition of a serious game's components, and how they are linked to the serious game's purpose. To authenticate if the PCASGDA model can be a useful evaluative tool for assessing therapeutic serious games, it was applied to five serious games: Remission (2006), SPARX (2012), Elude (2010), Sym (2015), and The Average Everyday Adventures of Samantha Browne (2016). The results of the assessment are summarized (table 5.6) and explained in this section.

Game	Empirical Validation	Game System Coherence	Play Score Evaluation
Game 1: Remission	(Kato & all, 2008)	No systematical conflicts	+10
Game 2: SPARX	(Merry & all, 2012)	No systematical conflicts	+10
Game 3: Elude	None	No systematical conflicts	+8
Game 4: Sym	None	Systematical conflicts, e.g. core mechanics do not relate to the serious content	+6
Game 5: The Everyday Adventures of Samantha Browne	None	No systematical conflicts	+10

Table 5.6 - Summary of evaluation results

The indirectly therapeutic serious game Re-mission is a highly successful and popular serious game and this is reflected with the PCASGDA framework. SPARX is a successful serious game intervention and this is reflected with the PCASGDA framework. The primary hypothesis that a serious game with empirical validation will have a high play score and game system coherence was confirmed, supporting the PCASDGA framework's practicality.

Elude is a "good" indirectly therapeutic serious game, as is reflected with the PCASGDA framework. Sym is a "good" indirectly therapeutic serious game, as is reflected with the PCASGDA framework. The Everyday Adventures of Samantha Browne is a "good" indirectly therapeutic serious game and this is reflected with the PCASGDA framework. The secondary hypothesis that these games will have a high play score and a coherent game system, like the empirically validated serious games Remission and SPARX, was unconfirmed in the case of game 4: Sym, indicating that the impact of this serious games may be vitiated.

Applying the PCASGDA model to Elude and Sym indicates the model's ability to pinpoint serious game design components that can benefit from further development, demonstrating the model's usefulness for critically reviewing the balance between game, play, and learning components; which if successfully balanced indicates a game's ability to demonstrate behavioral transfer. However, by applying the model to The Everyday Adventures of Samantha Browne, a critical issue, which was spotted through player reviews, with the interaction afforded between the player and the serious game was not detected using the PCASGDA framework.

The results of the case analyses demonstrate the PCASGDA model's effectiveness as an evaluation tool, but it is basic and warrants further testing, beginning with its application by other professionals and on other therapeutic serious games. To further determine the potential

success of the PCASGDA model and for a more thorough examination of the model's potential for improving serious game design and development throughout the serious game design process, it will be critical to use it for the development of a new serious game.

5.7 Conclusion

It is argued that if serious games are designed to be purposeful by design and intend to impact their players, their purpose needs to be considered in all design components, including play; to discuss the serious games' capacity to cast the player in the role of active participant. To authenticate if the PCASGDA model, synthesized in Chapter Four, can be a useful evaluative tool for assessing therapeutic serious games, it was used to guide the evaluation of five indirectly therapeutic serious games: Re-Mission (2006), SPARX (2012), Elude (2010), Sym (2015), and The Average Everyday Adventures of Samantha Browne (2016). The results of the case analyses validate the PCASGDA model's effectiveness as an evaluation tool. In the following chapter, to conclude this study, reflections on the research process are presented, the key contributions are summarized, and possible directions for future research are suggested.

Chapter 6 – Thesis Conclusion

Play is considered an important mediator and medium to help people resolve experienced inner conflict. Many of the opportunities for play are curtailed as the growth of cities lead to a diminution in the availability of spaces for play, giving the digital gaming community the opportunity to innovate spaces for play. Due to the acknowledgment that entertainment digital games are highly motivational, the gaming community in recent years has expanded to include games about and inspired by struggles linked to mental illnesses; moving the therapy locale from clinics and hospitals to the home, school, office, or wherever people are and increasing collaboration between professionals and nonprofessionals. These games are newly adopted in play therapy techniques that have aimed at increasing the direct involvement and awareness of the player while decreasing the time and energy commitment for treatment. They are labelled “serious” to set them apart and emphasize how different they are from entertainment games.

It is argued that a balanced combination of learning and entertainment objectives is both possible and necessary, because the reason why people can enjoy playing a serious game is not essentially different to the reason they enjoy popular commercial games. A background review of the role of play in therapy and contemporary design principles confirms the importance of the dynamics of player participation. Some experts claim that fun and engagement can be secondary to learning, however, others maintain that a game has to be engaging and motivational in order for the player to push the limits of his ability to learn.

The design and development of serious games has been facilitated and directed by the accessibility of various technologies which have developed to a point that games can be published independently. Designers use theoretical frameworks to facilitate and structure the

creative part of serious game design and development. However, despite the establishment the importance of the dynamics of player participation in therapy and entertainment games, a survey of existing serious game design evaluation models revealed that a methodology of play is not accorded a crucial part of high quality learning experiences.

It is argued that incoherence and missing components constituting a player-centric approach to designing a play experience are signs of an inadequate serious game design assessment framework. Serious games need to consider all the principles of digital games; i.e. motivation, flow, and presence; and the additional elements unique to digital serious games, such as learning objectives, to take a truly player-centric design approach to serious gaming; because the balance between game, play, and learning; in the design and implementation of a serious game in the service of meeting therapeutic needs; influences the serious game's impact.

For this reason, the PCASGDA framework is synthesized by combining the literature on play therapy techniques, principles of player-centric games, and serious games. The PCASGDA framework includes a play score evaluation, based on existing player-centric approaches to game design, and a serious game component taxonomy to cover instructional design and serious game design components.

Using the PCASGDA model, to determine if the synthesized model is a viable framework for guiding the design of engaging therapeutic serious games and substantiate the link between serious game components and their impact while eliminating the influence of other variables, five serious game designs were evaluated. The results of the evaluations indicate that the PCASGDA framework can be used as a constructive step towards a model for serious game criticism, design, and evaluation. Future work on the PCASGDA model includes further testing, beginning with applications by other professionals and, for a more thorough examination of the

model's potential for improving serious game design and development throughout the serious game design process, it will be critical to use it for the development of a new serious game; comparisons of the PCASGDA framework's results with future empirical validations on the impact of the studied serious games; comparing these results with future serious game design and assessment frameworks; and the development of a software to facilitate the application of the model, minimizing the challenges of using the PCASGDA model consistently.

Appendix

Game 1: Remission's Play Score Evaluation

New Terms	Clustered Player-Centric Guidelines	Play Evaluation	Play Evaluation Scoring
Goals and limits, motivate players to explore and learn.	– Games have clearly defined goals, giving players a sense of purpose (McGonigal, 2011).	(+1)	(+1)
	– Games have rules and limitations to expand creativity and foster strategic thinking (McGonigal, 2011).	(+1)	
Facilitate flow, engage players by immersing them in activities and/or a story.	– Dynamics (Hunicke & all, 2004).	(+1)	(+1)
	– Games speak in images (Squire, 2006).	(+1)	
	– Map a learning ideology or show the player what is important (Squire, 2006).	(+1)	
	– Provide enough information (Squire, 2006).	(+1)	
Agency and engagement, balance challenge and sense of achievement.	– Aesthetics (Hunicke & all, 2004).	(+1)	(+1)
	– Show empathy, by considering genuine needs and desires a game fulfills for the player and how these needs should be embedded into the game (Squire, 2006).	(+1)	
	– The player is the hero, the process of the experience should drive a game's design, not the content (Squire, 2006).	(+1)	
	– Players need to be afforded action (Squire, 2006).	(+1)	
	– Kinesthetic involvement (Calleja, 2011).	(+1)	
	– Shared involvement (Calleja, 2011).	(0)	
	– Narrative involvement (Calleja, 2011).	(+1)	
	– Affective involvement (Calleja, 2011).	(+1)	
Culture and collective play, increase player's understanding of game objectives.	– Ludic involvement (Calleja, 2011).	(+1)	(+1)
	– Spatial involvement (Calleja, 2011).	(+1)	

	– Voluntary participation, referring to a player’s freedom to enter or leave a game at will (McGonigal, 2011).	(+1)	
Intuitive integration, provide flexible play opportunities in a metaphorical, yet believable environment.	– Set the stage, a virtual world must be believable. This includes rules and implicit cultural ones (Squire, 2006).	(+1)	(+1)
Communication, help players track progress, allowing the player to orient their actions towards the goals.	– Games have a rapid feedback system that keeps players motivated and indicated progress towards achieving the goal (McGonigal, 2011).	(+1)	(+1)
Custom content, afford various options and paths to understanding and achieving goals while working toward increasing competency and mastery.	– Mechanics (Hunicke & all, 2004).	(+1)	(+1)
Realistic metaphors for transfer, create parallels between problems in reality and learned in game skills, allowing players to learn how to adopt behavior or skills.	– Roleplaying games (Squire, 2006).	(+1)	(+1)
Behavior modeling and mentorship, map objectives into demonstrations through character interactions in game environments.	– Construct learning environments, through social interaction (Squire, 2006).	(+1)	(+1)
Flexible direction, allow ample opportunity to practice.	– A game is what a player makes it, which details the explanation of transfer through player involvement (Squire, 2006).	(+1)	(+1)
Collected Play Score: (+10)			

Game 2: SPARX's Play Score Evaluation

New Terms	Clustered Player-Centric Guidelines	Play Evaluation	Play Evaluation Scoring
Goals and limits, motivate players to explore and learn.	- Games have clearly defined goals, giving players a sense of purpose (McGonigal, 2011).	(+1)	(0)
	- Games have rules and limitations to expand creativity and foster strategic thinking (McGonigal, 2011).	(+1)	
Facilitate flow, engage players by immersing them in activities and/or a story.	- Dynamics (Hunicke & all, 2004).	(+1)	(0)
	- Games speak in images (Squire, 2006).	(+1)	
	- Map a learning ideology or show the player what is important (Squire, 2006).	(+1)	
	- Provide enough information (Squire, 2006).	(+1)	
Agency and engagement, balance challenge and sense of achievement.	- Aesthetics (Hunicke & all, 2004).	(+1)	(0)
	- Show empathy, by considering genuine needs and desires a game fulfills for the player and how these needs should be embedded into the game (Squire, 2006).	(+1)	
	- The player is the hero, the process of the experience should drive a game's design, not the content (Squire, 2006).	(+1)	
	- Players need to be afforded action (Squire, 2006).	(+1)	
	- Kinesthetic involvement (Calleja, 2011).	(+1)	
	- Shared involvement (Calleja, 2011).	(0)	
	- Narrative involvement (Calleja, 2011).	(+1)	
	- Affective involvement (Calleja, 2011).	(+1)	
	- Ludic involvement (Calleja, 2011).	(+1)	
Culture and collective play, increase player's understanding of game objectives.	- Spatial involvement (Calleja, 2011).	(+1)	(0)
	- Voluntary participation, referring to a player's freedom to enter or leave a game at will (McGonigal, 2011).	(+1)	
Intuitive integration, provide flexible play opportunities in a	- Set the stage, a virtual world must be believable. This includes rules and implicit cultural ones (Squire, 2006).	(+1)	(+1)

metaphorical, yet believable environment.			
Communication, help players track progress, allowing the player to orient their actions towards the goals.	– Games have a rapid feedback system that keeps players motivated and indicated progress towards achieving the goal (McGonigal, 2011).	(+1)	(+1)
Custom content, afford various options and paths to understanding and achieving goals while working toward increasing competency and mastery.	– Mechanics (Hunicke & all, 2004).	(+1)	(+1)
Realistic metaphors for transfer, create parallels between problems in reality and learned in game skills, allowing players to learn how to adopt behavior or skills.	– Roleplaying games (Squire, 2006).	(+1)	(+1)
Behavior modeling and mentorship, map objectives into demonstrations through character interactions in game environments.	– Construct learning environments, through social interaction (Squire, 2006).	(+1)	(+1)
Flexible direction, allow ample opportunity to practice.	– A game is what a player makes it, which details the explanation of transfer through player involvement (Squire, 2006).	(+1)	(+1)
Collected Play Score: (+10)			

Game 3: Elude's Play Score Evaluation

New Terms	Clustered Player-Centric Guidelines	Play Evaluation	Play Evaluation Scoring
Goals and limits, motivate players to explore and learn.	- Games have clearly defined goals, giving players a sense of purpose (McGonigal, 2011).	(0)	(0)
	- Games have rules and limitations to expand creativity and foster strategic thinking (McGonigal, 2011).	(+1)	
Facilitate flow, engage players by immersing them in activities and/or a story.	- Dynamics (Hunicke & all, 2004).	(0)	(0)
	- Games speak in images (Squire, 2006).	(+1)	
	- Map a learning ideology or show the player what is important (Squire, 2006).	(0)	
	- Provide enough information (Squire, 2006).	(0)	
Agency and engagement, balance challenge and sense of achievement.	- Aesthetics (Hunicke & all, 2004).	(+1)	(0)
	- Show empathy, by considering genuine needs and desires a game fulfills for the player and how these needs should be embedded into the game (Squire, 2006).	(0)	
	- The player is the hero, the process of the experience should drive a game's design, not the content (Squire, 2006).	(+1)	
	- Players need to be afforded action (Squire, 2006).	(+1)	
	- Kinesthetic involvement (Calleja, 2011).	(+1)	
	- Shared involvement (Calleja, 2011).	(0)	
	- Narrative involvement (Calleja, 2011).	(0)	
	- Affective involvement (Calleja, 2011).	(+1)	
	- Ludic involvement (Calleja, 2011).	(0)	
Culture and collective play, increase player's understanding of game objectives.	- Spatial involvement (Calleja, 2011).	(+1)	(0)
	- Voluntary participation, referring to a player's freedom to enter or leave a game at will (McGonigal, 2011).	(+1)	
Intuitive integration, provide flexible play opportunities in a metaphorical, yet believable environment.	- Set the stage, a virtual world must be believable. This includes rules and implicit cultural ones (Squire, 2006).	(0)	(0)

Communication, help players track progress, allowing the player to orient their actions towards the goals.	– Games have a rapid feedback system that keeps players motivated and indicated progress towards achieving the goal (McGonigal, 2011).	(0)	(0)
Custom content, afford various options and paths to understanding and achieving goals while working toward increasing competency and mastery.	– Mechanics (Hunicke & all, 2004).	(+1)	(+1)
Realistic metaphors for transfer, create parallels between problems in reality and learned in game skills, allowing players to learn how to adopt behavior or skills.	– Roleplaying games (Squire, 2006).	(+1)	(+1)
Behavior modeling and mentorship, map objectives into demonstrations through character interactions in game environments.	– Construct learning environments, through social interaction (Squire, 2006).	(+1)	(+1)
Flexible direction, allow ample opportunity to practice	– A game is what a player makes it, which details the explanation of transfer through player involvement (Squire, 2006).	(+1)	(+1)
Collected Play Score: (+8)			

Game 4: Sym's Play Score Evaluation

New Terms	Clustered Player-Centric Guidelines	Play Evaluation	Play Evaluation Scoring
Goals and limits, motivate players to explore and learn.	– Games have clearly defined goals, giving players a sense of purpose (McGonigal, 2011).	(+1)	(+1)

	– Games have rules and limitations to expand creativity and foster strategic thinking (McGonigal, 2011).	(+1)	
Facilitate flow, engage players by immersing them in activities and/or a story.	– Dynamics (Hunicke & all, 2004).	(0)	(+1)
	– Games speak in images (Squire, 2006).	(+1)	
	– Map a learning ideology or show the player what is important (Squire, 2006).	(0)	
	– Provide enough information (Squire, 2006).	(0)	
Agency and engagement, balance challenge and sense of achievement.	– Aesthetics (Hunicke & all, 2004).	(+1)	(+1)
	– Show empathy, by considering genuine needs and desires a game fulfills for the player and how these needs should be embedded into the game (Squire, 2006).	(+1)	
	– The player is the hero, the process of the experience should drive a game’s design, not the content (Squire, 2006).	(+1)	
	– Players need to be afforded action (Squire, 2006).	(+1)	
	– Kinesthetic involvement (Calleja, 2011).	(+1)	
	– Shared involvement (Calleja, 2011).	(0)	
	– Narrative involvement (Calleja, 2011).	(0)	
	– Affective involvement (Calleja, 2011).	(+1)	
	– Ludic involvement (Calleja, 2011).	(+1)	
Culture and collective play, increase player’s understanding of game objectives.	– Spatial involvement (Calleja, 2011).	(0)	(+1)
	– Voluntary participation, referring to a player’s freedom to enter or leave a game at will (McGonigal, 2011).	(+1)	
Intuitive integration, provide flexible play opportunities in a metaphorical, yet believable environment.	– Set the stage, a virtual world must be believable. This includes rules and implicit cultural ones (Squire, 2006).	(+1)	(+1)
Communication, help players track progress, allowing the player to orient their actions towards the goals.	– Games have a rapid feedback system that keeps players motivated and indicated progress towards achieving the goal (McGonigal, 2011).	(0)	(0)

Custom content, afford various options and paths to understanding and achieving goals while working toward increasing competency and mastery.	– Mechanics (Hunicke & all, 2004).	(+1)	(+1)
Realistic metaphors for transfer, create parallels between problems in reality and learned in game skills, allowing players to learn how to adopt behavior or skills.	– Roleplaying games (Squire, 2006).	(0)	(0)
Behavior modeling and mentorship, map objectives into demonstrations through character interactions in game environments.	– Construct learning environments, through social interaction (Squire, 2006).	(0)	(0)
Flexible direction, allow ample opportunity to practice	– A game is what a player makes it, which details the explanation of transfer through player involvement (Squire, 2006).	(0)	(0)
Collected Play Score: (+6)			

Game 5: The Everyday Adventures of Samantha Brown's Play Score Evaluation

New Terms	Clustered Player-Centric Guidelines	Play Evaluation	Play Evaluation Scoring
Goals and limits, motivate players to explore and learn.	– Games have clearly defined goals, giving players a sense of purpose (McGonigal, 2011).	(+1)	(0)
	– Games have rules and limitations to expand creativity and foster strategic thinking (McGonigal, 2011).	(+1)	
Facilitate flow, engage players by	– Dynamics (Hunicke & all, 2004).	(+1)	(0)
	– Games speak in images (Squire, 2006).	(+1)	

immersing them in activities and/or a story.	- Map a learning ideology or show the player what is important (Squire, 2006).	(+1)	
	- Provide enough information (Squire, 2006).	(+1)	
Agency and engagement, balance challenge and sense of achievement.	- Aesthetics (Hunicke & all, 2004).	(+1)	(+1)
	- Show empathy, by considering genuine needs and desires a game fulfills for the player and how these needs should be embedded into the game (Squire, 2006).	(0)	
	- The player is the hero, the process of the experience should drive a game's design, not the content (Squire, 2006).	(+1)	
	- Players need to be afforded action (Squire, 2006).	(+1)	
	- Kinesthetic involvement (Calleja, 2011).	(+1)	
	- Shared involvement (Calleja, 2011).	(0)	
	- Narrative involvement (Calleja, 2011).	(+1)	
	- Affective involvement (Calleja, 2011).	(+1)	
	- Ludic involvement (Calleja, 2011).	(0)	
Culture and collective play, increase player's understanding of game objectives.	- Spatial involvement (Calleja, 2011).	(0)	(+1)
	- Voluntary participation, referring to a player's freedom to enter or leave a game at will (McGonigal, 2011).	(+1)	
Intuitive integration, provide flexible play opportunities in a metaphorical, yet believable environment.	- Set the stage, a virtual world must be believable. This includes rules and implicit cultural ones (Squire, 2006).	(+1)	(+1)
Communication, help players track progress, allowing the player to orient their actions towards the goals.	- Games have a rapid feedback system that keeps players motivated and indicated progress towards achieving the goal (McGonigal, 2011).	(+1)	(+1)
Custom content, afford various options and paths to understanding and achieving goals while working toward increasing	- Mechanics (Hunicke & all, 2004).	(+1)	(+1)

competency and mastery.			
Realistic metaphors for transfer, create parallels between problems in reality and learned in game skills, allowing players to learn how to adopt behavior or skills.	- Roleplaying games (Squire, 2006).	(+1)	(+1)
Behavior modeling and mentorship, map objectives into demonstrations through character interactions in game environments.	- Construct learning environments, through social interaction (Squire, 2006).	(+1)	(+1)
Flexible direction, allow ample opportunity to practice	- A game is what a player makes it, which details the explanation of transfer through player involvement (Squire, 2006).	(+1)	(+1)
Collected Play Score: (+10)			

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