Pedagogy in Commercial Video Games

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Abstract:

Books, film, television, and indeed every other medium that came before them has been used and sometimes studied as media for the delivery of instruction. Outstanding examples of each medium have been applied to educative purposes with enduring results. Digital games are now also receiving attention in this context. A first step to gaining an understanding for just how a particular medium can be used in education is to study the outstanding examples, regardless of their original purpose. This chapter examines numerous well-known and commercially successful games through the lens of several known and accepted learning theories and styles, using the premise that "good" games already embody sound pedagogy in their designs even if the incorporation of those theories was not deliberate.

Introduction

"(T)he central point of education is to teach people to think, to use their rational powers, to become better problem solvers."

Robert Gagné (1980, p. 85)

In spite of their having been around for more than a generation now, video games have still not gained wide acceptance as legitimate media. Perhaps it is worthwhile to raise this argument here, though it would be neither for the first nor the last time, to be sure. Games are a medium of communication and expression and possess some parallels with other forms of media, like film. As Henry Jenkins likes to point out (as in Palmer, 2004), the early days of film were little more than chases and pies in the face, yet just a few years later we see the likes of Chaplin's *The Tramp* [1915], and Griffith's *Birth of a Nation* [1915]. Thirty years after the beginning of film we already had recognized works of artistic merit, popular appeal, and lasting significance, such as *Tarzan of the Apes* [1918], *Nanook of the North* [i][1922], *The Jazz Singer* [1927], and *Steamboat Willie* [1928]. We also have "stars", such as Charlie Chaplin, Rudolph Valentino, Mary Pickford, and Douglas Fairbanks. Radio and television may have started with somewhat more sombre offerings insofar as their early shows were somewhat less extreme, but they too had both classics and stars within a few years of their introduction, as well as a broad range of offerings in several genres, both fictional and not.

Is it so radical to suggest that early gems of the game industry might already be out there, and we just aren't recognizing them? The average age of video game players in 2005 is 30[ii] (ESA, 2005), so we can't honestly claim that video games are in the same category as children's toys. Actually, those who are gamers already recognize game "classics", such as *Pong* [1972], *Donkey Kong* [1983], *Tetris* [1988], *Monkey Island* [1990], and others. There are also "stars": some, such as Mario, Lara Croft, and Link from *Zelda* belong to a category that would include Mickey, while others such as Will Wright, and Peter Molyneux are more tangible. Although each medium has its own unique qualities, each also shares qualities with the others, making it possible to compare as well as contrast. When we examine media such as radio, film, television, and even popular music, we see some similarities in the ways they have been accepted into society and the objections and resistances that were raised along the way (Williams, 2005).

Given that, it must be argued that the medium of the video game deserves a place among these others as a medium of human expression and communication.

Each of the other media mentioned have, in their turn, been applied to educative goals. Each also has, to a greater or lesser extent, been studied as a medium for the delivery of instruction, and although we are far from finished with this study, each has left us with a better understanding of how we might approach a new medium if our primary goal is to educate. Even though many offerings in film, on radio, and in television are designed primarily to entertain, there are also many that are intended to deliver a message – to *teach us something* – and that intent lies at the very heart of instructional design. When looking at how the different forms of modern media have been used this way and which particular instances have been chosen, one notion stands out – the majority of the most remarkable and effective "lessons" taught to us have been created by extraordinarily talented writers, directors, and producers together with their teams. They have, by and large, *not* been created by professional educators or instructional designers. Now, before we go too much further down this particular path, permit me to make a point. Far from trying to sell educators and instructional designers short, we should recognize the opportunities afforded us in studying these outstanding examples of "educational" objects, and try to learn why they have the impact they do. Why do many of Spielberg's movies move us so? Why did the radio show *Amos 'n' Andy*'s enjoy such lasting popularity? Why have so many people learned more about American politics and government from the television show *The West Wing* [1999] than they ever did in school? While we're on the subject of the appropriation of media objects for the purposes of education, it might be enlightening to note that the same can be said of literature. It is unlikely that Charles Dickens, Harper Lee or Miguel De Cervantes had the classroom in mind when they wrote *A Christmas Carol*, *To Kill a Mockingbird*, or *Don Quixote.* They had a lesson or two in mind when they produced these works to be sure, but none were teachers or instructional designers. There is much we can learn from them, not only from the lessons they were teaching, but also from how those messages were crafted.

When we turn our attention to computer and video games, the puzzle climbs to a whole new plane. Not only can we ask what makes this medium's finest examples so compelling, but, what could possibly motivate an individual to log thousands of hours in a game that, when reflected upon, doesn't appear to offer more than time spent? After watching players for a time, it becomes blatantly obvious that it is not done just for the fun. In fact, games can be excruciatingly frustrating (Johnson, 2005). Clearly there is something else at work beyond pleasure or entertainment. Could it possibly be that at least some of these games fulfill some fundamental human need to learn or to be challenged? While there are exceptions (such as Tetris), modern videogames are often extremely complex, requiring many hours to learn how to play. Somehow, these games manage to hold the players' attention while they fumble through the "learning curve", and then *continue* to hold the player's attention as they approach expertise. All in the same game. Sometimes for millions of players[iii]. How?

Games are so engaging precisely because they tap into some of the most effective approaches for learning. Successful games teach us to play in the manner we learn best. This is worth study.

With a bit of effort, it is possible to find examples of computer and videogames that embody every single worthwhile learning theory in existence. Whether the 'instructional design' was intentional or not, games designers have had to figure out how to keep their audiences interested while they learn the games – and judging by the number of people who willingly pay money for the experience, they appear to have been far more successful than formal education has.

On the other hand, it is one thing to retrofit a learning theory onto a successful game, or even analyze a bad game to see where it fails, and another thing entirely to try and do this in the other direction, namely, to use some learning theory to design a successful game. Although some of us still mean to try and come up with ways to do exactly that, I also suspect we are going to experience similar problems to those experienced in other disciplines (software engineering, film and fiction comes to mind). Some in the field of Software Engineering have been trying to formally specify "good" software design for 30 years - the dream seems to be that if we can only specify everything (requirements, metrics, documentation, etc.) well enough, we will be able to hire *anyone* to produce sound software, and the specifications and tools will compensate for human lack of skill and talent. The film industry and fiction writers haven't taken the same "engineering" approach, but even though movies have been around for over 100 years and books for 500[iv], we still have no sure-fire formulas for creating blockbusters and bestsellers. Anyone who thinks we will be able to do this for learning, whether it is using games or not, hasn't been paying attention.

On Motivation

> ***"The will to learn is an intrinsic motive, one that finds both its source and its reward in its own exercise. The will to learn becomes a "problem" only under specialized circumstances like those of a school, where a curriculum is set, students are confined, and a path fixed. The problems exist not so much in learning itself, but in the fact that what the school imposes often fails to enlist the natural energies that sustain spontaneous learning." (Bruner, 1966, p.127)***

Many factors influence engagement, and in educational contexts teachers have little control over much of this (Lumsden, 1994). However, it is also known that high motivation and engagement are linked to student success (Dev, 1997), or as Donald Norman puts it, "Students learn best when they are motivated, when they care." (Norman, 2004, p.205), so it behoves us to examine ways in which motivation and engagement can be maximized. Examining games known to be engaging is one way to accomplish this.

It has been established that motivated learners are desirable. "Motivated learners are easy to describe. They are enthusiastic, focused, and engaged. They are interested in and enjoy what they are doing, they try hard, and they persist over time. Their behavior is self-determined, driven by their own volition rather than external forces. Skinner and Belmont (1993) noted that although motivated learners are easy to recognize, they are hard to find, and they are, we would add, hard to create." (Garris et al., 2002, p. 444) The preceding description fits video gamers quite well, so it would seem reasonable to conclude that video games do in fact motivate players. But then the question becomes, are motivated players also *learners*? At the very least, it could probably be claimed that players learn how to play (and often to beat) the game, but we know

that they also learn a great many other things in the process. (Gee, 2003; Jenkins, 2002; Koster, 2004; Prensky, 2001a; Squire, 2003) Players are also learners.

Both Piaget (1951) and Bruner (1962) have said that play is important for deep learning, so perhaps they might (have) agree(d) with the previous assertion that players are also learners. In his work on the development of an Australian tall forest game, Bruce Leyland concludes that an important criterion for deep learning in games is the sustained imaginative immersion of the player, and that too many interruptions, either from the game or from external sources interfere (Leyland, 1996). This in turn would suggest that casual (i.e. surface?) play would not necessarily lead to deep learning, but that immersive play would. Once again, games fit the description. No discussion of immersion, of course would be complete without at least some mention of Csikszentmihalyi's concept of "flow" (1991). Flow is a state that today might be referred to as "being in the zone" – it involves absolute concentration on a task. But flow is not necessary for deep learning. Although flow is sometimes used in connection with fun, having fun is not a requisite condition for being in a state of flow, nor is learning. Raph Koster, in describing his theory of fun suggests that flow is often cited in relation to the exercise of mastery, rather than the original learning. (Koster, 2004)

While they may not always be having fun, video game players generally enjoy what they do. It's why they keep doing it. The following is a list of qualities associated with the enjoyment of games. See how well they fit when viewed in the context of learning. Generally speaking, people enjoy games (and learning?) when:

They can achieve the specified goal, but not too easily.
The task is perceived to be fair: all participants have a similar chance of 'winning', at least at the start.
The stakes (risk) for failure are not too high, but still present.
There is sufficient positive feedback (rewards for achievement); which must occur *during* the process and must be *in context* or at least measure progress towards goal.
There exists negative feedback as well (which also ties in to the idea of fairness).
There is some element of chance (among other things, this allows people to minimize, or off-load 'guilt' of failure to a certain extent, which in turn encourages people to keep trying or to try again).

The approach to be used for a good learning application is in many ways the same as the approach that is used for a successful game[v]. Even though there are some significant differences, the chances that the similarities turn out to be purely coincidental are slim. One key difference often raised is that games are consumer driven and learning, by and large, is not. When looked at from a different perspective, this is no longer true. In games the consumer is the player, and yes, the shelf life of a game is determined by the player/consumer. In games, the primary source of funding is the consumer. Even though much has changed in formal education in the last decade or two, and learning may often be student-centered, it is still educator-*driven*. Drawing a closer parallel between who drives games and who drives education requires us to identify the body in the 'education business' that is the counterpart to the games business' player, and in formal education that distinction falls in two places: first to government, and only indirectly, tax-payers, and second to the learners (and sometimes teachers). This is an important distinction to be sure, and a thorough examination of this issue is not within the bounds of this chapter, yet at least one

notion is worth identifying here: when looking at key ideas for player-driven design of games, “don’t waste the player’s time” is important (Walpole, 2004), yet the counterpart in education, “don’t waste the student’s time” is not normally considered. There is much we can learn about learning from games.

The first principle described by James Gee in his discussion of what we can learn about learning from games is that “all aspects of the learning environment (including the ways in which the semiotic domain is designed and presented) are set up to encourage active and critical, not passive, learning.” (Gee, 2003, p.49) Players then, are also active learners, and games (good ones, at least) embody all of those qualities that Thomas Malone and Mark Lepper (1987), in their landmark work on intrinsic motivation claim are necessary for creating such a state.

How Are Video Games Educational?

When taken as a group, those things educators say are important in the design of effective instruction have already been put to practice in 'good' commercial games. 'Good' here is a bit of a tautology - these games are good because they embody sound learning theories. However, it turns out that finding examples of good games defined in this way is not very hard. People like Jim Gee (2003) have already said that good games embody sound learning principles (as have various others) but few have actually connected well-known (and loved) existing theories with what is found in games.

Games, Learning, Theories and Models

Support for the use of games in learning contexts seems to be picking up speed, and the body of research examining the contexts and conditions for the effective use of games as an instructional technology is growing along with it. Some people, like game designer, Raph Koster, have even suggested that learning is really what are games are all about (2004). For most of us who are interested in this field, the claim is not, as some may fear, that games are the panacea for all that ails education, but that what we have here is a new instructional technology with exciting potential. One way to substantiate this argument is to demonstrate how effortlessly good games can be shown to fit into multiple widely-known and well-accepted instructional approaches. Existing game pedagogy is sound but often unrecognized: good games *already* possess the major components necessary to meet the requirements of sound instruction. The following pages will demonstrate this through an examination of several specific learning theories: Gagné’s Nine Events (Gagné *et al.*, 1992), Reigeluth’s Elaboration Theory (Reigeluth *et al.*, 1980), and two more recent works: Bruner’s Socio-Cultural Approach to Education (Bruner, 1996), and Merrill’s First Principles of Instruction (Merrill, 2002).

Gagné’s Nine Events of Instruction

Like many others, Gagné’s theory spans both learning and instructional principles. On the learning side, Gagné claims that there are five kinds of learning capabilities: 1) verbal information, both oral and written, 2) intellectual skills involving the manipulation of information in symbolic forms and problem solving, 3) cognitive strategies which involve creativity, and control over one’s own learning process, 4) motor skills encompassing physical activities, and 5) attitudes that influence personal choice. Each type of capability requires a

different approach to instruction. Good games already do this. If for no other reason than to reach the broadest range of consumers, game designers must employ multiple approaches to both aid and challenge players. According to Gagné, "an instructional plan can generate both appropriate environmental stimuli and instructional interactions, and thereby bringing about change in the cognitive structures and operations of the learner" (Anglin, 1995). If we were to restate this in plainer terms and superimpose the same ideas onto games, it might sound something like this[vi]: the game design must offer both appropriate ingame triggers and hints, and thereby supporting progress in the knowledge and skill of the player so they can complete the game.

Each of Gagné's five categories of learning is well supported in most good games. Verbal information is provided both orally and textually, and even games like *Pokémon* that are targeted at young children (pre-readers), still present information textually. In fact, a growing number of children claim that it is precisely games like *Pokémon* that have helped them to develop their reading skills. Intellectual skills, such as the use of concepts and rules to solve problems (Aronson & Briggs, 1999), are the cornerstone of most strategy games from Sid Meier's *Civilization* series to games with far less educational appeal, like *Deus Ex*. Cognitive strategies pretty much sums up how players win games: by finding novel solutions to problems, the acquisition of skills and knowledge, and practice and perseverance. A still small, but growing genre of games, like *Dance, Dance Revolution* (DDR) supports the development of gross motor skills. All games require the use of some sort of controller or keypad, thereby helping to develop fine motor skills. However, except in specific areas of need, like perhaps rehabilitation for people recovering from injuries or people with specific disabilities in fine motor control, there is no longer a need to encourage the use of games for the purposes of fine motor skill development – children are doing this for themselves. The last category, that of attitudes (also recognized as the affective learning domain), is central to role-playing games, and it is the essence of most 'god games[vii]'. Sir Peter Molyneux's *Black & White* has not only incorporated ethical and moral dilemmas into the gameplay, the consequences of the player's choices even affect the appearance of the player's onscreen pet.

Direction for the design of instruction that supports the development in these five categories lies in Gagné's well-known "Nine Events of Instruction" (Gagné, 1985; Gagné et al., 1992). Not only do these events provide the necessary conditions for learning, but they also offer guidelines for the appropriate selection of media. Good games meet virtually all the criteria listed. As in all good instruction, the nine events need not be distinct, separately identifiable tasks, as often elements of one "event" can be combined or intertwined with another. This also holds true for other well-accepted instructional technologies, such as goal-based learning (Schank *et al.*, 1994) and story-telling (Brown *et al.*, 2001; Schank, 1990). For example, gaining attention, explaining the objective and stimulating recall are often all combined as part of the initial "set-up". The connections between goal-based and story-telling scenarios and the first three events are strong, and exist in full measure in many games.

Gagné's Nine Events Applied to Games:

Gaining Attention (Reception) One implementation of this event in games is what's known as "attract mode"; this is what one sees when a game appears to be playing by itself – it shows elements of the game play and is intended to entice players to play. In arcades, this is necessary to entice players to choose this game over others. It is assumed that once the player inserts her

money to begin playing, you already *have* her attention. At home, this aspect is also addressed through the game's introduction when one begins to play; it is often accompanied by prepared video clips, which are typically of high production quality. This is where the game is set-up. An idea borrowed from film and television, and one that works for all kinds of games, the trailer also fulfills the role of gaining attention.

Informing Learners of the Objective (Expectancy) Explaining the objective is typically part of the back-story and description of the victory condition (how one wins the game). These days, players often know quite a bit about the back story and the objective long before they start to play. It is presented in various forms – in the trailer, through advertising, and at the start of the game. If the game is a "numbered game" (a sequel) there is usually an assumption that the basic premise will be similar to the previous game. *Pikmin*, for example, is about Captain Olimar, who crashes on an alien planet and must find and reassemble the parts of ship so he can return home. He, of course, must face various challenges and take advantage of opportunities along the way. The sequel, *Pikmin 2* has Captain Olimar returning to the same planet (since, presumably he succeeded in his earlier mission) to collect treasures to bring home.

In the case of licensed games, that is, those where the story line and/or characters are based on a pre-existing story, movie, cartoon, comic, etc., the back story is usually pre-determined also. It would be assumed, for example, that a game based on the *Spiderman* comic book character (or movie) would involve fighting crime, and that the main character would look, and act in a particular way and have particular abilities as well as weaknesses.

Given the culture that already exists around video games, information about the objectives of games and approaches for play are becoming part of what could be described as basic game literacy. In the same way that most school children know what to expect from a math text by the time they reach middle school, they also know what to expect from a strategy game, a first-person shooter, a puzzle game, and so on. Children become encultured to the format and basic premise that goes along with the genre, and character of a game. Those who are not yet familiar quickly become informed by their peers, or by learning about the game in advance on the Internet.

Stimulating Recall of Prior Learning (Retrieval) – Again, the back-story associated with the introduction to a game typically provides the frame of reference: sequels and new levels may refer back to things learned, achieved, or discovered in previous levels/versions. Even when it is not explicitly noted in the game, by now virtually all game players are aware of the concept of levels (basic game literacy again), where each level requires players to build on knowledge and skills acquired in the previous level. In fact the notion of levels has made its way into the general popular culture to the point where even my own mother (who is most emphatically *not* a fan of video games) knows what it means. Stimulation of recall can be both explicit, and implicit. At the start of a game, the opening sequence describes some thing that players are expected to know. Some games provide both subtle (a glow around an object) and not-so-subtle clues (a voice actually tells you).

Presenting the Stimulus (Selective Perception) – This aspect is controlled with-in the game and is designed to provide encouragement as well as challenge but a key element is that it must be presented in a manner that keeps the player in the game. If a player can not easily determine what she needs to do in a given situation, she will become frustrated and eventually give up. If I choose to wander aimlessly about on the alien planet in *Pikmin*, I will eventually receive a message reminding me of my ultimate goal, and offering a hint – where to look, something to do

or examine that may help me. A game that is insufficiently stimulating for the target audience will fail to hold their attention, receive a poor rating and eventually fail economically.
Providing Learning Guidance (Semantic Encoding) Games must be self-contained; players do not use manuals, and players often do not have a "facilitator" to help them learn how to play. Learning how to play is accomplished within the game itself. In effect, games act as the tutor – often employing a multitude of sophisticated "just-in-time" approaches to providing help. Verbal or written hints, items that glow briefly as they come into view, NPC's[viii] that tell you something or offer help are all ways in which guidance can be provided. On the other hand, some games take advantage of the fact that many players are by now quite sophisticated when it comes to understanding the genres and basic gameplay. They relay on the real world communities to help new players get up to speed.
Eliciting Performance (Responding) – This is, of course, an essential component of interactivity – without this, there really ***is*** no game. While the physical interface for most games is limited and tends to remain the same from game to game and console to console, *how* one actually plays the game can vary.
Providing Feedback (Reinforcement) – Feedback is also provided in many ways, including scores; displays (the head up display, or HUD being a common approach); queries; and verbal feedback. Again, this is one of the imperative elements of every game: without timely and appropriate feedback, the player has no way of knowing whether or not they are progressing towards their goal. Characters within games typically have various attributes that the player can monitor throughout the game: strength, magic, health, etc. It is like keeping track of the vital signs of your patient – if the patient's heart-rate goes up, we may have to do something to bring it back down before continuing with whatever else we were doing.
Assessing Performance (Retrieval) – Feedback and assessment are integral to any game, and games that do this poorly are often panned. Since virtually all games are contests on some level, achieving a favourable assessment is what the game is about. The journey is important, to be sure, but even in a game like *Dance Dance Revolution* where there are no opponents to fight, no treasure to find, and no puzzle to solve, a running 'score' of how closely the players' moves approximate perfection is essential.
Enhancing Retention and Transfer (Generalization) – On a small scale, moving through levels within a single game requires players to remember skills, knowledge and strategies learned in the previous level and use them to overcome obstacles and solve problems in the next. Once again, games that fail to provide a logically understood progression of difficulty and challenges through the levels of the game tend to get poor reviews and fewer players. If the skills required to reach the end of one level are completely different from those acquired in the previous level, it is not a good game. On a larger scale, skills and strategies learned in one game are often applicable to sequels, other games and even entire genres.

When looking at "good" games through the lens of Gagné's Nine Events, we find that they do indeed possess the necessary conditions for learning and facilitate the required events.

Reigeluth's Elaboration Theory

Jean Piaget gave us the notions of the pre-, concrete, and formal operational stages of development, and both John Dewey and Herbert Spencer advocated that the organization of learning should progress from simple to complex as it does for all human development. Ausubel and Bruner advocated the organization of learning in increasing order of complexity; Ausubel

used this notion to help form his subsumption theory and the concept of advance organizers, and for Bruner this took shape in the notion of constructivism – one of the most significant learning theories of the late twentieth century.

All of these contributed in laying the groundwork for Reigeluth's Elaboration Theory. A key argument for this approach is that learners need to develop meaningful contexts to which they can anchor new ideas and skills, and that this will in turn aid in transfer and retention. One of the most critical components in this scheme is the proper sequencing of instruction, which increases learner motivation and allows for the formation of stable cognitive structures. When this theory is viewed in the context of video games, once again, the organization and design of good games *already* meet many criteria for well-organized instruction.

Elaboration theory proposes seven major strategy components, and when they are applied to the design of good games we find:

An Elaborative Sequence. Good games follow a well-paced sequence progressing from simple (and easy) to complex (and hard). A Game explains its own context (theoretical), requirements to operate (procedural), and goals for play (conceptual).

Learning Prerequisite Sequences. Many games offer a tutorial or practise mode that involves some simplifications as well as suggestions. Actions carried out in this mode count neither for nor against the player once she enters the game 'for real'. Once inside the game, there are clear distinctions between various grades of action – a 'boss-battle' for example, is one where the player goes up against the most powerful adversary in the game. Often, before it even becomes possible to enter into such a battle, the player must have earned a particular status by meeting other challenges that could include having to beat various other opponents. It may not even be possible to instigate a boss fight before attaining certain status. In other games, you can try any time you like, but without adequate preparation, you will be instantly defeated.

Summary. Virtually all games provide some form of "tab-sheet", or means of checking on progress with respect to what has been accomplished and discovered up to a particular point in a game. Driving games often show tiny maps in one corner or along one edge of the screen that show where on the track the player currently is. Fuel gages, point tallies, current position in the race – all these statistics are routinely displayed somewhere on the screen, and most players learn to be aware of them even while their concentration is primarily focused on keeping the vehicle from crashing.

Synthesis The implementation of this criterion tends to be fairly game-specific, and is typically evident in the way many games progress through various levels of play, each building on knowledge gained from the previous one, but can also come in the form of strategic hints. Often players are defeated many times before finishing a game. Each time they try again, they do so having gained some knowledge or understanding that they will apply correctly this time in order to progress a little further.

Analogies. These are sometimes not evident in any one particular game, but games of similar genres have enough in common that players create their own. Players very quickly learn

to look for approaches or tactics that are similar to some other game they have played, and will try to apply these in any new context that looks like it might favour this approach.

Cognitive Strategies. These exist by the very design of games and is one of their great achievements: the ability to force the player to use strategies invented by the designers in order to achieve their goals. A significant part of the challenge, enjoyment, and attraction of games is the desire to uncover the requisite strategies that allow the player to reach the 'victory condition' in a game.

Learner Control. Player (learner) control is an obvious requirement of all games: without this it stops being categorized as a game. This is one area where good games positively excel. A good game gives the impression of providing the player with infinite choices at almost every turn. The reality cannot possibly allow for this degree of complexity, but the *design* of the experience is such that most players don't notice or don't care. Either way, we win. The player feels in control, while experiencing the encounter the designers planned.

Bruner's Psycho-Cultural Approach to Education

Bruner's accomplishments in helping to shape the notion of constructivism are perhaps among the best known of all of major advances in education of the twentieth century. This work is of prime significance when looking at pedagogy in games, as the kind of learning that occurs in games is almost entirely constructive. In one of his more recent works, "The Culture of Education" (1996), Jerome Bruner discusses the importance of narrative to the development and maintenance of culture. While some believe the debate about narrative versus gameplay still rages and others feel it is a non-issue (Frasca, 2001), the importance of narrative remains a recurring theme in many discussions of games (Beavis, 1999; Kafai, 2001; Wolf & Perron, 2003). Bruner's approach is very much a culturalist one, believing that "education is not an island, but part of the continent of culture." (1996, p11) Education serves several roles in his view, and the information processing, or computationalism role is just one part of that. Bruner's approach embraces the view that "'external' or 'objective' reality can only be known by the properties of mind and the symbols systems on which it relies." (ibid. p 12) Bruner further outlines a number of tenets to guide such a 'psycho-cultural' approach to education, and like the others already mentioned, this too lends itself easily to description through the lens of games.

A Psycho-Cultural Approach to Games

The Perspectival Tenet Meaning making is relative to its frame of reference. One of the aspects of games that keep players involved with the same game for extended time is the ability to play it again from a different angle. One can play the *Lord of the Rings, The Two Towers* from the perspective of any of six different characters, and in a game like *Black & White*, your choice is quite fundamental: do you wish to be good, evil, or somewhere in between? Each has consequences.

The Constraints Tenet Forms of meaning making are constrained by human mental functioning and by semiotics, including the Whorf-Sapir hypothesis, which states that the thoughts you can think are shaped by the language you speak. Good games can push you to the outer edges here. While other technologies facilitate role-playing, good games can place you in

the virtual skin of someone you could not otherwise be – your choices and actions are largely constrained by the design of that character.

The Constructivism Tenet Our reality is a constructed one ascribed to the worlds we inhabit. There is no reason that this cannot be applied to virtual worlds. I am not trying to imply some *Matrix* like existence, in fact quite the contrary. The scenario presented in *The Matrix* was one that had mankind living entirely in an artificially constructed reality, while their real bodies served as fuel for the machines that supported them. The realities that can be constructed in virtual worlds can be both dream-like and fantastic, but also a hybrid of societies and relationships that exist partly in a gameworld, but anchored to real people and bolstered by real relationships and real sharing.

The Interactional Tenet Passing on knowledge involves a subcommunity in interaction. One has only to visit the website of *Apolyton University* (http://apolyton.net/) to see how strong this tenet is for some games. *Apolyton.net* is a site devoted to discussion, tutorials, and all manner of support for players of Sid Meier's *Civilization*. Websites such as this have grown to become a vital element for many games, without which the kinds of challenges and the complexity of some games would make them unwinnable by all but a select few.

The Externalization Tenet Externalization is evidenced by the production of 'works' that can help produce and sustain group solidarity. Once again we turn to the Internet. Fan art and fan fiction thrives in the 'shadow' of a successful game. People become exited by the characters they encounter and the stories they experience. They eagerly build and share. Within the game itself, the notion of 'modding' which is the ability to add custom elements to a game has resulted in such feats as a racing game developed exclusively by the players that exists completely *inside* of another game. The track, and vehicles and built entirely out of elements provided in *Warcraft III*, a game, which, by the way, has nothing to do with racing on a track. *Warcraft III* is a mediaeval dungeons and dragons type of role playing game. There are not many racetracks in the game as it was originally conceived and designed by Blizzard entertainment. None, in fact.

The Instrumentalism Tenet Education has consequences that are instrumental in the lives of individuals. We all hope that formal education has a lasting effect, not only of the knowledge imparted, but also of the creation of good citizens. As Marc Prensky claims (2001b), by sheer numbers, the amount of time spent playing video games is bound to have an effect on brain development. It is beginning to become clear, that there exist other consequences in the later lives of gamers, some of which appear to be quite promising. According to a study performed by Beck & Wade (2004), instrumentalism for gamers includes confidence in taking reasonable risks, teamwork, a willingness to listen to advice before making decisions, and an ability to cope with failure. Formal education should be so lucky.

The Institutional Tenet Education behaves as an institution. The institutions of a society help to shape the roles that its members take up and what shape those roles take In Bruner's view this is not necessarily a benefit, but it is a reality. Although it would be nice to be able to report that neither game designers nor game communities follow this tenet, as it turns out, they

sometimes do. However, while formal educational systems tend all to follow very similar institutional forms, game communities often evolve in a manner befitting the theme of the game.

The Tenet of Identity and Self-Esteem This tenet speaks to agency and self-evaluation. This is just too easy. Will Wright said “interactive entertainment is a fundamentally different proposition than its linear cousins, involving quite different psychological mechanisms." (Wright, 2003, p.xxxii) Games are almost entirely dependent on agency. “Agency is our ability to alter the world around us, or our situation in it. We are able to act, and that action has effects.” (Wright, 2003, p. xxxii) Brenda Laurel, in a speech delivered during the first Education Arcade Conference in 2004 stated that agency is one of the places where formal education has, by and large, failed. Students are not especially encouraged to exercise personal agency, except within very controlled boundaries. Games, on the other hand would not be games if not for the players ability to make choices, alter situations, and be subjected to the resulting consequences. While self-evaluation may be one area where games could be improved, the study conducted by Beck and Wade (see Instrumentalism Tenet) would imply that, at least indirectly, games have the effect of helping to foster the development of strong self-esteem.

The Narrative Tenet People make sense of the world and their place in it in two ways: through logical-scientific thinking and through narrative. Games overwhelmingly do what they do through the use of narrative. Although many games require players to solve elaborate problems, it is primarily done within the context of a story. Even one of the quintessential puzzle games, namely, *Myst* is set in the context of an elaborate story with an extensive history. This gives it context, and a way for the player to connect with the experience. Mankind has been teaching this way, well, pretty much always. It encourages us to identify with the characters in the story and learn through empathy. "This is important because this empathic ability we seem to exercise so seamlessly is also the psychological engine that drives the thing we call "story." Story (in its many forms) seems to be an "educational technology" of sorts that we have developed over millennia that allows us to share experiences with one another across great distances of time and space. We can learn to avoid failures or achieve successes from people who are long dead across the world or who never existed at all. It's a technology that's entirely dependent on our ability to empathize with other beings."(Wright, 2003, p.xxxii) It is also key to our cultural evolution.

Merrill’s First Principles of Instruction

After a highly successful and productive career in the development of instructional design theories and models, David Merrill has returned to the basics. Merrill claims that the success of a given instructional program will be directly proportional to how well and how deliberately the first principles are implemented. (Merrill, 2002) Given that, if we can demonstrate that these first principles have been implemented in games, we should be able to conclude that the learning from this ‘program’ was indeed facilitated by the design.

1. **Activation** Start where the player is. Recall relevant experience. In games, the back story gives clues as to the kind of knowledge that will be needed to accomplish the mission. This gets reinforced throughout the game (gameplay is typically monitored and certain actions on the part of the player trigger intervention by the game with more information, offers of help, etc.). In a sequel game it is even easier: it is a given that the sequel will expand upon what the

players learned in the previous version. In fact, sequels that don't do that are typically panned (==> no sales ==> game fails ==> developer doesn't do *that* again).

2. **Demonstration** This principle tells us we must show people what we want them to learn, not simply tell them. Games are often quite clear about what the player will need to be able to do or achieve in order to accomplish the mission. Media often plays a starring role here with prepared animation clips, audio, flashbacks, etc.
3. **Application** New knowledge must be applied to solve problems. Skills are learned and knowledge is gained, and as the player becomes more competent, the difficulty level gets ramped up - eventually culminating in a "level up", where new challenges are presented, twists in the challenges require variations on skills and knowledge already learned, etc. Players have constant feedback ingame - statistics on their progress, vitals on their avatars, remaining resources, etc. Merrill says, "Appropriate practice is the single most neglected aspect of effective instruction" You can't rush Mother Nature. (Wasn't it the Green Giant who said that?) Here is where good games absolutely shine - just imagine what we can do if we can entice people to willingly spend 5-10-30 or more hours practicing?
4. **Integration** Learners are motivated to apply what they have learned. In augmented reality games, as many as several hundred thousand players must learn new skills in order to work together and solve the problems and puzzles presented to them. Once the game is finished, players actively seek out ways to use the knowledge and skills they have learned. In other games, both online and off, players like to publicly demonstrate their new skills. This is part of the need that game communities fulfill. Around every popular game (whether it be a multi-player game or not) people create websites, chat rooms, wikkis, offer screenshots, hints, tips, cheats, discoveries, and so on. This has other side-effects too: for example, some people have learned to create web pages and use html just so they can contribute to the games community of their choice. There's reflection a'plenty. Also invention, exploration, practice, analysis, discussion, argument, etc.

Games and Learning Styles

The total mental efficiency of a man is the resultant of the working together of all his faculties. He is too complex a being for any one of them to have the casting vote. If any one of them do have the casting vote, it is more likely to be the strength of his desire and passion, the strength of the interest be takes in what is proposed. Concentration, memory, reasoning power, inventiveness, excellence of the senses,—all are subsidiary to this. (James, 1983, p. 57)

The previous section looked at how games embody various learning theories and some of the instructional strategies that go with them. This section takes a slightly different perspective to look at how games adapt to the learning styles of their players. The styles to be examined here include Howard Gardner's Theory of Multiple Intelligences (Gardner, 1983), the Keirsey Temperament Sorter (Keirsey & Bates, 1984), Felder's Index of Learning Styles (Richard M. Felder & Silverman, 1988), Kolb's Learning Styles (Kolb & Fry, 1975), and The Gregorc System of Learning (Gregorc, 1985).

The commercial games industry is just that: commercial. In other words its primary goal is to be profitable. Just like books, movies, television and other media are targeted at particular demographic groups, so are games. There are fantasy books, non-fiction, historical epics, etc. In games, there are sports games, fantasy games, slower paced strategy games and high-action adventure games, to name just a few. Some games are intended for younger audiences, and some

for older audiences, but in order to sell well, the differences in the games must go beyond mere narrative and imagery. If the setting, characters, story line, gameplay or any other aspect of the game is not appropriate to the audience, the game will not sell. One thing that is not overtly taken into account is that the targeted audiences will invariably include individuals with various learning styles. From that, it follows that in order to be successful the gameplay must address these learning styles, whether it is done deliberately or not. Modern games are expensive to produce, so an adequate return on investment is essential – all individuals in the targeted demographic must be able to engage with the game.

In his seminal work on intrinsic motivation, Thomas Malone, together with Mark Lepper outlined four criteria that can be used to examine how to engage learners (Malone, 1981; Malone & Lepper, 1987). Using Malone's criteria, in order to be successful a game must incorporate the right amount and kinds of challenge, curiosity, fantasy, and control. Although beyond the scope of the current work[ix], there exist direct parallels between those elements considered to be important to engagement and motivation by Malone and Lepper, and most, if not all of the learning styles described in this paper. Games that are highly engaging according to Malone's criteria will also be found to meet the criteria necessary to engage learners of different learning styles.

Many games are intended to appeal to a fairly specific audience, such as *Half-Life II*, *Halo*, and *Grand Theft Auto*, while others appeal to a wide range of ages, skill levels, backgrounds, even genders, such as the *Phantasy Star* series, *Pikmin*, *Harvest Moon*, *Animal Crossing*, and the *SIMs*. These games are **not** designed with specific learning styles in mind, yet they are very successful at capturing the desired demographic. As has been stated before, many games have a steep learning curve, and must be well-designed to support players while they learn the game, or they will loose the player, yet once the player is acclimatized, the gameplay must change. Missing the mark in either case (during acclimatization, or during play) results in a game that that doesn't sell. Inadequate player support while they learn the game discourages novices, while too much 'support' during gameplay is obnoxious to experienced players. Designers accomplish this feat of meeting both requirements in a number of ways, which are often employed simultaneously in the game. For beginners, many different learning approaches are exploited that keep people engaged and help them learn the game. A player who remains in one area too long may be offered a hint about a direction they might try, or one who is supposed to be searching for a particular item may be given more information about how to obtain that item. Rarely do games simply give the player the 'answer'. These hints sometimes come in the form of images, sometimes text, narrative or just sounds. As players become better at using the game, the amount of support offered automatically is reduced, by monitoring the players' actions in ways very similar to what educators call assessment, and responding appropriately. As the players' skills increase, so do the challenges. Players are also often given direct control over the amount of support they receive and can choose among various modes (beginner, expert, etc.).

Support for various learning styles is obviously better in some games than others, and this has implications for how children who play games are "learning to learn". If nothing else, games train people how to play them. This 'training' often begins before they even start school, and continues all through school and beyond. The average age of gamers is increasing steadily as time progresses (ESA, 2005), which implies that gamers are not abandoning their games as they

get older. Whether games will eventually be found to influence learning styles in individuals, and to what extent, remains to be discovered. There are indications that this also has an effect on how they learn and work once they get older (Beck & Wade, 2004), so early indications are that at least some aspects of an individual's learning style may be affected through gameplay.

Gardner's Theory of Multiple Intelligences

By several measures, Gardner's Theory of Multiple Intelligences (Gardner, 1983) is one of the most significant developments in learning theories to come out of the last quarter of the 20th century. Certainly in the school districts surrounding the author's home, one would be hard pressed to find an elementary school child who couldn't tell you something about his or her "kinds of smart".

The foundation of this theory is that we all employ different strategies for learning, and that these strategies relate to internal strengths and capabilities that can be classified into eight categories or "intelligences" (Armstrong & Association for Supervision and Curriculum Development., 2000). Gardner proposes eight primary forms of intelligence: (1) linguistic (oral and written), (2) musical (sound, rhythm), (3) logical-mathematical (symbolic and rule-based), (4) spatial (2-, and 3- dimensional), (5) body-kinesthetic (physical), (6) intrapersonal (insight, metacognition), (7) interpersonal (social skills), and (8) naturalistic (sensitivity to natural phenomena, and classification skills). The implication of this theory is that learning can be facilitated if we focus on and develop instruction for these intelligences. Generally speaking, assessment of learning should include more than one 'intelligence', as each is more than simply a content domain; it is also a learning modality. It is known that cultural differences play a key role, as each culture tends to value and emphasize particular intelligences in favour of others.

Gardner's Seven Intelligences

Connecting Gardner's ideas with the design of games is particularly effortless, as almost every one is evident in almost every successful game – in fact, it could be argued that one of the features of games that make them so engaging is precisely their success in addressing each one of these forms, and in providing players with an especially rich experience, where each player has an opportunity to take advantage of her own particular strengths.

Linguistic This intelligence coincides nicely with Gagné's Verbal Information category, and thus what was said there also applies here. Games often include written and spoken elements – for game play, as well as for direction and help. (Rosas *et al.*, 2003) Many games combine verbal cues with written ones, and the topic of conversation is additionally supported with other visual queues. This is one reason why children often experience success in learning to read through games like *Pokémon.*

Musical: Virtually all games include sound to enhance play – there are sound-effects, both diegetic (sounds that the characters could hear, like gunshots or radio) and non-diegetic (most typically the musical score, as well as music to set the mood or provide feedback about game states). In some cases musical scores for games are as sophisticated as they are for film. Sounds are used as feedback and reinforcement as well as for cinematic effect and enjoyment. Some games, like *Electroplankton*, *Donkey Konga,* or *Karaoke Revolution* feature sound as the main attraction.

Logical-mathematical: Strategy is one of the key elements in the play of many games – the extent to which this intelligence is exercised depends heavily on the genre and specific game played. Puzzle games rely heavily on logical and mathematical intelligences to win. The management type games, like *Zoo Tycoon* also involve reliance on and further development of this intelligence, for it is virtually impossible to manage the zoo well without an ability to plan and manipulate a fairly complex set of resources. Simpler games, such as *Pikmin*, still require counting and arithmetic. Moving an object often requires a minimum number of *Pikmin*, and even very young players quickly learn to do simple calculations in order to get the optimal number of *Pikmin* into position to complete a task. Very young players who may still be struggling with basic sums, can get reinforcement from the heads up display – which very often includes a thermometer-style guage.

Spatial: Most games are of course highly visual, providing a rich and colourful 2- or 3-dimensional environment, which is always at least partially under the player's control in terms of what is visible on the screen at any given point in time. Thus it can be quite common to be shown multiple simultaneous first- and third-person views on the screen – which not only tap into one's spatial intelligence, but at the same time actively help players learn to use these views in their gameplay.

Kinesthetic: Although games can not yet place their players physically in the game, most games do require players to 'insert themselves' virtually into the game in one way or another and all involve movement and action which can be realized through physical movements of the players hands. Watching players as they play quickly confirms that there is indeed more going on than just hand motions – they tense, lean forward, jump up, punctuate choices with head motions, and so on. Some games are specifically designed to involve mild to heavy physical activity, such as *Dance Dance Revolution*, and, to a lesser extent, games like *Donkey Konga*. In spite of the fact that these games are marketed on their "Kinesthetic Intelligence" attraction, they still provide musical, visual, and linguistic stimulation, as well as requirements for logical thinking and strategizing. There are very few games indeed that rely on only one or two modes for eliciting responses and engaging the user.

Intrapersonal: Games force players to discover and practice various skills, and although reflection is probably one of the weakest elements of games, the communities that evolve around popular games often more than compensate. Other aspects of metacognition, such as considering what one wants to do, how one reacts to things, which things to avoid, and which things to gravitate toward are integral to most games, even first-person shooters that do not purport to be much more than target practice. Many games, such as *Black & White*, or *Fable* present scenarios that involve ethical dilemmas, and have moral (or immoral) themes.

Interpersonal: This is again an area where games excel. Many of the most popular games include multi-player modes, many online games massively so. Even single player games typically include multiple NPC's (non-playable characters) and often require varying degrees of both competition and cooperation in order to win. Sports games demand teamwork, but even games without multiplayer modes encourage the formation of game communities, where players help each other and share information.

Naturalistic: Games with naturalistic themes are common – whether they include purely realistic flora and fauna, purely fantastical ones or some combination of the two. Clearly, games like *Zoo Tycoon* call upon one's natural intelligence in order to be able to identify various animals' requirements for housing and care. Beyond that, any game that creates a world with geography and a variety of inhabitants require classification, as well as naturalistic skills and

understandings. Once again, even a game like *Pikmin* includes several distinct kinds (species?) of *Pikmin*, each with its own strengths and weaknesses.

Although not all games embody every kind of intelligence, most embody the majority of them, and it is always possible to find a specific game that favours one or another. And even though it can be claimed that the different genres of games, as well as variation within are not always designed to appeal to broad audiences, that same condition has not prevented us from making effective use of classic novels or movies in education.

Keirsey's Temperament Sorter

The Keirsey temperament sorter is based on the Jungian model which was developed by Isabel Briggs Myers and her mother (Myers & McCaulley, 1985). It uses four different scales, which are used to classify personalities into four different basic types. Even a superficial examination of the types described conjures up images befitting many role-playing games. Each can be seen as symbolic, perhaps even memetic, and can easily be represented as an avatar in a game. One could even envision each as a description for an entire race of beings in some epic strategy game. See for yourself:

Artisans value freedom and spontaneity. They tend to be impulsive, playful and creative.
Guardians value belonging to a group or community. They tend to be traditional, responsible and conservative.
Idealists value personal growth, authenticity, and integrity. They tend to try and encourage these traits in others. This group includes people labelled as "teachers".
Rationals value competence and intelligence. They strive for knowledge, predictability, and control. (Keirsey & Bates, 1984)

The results of a test that asks participants about various preferences categorizes traits into one each of four groups. The results allow for sixteen possible combinations: four for each personality type.

E = Expressive (extrovert)	I = Reserved (introvert)
S = Observant (sensation)	N = Introspective (intuition)
T = Tough-Minded (thinking)	F = Friendly (feeling)
J = Scheduling (judgment)	P = Probing (perception)

As has been mentioned before, the degree of choice permitted in games is largely an illusion; the *appearance* of virtually unlimited choice exists. As a consequence, Artisans get their freedom, and through the non-linear play and exploration possibilities built into most games, their need for spontaneity is met. Additionally, there is usually a relatively "linear" (sequential) path through the game that can be taken, which will comfort Guardians and Rationals, but the choice remains with the player. Many games cannot be won without some form of cooperative effort, either with other players (as in most MMOGs[x], and some multiplayer console games), or with the non-playable characters (NPC) that are part of almost every game. A game like *Pikmin 2* requires the player to enlist the help of dozens of tiny "Pikmin" as they are essential for everything from picking up objects to defence from attack.

For the Idealists, aspects of personal growth, authenticity, and integrity are inherent in many games too. Transgressions, and playing the "bad guy" are permitted, but many games implement character attributes such as "health" and "wisdom" which are often diminished as a direct result of these actions. A moral code exists in most games, but it is one defined by the designers rather than outside forces.

One of the key aspects of successful games is how well they balance between randomness and predictability – a game that is too predictable quickly becomes boring even for most Rationals, yet one that is too unpredictable appears random, and players do not feel in control. Most games allow users to adjust the degree of randomness, and so stout Rationals can reduce the element of chance, while Artisans can "dial it up".

Felder's Index of Learning Styles

Felder's ILS model is based on the theory that students learn best when material is presented in a manner best matching their own style, so for each learning style, there is also a teaching style to match. (Richard M. Felder & Silverman, 1988) The original model has been altered in recent years to exclude the original aspect of inductive vs. deductive style as the authors have come to believe that the "best" method of teaching is inductive regardless of which style the learner prefers. However, the fundamental tenet remains (Richard M. Felder, 2002).

Index of Learning Styles	
Active (doing) Medal of Honor, Star Wars, Super Mario Kart	Reflective (thinking) Black & White, Syberia, Myst
Sensing (facts, processes) Civ III, SIMs, Age of Empires	Intuitive (concepts, relationships) Pikmin, Katamary Damacy, Harvest Moon
Visual (seeing, picturing) Super Mario Kart, Super MonkeyBall	Verbal (hearing, reading, saying) *Elecrtoplankton*, *Karaoke Revolution*
Sequential (step-wise) *Roller Coaster Tycoon*, *Myst*	Global (leaps, random) Psychonauts, Grim Fandango

As with other theories and models, the one aspect of the model that is not especially well supported within most games is that of reflection. This seems to be a shortcoming for which the players themselves see a need, as it is often be found to be thoroughly supported through the communities of players that can evolve outside of the game. (Galarneau, 2005) One of the qualities of games that make them both distinct from other educational technologies that have come before, and intrinsically suited to experiential approaches to learning, is that they are highly interactive. ALL games require players to "do". Most modern games are highly visual in presentation, and yet they almost always include narratives and text to either augment visual information, or provide extra information not available in other forms. They require players to learn facts and understand processes, but they also require them to understand concepts and synthesize relationships. Games have sequential aspects, which are balanced by global requirements.

Kolb's Learning Styles

David A. Kolb (with Roger Fry) outlined four elements in his model: concrete experience, observation and reflection, the formation of abstract concepts and testing in new situations. (Kolb & Fry, 1975) These four elements form the nodes of a connected circle of experiential learning, with learners able to enter, as it were, at any point along the circle. Ideally, learners will posses balanced abilities in each of the four areas, but in reality, they tend to polarize towards one of four "poles". These four poles are summarized in the table below. Note that as we continue to examine additional descriptions of learning styles, many common descriptions become evident. Similarly, the same games can be used as exemplars for these common descriptions.

The primary argument being made here, is that many games already include elements to meet the needs of various learning styles, so if true, it should not be surprising that many of the games listed could just as easily have been listed in different columns. It's all a matter of perspective, and how the player chooses to take up the game.

Learning style & Characteristic	Description
Converger: Abstract conceptualization (AC) + active experimentation (AE) *Myst, SIMs, Railroad Tycoon*	· Practical application of ideas · Focus on hypo-deductive reasoning on specific problems · Unemotional · Narrow interests
Diverger : Concrete experience (CX) + reflective observation(RO) *Gitaroo-Man, Katamari Demacy, Myst*	· Imaginative ability · Generates ideas and sees things from different perspectives · Interested in people · Broad cultural interests
Assimilator : Abstract conceptualization (AC) + reflective observation (RO) *Metroid Prime, SIMs*	· Can create theoretical models · Excels in inductive reasoning · Abstract concepts rather than people.
Accommodator : Concrete experience (CX) + active experimentation (AE) *Need for Speed, Far-Cry, Phantasy Star Online*	· Doing · Risk taker · Can react to immediate circumstances · Solves problems intuitively

In more traditional settings, once an individual's style is identified, instruction can be organized to support his or her strengths, which can give confidence, while still encouraging the further development of the others. In games, the need to appeal to a broad audience ensures that the Converger can remain unemotional, yet imaginative exploration is encouraged and rewarded. Theoretical models can be devised and tested with minimal risk, yet risks *can* be taken, and normally the worst that will happen is that the player must start over.

This bears repeating: a key aspect of good games is that the player can take up the game in many different ways: as a neutral orchestrator, or as an impassioned participant. Games encourage Accommodator abilities of immediate reaction to circumstances and Converger abilities of the application of ideas, and both can remain within the bounds of the "magic circle"

of play (Huizinga, 1950) because the usual rules and consequences of reality don't apply. Divergers can identify with other players or NPCs (non-playable characters) as if they are people, and Assimilators can relate to them using whatever conceptual frameworks they like. Some strategies will lead to greater success within the game than others, but the fact remains, that *it is only a game* – exploration and experimentation are actively supported in most good games.

Gregorc System of Learning

Based on left / right brain studies, Gregorc's system of learning takes into account different ways of perceiving and ordering information. Perceptual preferences can be Abstract, which involves reason, intuition, and deduction, or Concrete, which involves the senses. The ordering preferences indicate how individuals are most comfortable organizing the information they incorporate. The two ends of the spectrum here are the Sequential (or linear and systematic), and the Random (less organized). (Gregorc, 1985)

Gregorc's Learning Styles		
Concrete-Sequential	Linear and sequential.	Super MonkeyBall, Pikmin
Concrete-Random	Concrete and intuitive Thrives on problem- solving.	Syberia, Myst
Abstract-Sequential	Abstract and analytical Thrives on a mentally challenging but ordered learning environment.	Myst, Syberia
Abstract-Random	Emotional and imaginative, Prefers an active, interesting, and informal learning environment.	Katamari Damacy, Electroplankton

Good games support the approaches of Concrete learners by design, through a myriad of feedback mechanisms: visual, auditory, textual, progress charts, etc. while Abstract learners can ignore which ever feedback mechanisms they choose – often by simply switching them off. Abstract learners can develop theories and test them out within games in ways not feasible in real life. The "reset" button remains available to both whenever they get into trouble.

Sequential learners can progress through games in an orderly fashion; they can strategize about which tasks to complete first when there are choices, and follow through. Most games also permit a fairly ordered progression through the challenges, yet for more Random learners, the option exists to choose from among various "next steps". Although some games require some tasks to be completed in certain orders (good for Sequential learners), most also allow for a substantial degree of freedom for Random progressions.

From Commercial Games to Educational Game Design

A demonstration of how “good” games already seem to embody sound pedagogy in their designs accomplished several things. First it may help to put our minds somewhat at ease to know that some of the games we are playing appear to be designed on sound instructional principles. These games are not twisting our minds to a wholly foreign way of learning. Second, entities that could be viewed as implementations of some of our favourite and best loved theories appear to be highly successful. The theories and principles that have been accepted by scholars and teachers can lead to highly engaging artefacts – in other words, following best practices in the design of instructional articles can have immensely compelling results.

A caution, however: there remains an awfully big step between showing how existing games employ 'best practices' in instructional design, and turning that around in order to be able to develop instructional design strategies for creating good learning games. A useful analogy again comes with film. We can often elaborate on why great movies are so great, and a portion of most film studies curricula concerns just that, but we still have not come up with a formula for generating them. Understanding what makes a great game what it is, is but the first step. One hope is that we will eventually be able to articulate what kinds of elements comprise a “good” learning game – one that is both compelling *and* delivers on its instructional goals. Another is that we will never undervalue the contribution made by the talented people involved.

I remain convinced that the work is worthwhile and important. If we can better understand why games are so good at teaching the things they do, we may still not be able to *generate* sure-fire winners using the same principles, but we should be able to evaluate designs based on them. It can help us to avoid some of the bad stuff. I think the design of games for learning is one of the biggest challenges that instructional designers have had to face - games are, in many ways, a completely new technology. Knowing how to build websites, or e-learning may help, but cannot fully prepare one to design good games for learning[xi], nor does knowing how to design traditional games. These may help, but games for learning are still orders of magnitude more complex.

Finally, instructional design for games must come ***out of*** the games design itself and cannot be imposed upon it. When we try and spread ID on top of games, you get the likes of *Mathblaster*, but when the ID 'becomes one with the games design', you get games like *CivIII*, and *Black & White*.

Much work remains to be done before we can begin to use games for learning with the same confidence we currently enjoy for text-based and other learning technologies. That players are already learning a great deal through gameplay is clear. Whether or not we can leverage this learning to other objectives is less clear. One body of knowledge that must be developed before we can truly conclude that the strategies employed by games designers can be used effectively in the design of intentional instruction is to study gamers in order to determine if particular learning styles are found to be more common than would be expected in the general population. If so, we will need to determine whether specific genres of games are preferred by people with specific learning styles, or all games have similar attractions. This information can be significant in deciding if, and how games can be effectively used in instructional settings.

Just as Felder now finds it appropriate to advocate for inductive teaching styles for all types of learners, it may also be appropriate to now advocate for supported learner control for all. That learning is more effective and learners more amenable and responsive when they are given greater control over their learning environment is now a widely endorsed tenet. *Games already do this.* Control over one's environment is a key aspect of virtually all popular games, from *Lord of the Rings*, to *Paper Mario,* and *Metroid Prime*.

Perhaps it is appropriate to close with Lev Vygotsky, who believed that with new technologies come new human capacities and a need for new approaches to learning. "The invention of new methods that are adequate to the new ways in which problems are posed requires far more than a simple modification of previously accepted methods." (1977 p. 58)

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EndNotes

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[i] While a certain degree of controversy surrounds this film regarding the legitimacy of the footage, it is credited with being the first documentary, and is included for its status, dubious as it may be, as the first documentary film.
[ii] It might be interesting to note that last year, in 2004, the average age was 29.
[iii] In 2004, twelve games were listed as having sold over one million units. (ESA, 2005) Nine of those games were rated for Teens or Everyone.
[iv] Not to mention the ever popular story-with–a-moral, which predates literate cultures by a considerable amount.
[v] For an example of elements important to a successful gaming experience, see: (Walpole, 2004) on designing games for the wageslave (i.e. people who must work for a living).

[vi] Admittedly, this still sounds far more like something an educator would say than like something a game publisher would.

[vii] A *god game* is one where the player controls the actions of the game and the characters within, normally without being one of the characters. They are generally played from a third person perspective – and often the player has only indirect control over other characters in the game. One can build buildings, create a storm, or move army's but the player is not any single character.

[viii] NPC = non-playing character. These are characters that act within the game but are not controlled by the player. Also known as 'bots' (for robot).

[ix] I'm sure we'll have seen enough of this sort of comparison by the end of this chapter.

[x] MMOG = Massively Multiplayer Online Games

[xi] By the way, I'm avoiding the term "learning games" because it has a specific meaning in AI - namely games that learn, as opposed to games that are used as vehicles to help people learn, but most people outside of CS won't get the distinction.