

## MIT Open Access Articles

### *Subversive game design for recursive learning*

The MIT Faculty has made this article openly available. **Please share** how this access benefits you. Your story matters.

**Citation:** Mitgutsch, Konstantin, and Matthew Weise. "Subversive game design for recursive learning." 2011 DiGRA International Conference: Think Design Play (January 2011).

**As Published:** <http://www.digra.org/digital-library/publications/subversive-game-design-for-recursive-learning/>

**Publisher:** Digital Games Research Association

**Persistent URL:** <http://hdl.handle.net/1721.1/100273>

**Version:** Author's final manuscript: final author's manuscript post peer review, without publisher's formatting or copy editing

**Terms of Use:** Article is made available in accordance with the publisher's policy and may be subject to US copyright law. Please refer to the publisher's site for terms of use.



**Massachusetts Institute of Technology**

# Subversive Game Design for Recursive Learning

**Konstantin Mitgutsch**

Singapore-MIT GAMBIT Game Lab  
Massachusetts Institute of Technology  
77 Massachusetts Ave, Building NE25-315  
Cambridge, MA 02139  
Office: (+01) 857-204-0214  
k\_mitgut@mit.edu

**Matthew Weise**

Singapore-MIT GAMBIT Game Lab  
Massachusetts Institute of Technology  
77 Massachusetts Ave, NE25-365  
Cambridge, MA 02139  
Office: (+01) 617-324-9113  
sajon@mit.edu

## ABSTRACT

How are players' expectations challenged through subverting common design patterns in digital games? The following paper outlines a game design experiment that combines state of the art learning research with game design. The goal of the game project is to explore how subversive design patterns can be created that force the players to rethink their expectations and interpretations. In the developed game *Afterland* various paradigm shifts subvert common gameplay patterns in order to encourage players to modify their anticipations. This is designed to provoke a corresponding paradigm shift in the players, forcing them to reassess certain expectations and to adopt new mental models, strategies, and goals other than those commonly found in games of this genre. The paper introduces recursive learning as a theoretical foundation for the game design process and offers constructive insight derived from this particular research-based game design project conducted at the Singapore-MIT GAMBIT Game Lab.

## Keywords

Learning, Recursive Learning, Theory-Based Game Design, Subversive Game Design, Learning Theory

## 1. INTRODUCTION

Are games constructive tools to research learning processes? How do they motivate players to rethink their habits and expectations? These questions are the starting point of a theory-based design project at the Singapore-MIT GAMBIT Game Lab, one that connects state of the art learning research with unconventional and subversive game design. The

Proceedings of DiGRA 2011 Conference: Think Design Play.

© 2011 Authors & Digital Games Research Association DiGRA. Personal and educational classroom use of this paper is allowed, commercial use requires specific permission from the author.

form of learning this game project focuses on goes beyond learning as a rational process of acquiring information to *recursive learning* through failure by resolving incorrect expectations. The process of experiencing something always starts with a general expectation that is based on our prior experiences. Recursive learning hereby involves the readjustment of insufficient preconceptions and the establishment of novel judgments and adequate prospects. The ability to learn recursively, to restructure incorrect expectations and to overcome prejudices and biased approaches, is a core element of learning in our everyday lives (Toffler 1970; Buck 1989; Mitgutsch 2011). To hold onto wrong expectations and stick to insufficient judgments hinders the learning process fundamentally.

Nevertheless, as educational learning theories, cognitive science, and experimental learning design show, humans tend to avoid learning through failure and in many cases stick to incorrect expectations and judgments. While the reasons for this habit are manifold and outlined in a variety of scientific studies, one recurrent aspect is the learners' fear of accepting the consequences of having made a mistake. The higher the pressure on the learners and the more unpleasant the results, the harder it is for them to bear the consequences. But suppose this process was taking place in a "safe" space, where the outcomes are playful? Learning through failure is an integral part of games and of engaging gameplay experiences. The improvement of our skills and readjustment of our expectations can be appealing, even satisfying. Designing a game built on these concepts was the research challenge of *Afterland*, a digital game developed by students at the Singapore-MIT GAMBIT Game Lab in 2010. Conceived as a project in two phases, the creation of *Afterland*, as a tool to study recursive learning, was the first step. It is the first phase that this paper concerns, outlining the theoretical background, design process, and lessons we took from designing a recursive learning game.<sup>i</sup>

## 2. RECURSIVE LEARNING – THEORETICAL BACKGROUND

What is *learning*? As trivial as this question appears to be, hundreds of years of research has shown that the answer is complex and defined differently across various fields of study. Is learning a rational process of acquiring information, a behavior-based reaction to a stimulus (B. H. Skinner), a developmental process of construction (J. Piaget), a form of cultural habitualization (P. Bourdieu), or an act of cognitive adaptation (D. P. Ausubel)? As recent research indicates the interpretation of *what* learning means is dependent on historical and cultural factors (Meyer-Drawe 2009). Thus, there are central patterns that can be identified as basic fundamentals of the learning process. Gregory Bateson's statement remains simple but valid: "The word 'learning' undoubtedly denotes change of some kind. To say what kind of change is a delicate matter" (Bateson 1972, 283). Learning is a process of change that is grounded on experiences. A further essential categorization is the difference between *what* we learn and *how* we learn. Robert Kegan defines *informational learning* as acquisition of information, knowledge, skills, and competences as an extension of already established cognitive structures. This form of learning is of existential importance and our school system is built on its foundation. *Transformational learning*, on the other hand, does not only change the learners' knowledge about something. As Jack Mezirow outlines, transformational learning processes structure our way of perceiving, experiencing, and meaning making. It changes the frames of reference and the ways learners learn, think, and experience in general.

"Frames of reference are structures of culture and language through which we construe meaning by attributing coherence and significance to our experience. They selectively shape and delimit our perception, cognition and feelings by predisposing our intentions, beliefs, expectations and purposes." (Mezirow 2010, 92)

If humans learn on a transformative level they develop new perspectives on the world, others, and themselves (cf. O'Sullivan, Morrell and O'Connor 2002, 18). As Kegan points out, "both kinds of learning are expansive and valuable, one within a preexisting frame of mind and the other reconstructing the very frame" (Kegan 2010, 42). Most educational approaches to learning focus on *informational* learning because it is mainly result orientated, quantifiable, and controllable, and very much related to the way of teaching and learning in our school systems. Transformational learning, however, has a profound impact on the way humans learn in general, as it allows learners to develop new perspectives and change their modes of thinking. In this respect the futurist Alvin Toffler quotes Herbert Gerjuoy's perspective on the future of learning, "Tomorrow's illiterate will not be the man who can't read; he will be the man who has not learned how to learn." (Toffler 1970, 414). The ability to restructure and relearn might be one of the core abilities for a society growing up in times of constant cultural, technological, and social change, and we therefore felt a video game project was a good opportunity to observe how this phenomenon works. Our approach was thus based on transformational learning in general, and the recursive aspect of restructuring and reframing of expectation in particular.

## 2.1 RECURSIVE LEARNING

The interrelation between learning and experiencing is a key factor to take into account when investigating the processes of learning. When we learn we never learn in *general*, we always learn something *particular*, in a specific setting and in relation to our prior experiences. The learning process is contextualized into specific frames of reference that structure our expectations and can be transferred to other settings in meaningful ways (Mezirow, 1996; Mitgutsch, 2011a). However, it is not only the experienced content that is *saved* in our body of experience, but also the frames of reference as structures or patterns that contextualize these experiences (Breiter & Scardamalia, 1993). As Jeong-Im Choi and Michael Hannafin (1995) state: "Context provides the framework for learning, but content determines its authenticity and veracity" (p. 57). The adjustment and revision of old experience patterns and the development of new ones is the central challenge we consciously or unconsciously undertake while learning:

"New patterns are created through a sometimes lengthy process in which existing patterns that have some slight fit to the problem situation serve to suggest the kind of pattern that is needed and eventually the 'right' pattern clicks into place. It is much like the perception of puzzle pictures where the initially meaningless patches of dark and light gradually acquire meaning or else suddenly click into a recognizable picture when a clue is given." (Breiter & Scardamalia, 1993, 129)

The general question of how learning patterns are discovered and developed is a major challenge for the cognitive sciences (cf. Breiter & Scardamalia, 1993; Choi & Hannafin, 1995), but the idea of restructuring prior experience can be traced back to the

philosophical approaches of Plato, Aristotle, and Francis Bacon. Departing from Aristotle's epagoge and the theories of induction by Bacon, Hans-Georg Gadamer states in his book *Truth and Method* (1998) that the refutation of wrong generalizations through new experiences is constitutional to every process of experience. He argues that the "negativity of experience" has a certain "productive meaning" to the process of gaining experience (1998, 353). In discussing how one learns through irritations, disillusionment, and failure Gadamer outlines the following process: one experiences something new about a learning object, about the limitation of one's own prior experiences and expectation, and about the limitation of one's own way of thinking and, finally, one reaches a new horizon of experience. From an educational point of view Gadamer's approach to the productive meaning of the negativity of experience has an important implication. If the learners' expectation of *something* is disillusioned, their knowledge of this object (1), of their former expectation (2), and of their body of experience (3) transforms. Learning from the productive negativity of experience manifests as an overcoming of dogmatic cognitive bias, and proceeds as a change of the body of experience. The educational scientist Günther Buck calls this fundamental kind of learning "*umlernen*" (Buck 1989, 42), a process of *recursive learning* fostered by productive negative instances (cf. Mitgutsch 2009, 2011b). In this process the experience of productive disillusionments, the confrontation with our own expectations (Meyer-Drawe 2009), and the irritation of our knowledge are key moments (Benner & English 2004). In short: To foster learning as a change of frames of reference patterns, the learners' expectations need to be confronted and challenged. But – as we all know from our own experience – not every confrontation, even if it has dramatic outcomes, enables us to develop novel reference structures and new ways of thinking and learning.

This problem was researched centuries ago by Francis Bacon who examined the tendency of the human mind to search for affirmation and neglect refutation. Gaining experience is dependent on negative instances that help to correct incomplete pre-experiences and anticipations (cf. Bacon 2000; Mitgutsch 2009a). Bacon focused on central moments of experience and discusses the *instantiae negativae*, which human consciousness tends to avoid by keeping the confirming moments in mind and suppressing the resisted experience:

"And even apart from the pleasure and vanity we mentioned, it is an innate and constant mistake in the human understanding to be much more moved and excited by affirmatives than by negatives, when rightly and properly it should make itself equally open to both; and in fact, to the contrary, in the formation of any true axiom, there is superior force in a negative instance." (Bacon 2000, 43)

In the cognitive sciences, the reasons we often fail to learn recursively and allow transformation can be found in our inability to react to the refutation of our expectations. But what if the context of the recursive learning process is changed to a playful setting? Would having no real-life consequences or failure change the transformation of frames of reference patterns? Can games be a useful tool to foster recursive learning?

### 2.3 RECURSIVE LEARNING IN VIDEO GAMES

If our expectations collide with confrontations in real-life settings we tend to ignore or neglect the facts, as the consequences would be negative. In games we find the challenge of our expectations amusing, and sometimes motivating and engaging. The loop of trying, failing, and readjusting makes a game appear exigent and motivates us to develop our competences and skills further (cf. Gee 2003). Video games are extraordinary learning tools and – in theory – motivate players to explore the edges of their competence, their skills, and their knowledge. Playing is a voluntary activity that relates to the needs and values of players. It is contextualized in its own space, time, and affinity group. Playing can be defined as the voluntary attempt to intentionally confront ourselves with unnecessary challenges in a satisfying way (cf. Suits 2005). To overcome these obstacles the players are forced to develop skill and competences, knowledge and tactics, and to explore their abilities – they are forced to learn. Games open up different solutions and ways of solving problems for players (cf. Gee 2003; Mitchell & Savill-Smith 2004) and provide a risk-free environment for innovative problem solving and exploration (Squire 2006). Their instant feedback loops foster experimental explorations and discovery learning (Kirriemuir 2002) and they cultivate higher-order thinking skills by which the players reflect on a different level. This learning process can be labeled as "meta- or double loop-learning" (Argyris and Schön 1974), "deutero-learning" (Bateson 1972), or "recursive learning" (Buck 1989; Meyer-Drawe 2009; Mitgutsch 2009, 2011b). Through recursive learning experiences the players' approach to a problem changes fundamentally, as the expectations are restructured and the players do not only learn about a learning object, but about themselves and their ways of thinking and learning.

Recursive learning in games requires the players to (a) develop an understanding of a situation, challenge, or obstacle and (b) create an expectation of how to overcome it only to have that expectation confronted by an unexpected result. Players are then (c) forced to restructure their understanding, their expectation, or even their frame of reference. They subsequently (d) develop a new approach to overcome the obstacle. This recursive process is repeated until players (e) develop a suitable pattern of how to overcome the obstacle. Players hereby learn recursively on an *informational* level about the object and the obstacle in the game or they can start to question their frame of reference and their ways of learning and thinking in general – on a *transformational* level. While this recursive learning loop is already processed by players in different games and in relation to their body of experience (cf. Gee 2003), we were interested in how we could intentionally apply this learning process to a computer game. Furthermore we wanted to develop a research tool to investigate if these theoretical claims can be verified on an empirical level (cf. Linderoth 2010). Our research questions therefore were:

1. "How are patterns in games designed that challenge the players' expectations without 'breaking the magic circle' or reducing the players' enjoyment?" (Focus: design)
2. "How do players interpret the shift of common design patterns and how do they reflect on the reverse structure of known game paradigms?" (Focus: player experience)

The second step in our design and research process was to apply the theory of recursive learning and cognitive dissonance to design concepts and game mechanics:

### 3. APPLICATION OF THE THEORY TO QUESTIONS OF DESIGN

Our research benefited greatly from the fact that one of us was an educational theorist and the other was a game designer. This initial position demanded the translation and application of the theoretical basis to the sphere of game design. The project involved a dialogue between academic theory and game design practice. What became apparent quickly in this dialogue was that, in the world of commercial/indie game design, there were already many analogies to the recursive learning concepts outlined above. The idea of a game deliberately deceiving the player about its mechanics or goal structure, thus forcing him or her to re-evaluate his or her entire orientation towards the game, already existed in a variety of games. The first challenge was to compile a catalogue of existing game examples that from our point of view already implied the sort of learning we wanted to explore. After some discussion, we arrived at an analytical template we felt was useful. For terminology we settled on "patterns" as the broadest definition of the structures, systems, ideologies, etc. that we felt shaped player expectation. We chose games that, through personal experience or reputation, intentionally subverted normal expectations in one way or another. In each of these games we identified the "common pattern" being subverted, the "uncommon pattern" it was being subverted with, and the overarching "lesson" we felt this might teach one attempting, as we were, to design similar subversions. Below are two examples from the final, compiled catalogue.

Game	Monster Party (Bandai, 1989)
<b>In-game example</b>	Act differently than expected to "defeat" a boss monster. He even tells you how to defeat him, if you listen.
<b>Common pattern</b>	Kill the boss monster through violence
<b>Uncommon pattern</b>	You cannot kill him through hitting, but through reading what he asks you to do and doing it ("watch my dance")
<b>Lesson</b>	If a certain pattern of how to overcome obstacles is taught by the game, players do not question it anymore. To flip this pattern opens a new challenge.

Game	Fathom (Adam Atomic, 2009)
-	
<b>In-game example</b>	The ultimate goal and win state of this small flash game is not what it first appears to be.
<b>Common pattern</b>	Basic run & gun platformer: run, jump over obstacles, and defeat the level's end "boss" by shooting it
<b>Uncommon pattern</b>	"Losing" the boss fight gives way to "real" game, which involves swimming, exploration, and making fish friends.
<b>Lesson</b>	Showing the player a common pattern can immediately "fool" them into thinking they are playing one type of game when really they are playing another.

**Table: 1** Subversive Game Design Catalogue (2010)

By subverting common design patterns these games challenge game paradigms that are common in almost all games. Players are forced to overcome their routines and habits to "win" the games, and this aspect can be identified as a recursive learning process. *Monster Party* and *Fathom* influenced *Afterland* the most, which is why they are included here. The complete catalogue had 10 more examples, including *Metal Gear Solid 3: Snake Eater* (2004, Konami), *Passage* (2007, Jason Rohrer), *Shadow of the Colossus* (2005, Sony Computer Entertainment), *Second Sight* (2004, Codemasters), *September 12<sup>th</sup>* (2003, Water Cooler Games), and *Ulitsa Dimitrova* (2009, Lea Schönfelder/Gerard Delmàs).

Creating this catalogue helped us grasp what it might mean to create a recursive learning game. One insight we felt was key to a successful recursive learning game was the idea that an uncommon pattern needs to be *unexpected but logical*. In all the examples cited in the catalogue, the bait-and-switch tactics of the game designers only work because the surprise has strong logical underpinnings. For example, the idea in *September 12<sup>th</sup>* that killing civilians "creates more terrorists" is a known ideological position, one that a player is likely to comprehend even if he/she does not share it. One does not expect a video game about combat to have this sort of pacifistic bias built into its game mechanics, but once the player understands it he/she is likely to understand it as an ideological statement – one they may or may not agree with – but not a "broken" game. We felt this was crucially important since unexpected, confusing, and/or counterproductive consequences for familiar actions in video games are usually factors that denote bad game design, and can cause players to quit a game outright rather than persevere. And since we, as researchers, could not be there in the room with every player who might potentially play the game online we felt strongly that we could not risk our uncommon

patterns feeling arbitrary and therefore broken. They had to feel logical to the player, but logic they did not expect to encounter in a video game because of their prior experience with other games. Only in such a case, we hypothesized, is there a chance that a player will see the bait-and-switch tactic as an intriguing puzzle to be solved, an invitation for them to adjust their mental model, rather than a game made by people who don't know what they're doing.

We realized that all the "common patterns" of these games were common video game conventions. Boss fights, platforming, collecting, shooting, etc. were all action/reward patterns these games subverted in some way, replacing them with logical patterns not normally found in video games. Video game literacy was therefore key to this process, since video game conventions were essentially what were being unlearned and relearned. For the purposes of examining recursive learning in general, one might imagine it would be advantageous to base a game on some other literacy, one not so game culture centric, to study a wider range of people. However, such thinking demonstrates a fundamental misconception about video games and games in general. As Jesper Juul (2005) argues, all games are abstractions, even the so-called "realistic" ones. No game models reality, only an abstraction of reality, otherwise it would *be* reality and not a game. All logic in a video game is therefore game logic in a sense, once it is abstracted and implemented as part of a game design. Games which attempt to reach wider audiences with so-called "realistic" or "naturalistic" interfaces, like *Rock Band* (2007, Electronic Arts) or *Wii Sports* (2006, Nintendo), simply use game logic abstractions with stronger real-world referents (playing a guitar, swinging a tennis racket), ones that require less an understanding of the many complex, arcane reality abstractions (health meters, experience points) that have become commonplace in gamer culture over the past 30 years.

Modeling a game on something new, i.e. something not normally modeled in video games, would require us to invent a new, unfamiliar abstraction, which enables the player to first learn and *then* try to get them to unlearn. We thought it was more advantageous to leverage the players' familiarity with existing abstractions, which we could reasonably expect a certain portion of our players to have. This is important because, as people who understand all games as abstractions, seasoned players do not necessarily assume things will "work" in video games based on their real world referent, but on how they have been commonly abstracted in other video games. Not basing our concept of recursive learning on existing game conventions could have invalidated the entire concept of expectation to begin with. Less experienced players, we supposed, were more likely to grasp for real world referents in attempting to understand unfamiliar abstractions. This lead to the hypothesis that the game we wanted to make would probably punish seasoned players for their game-based expectations and reward less seasoned players for their non-game-based expectations, which was an outcome we were fine with, because it would still yield useful observations on relearning, expectation, etc.

With all this in mind, we created a series of questions for brainstorming game concepts. These brainstorming questions were given to our team of summer interns whose task it was to actually develop the game under our supervision. These questions were:

- What are some common patterns (i.e. what could the game appear to be about)?

**Proceedings of DiGRA 2011 Conference: Think Design Play.**

© 2011 Authors & Digital Games Research Association DiGRA. Personal and educational classroom use of this paper is allowed, commercial use requires specific permission from the author.

- What are some uncommon patterns (i.e. what could the game really be about)?
- What kinds of patterns could be “unexpected but logical”?
- What sort of previous knowledge (i.e. video game knowledge) would the player need to identify certain common patterns?
- What sort of previous knowledge (i.e. non-video game knowledge) would the player need to identify certain uncommon patterns?

Following is a discussion of the design process itself and the final prototype that was developed.

#### **4. DESIGN AND CONCEPT OF AFTERLAND**

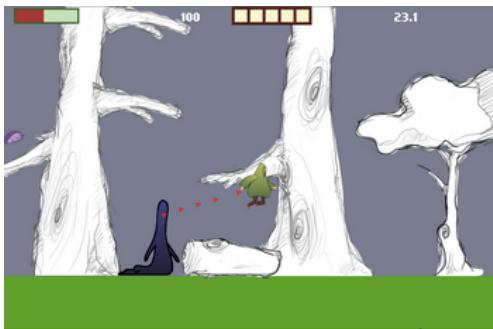
Once our student team was assembled the first thing we did (after outlining a simplified version of the learning theory from above) was go over the catalogue, discussing recursive learning experiences in general, and encouraging them to add their own examples of games. After a few sessions of discussion, reiterating the core concepts of common patterns, uncommon patterns, literacy, logic, and expectation, we set the team to work on brainstorming their own game ideas using these concepts as guidelines.

Out of this came three radically different ideas. One was a platformer, where traditional user interface (UI) elements, specifically the "options" menu, affected the game world in an unusually literal way. Pausing the game and clicking "sound off" made your character silent, allowing them to sneak past things, and so on and so forth. Another was about a nerd who had to avoid scary people in order to collect more toys and trinkets for his room. In this game, the twist was that collecting things was actually unnecessary, and the scary people were really just normal but seemed scary because the nerd had no social skills. The last idea involved managing an advanced industrial country at a high level, similar to *Sim City* (Maxi, 1989) or *Civilization* (Microprose, 1991). The trick of this game was that, unlike most games of this type, all the resources you had to build actually came from a finite source, a small poor country you could visit any time but were never told about explicitly.

After carefully weighing the pros and cons in terms of complexity, development cost, and how well they embodied the desired recursive learning theories, the team settled on the second idea about the nerd, which at the time was simply called "The House Game". There were several reasons this game concept stood out. First of all "collecting" is one of the most common patterns in video games, with a long history of encouraging compulsive behavior in many different types of players, from casual to seasoned, and across all sorts of genres. We therefore decided that "collecting" would be one of the main common patterns we wanted to subvert. Additionally we felt that "enemies" – in-game characters who traditionally exist only to attack you – were another widely common pattern that could be subverted effectively, and in logical tandem with collecting.

One of the first challenges of developing a game based on relearning is exploring how exactly to deceive the players, but doing so in a way that will make them blame themselves - not the designers - for misconstruing the game's true nature. We wanted to offer the players different options for how to play the game. But playing in the "right" way needed to require players to look beyond common design patterns and game

mechanics and develop different ways of approaching a problem. For us this came down to two important aspects: backstory and on-screen user interface elements. We felt that the backstory had to "explain" in some way why the game appeared to be about collecting but, in fact, was not. This caused us to re-evaluate the "nerd" concept (cf. fig. 1) of the original game idea and search for a stronger, more holistic framing device. Through many iterations of the art style, we finally arrived at a deliberately ambiguous, implicitly post-apocalyptic framing narrative, in which the player took the role of an unnamed resident of a surreal woodland house. The art style was highly abstract, featuring a world of characters that all appeared to have identical silhouetted bodies but were distinguishable by the elaborate masks they wore (cf. fig. 2). The protagonist also wears such a mask, only sleeker and more "friendly"-looking than those worn by the other inhabitants of the game world. The world itself was also highly abstract, with highly stylized environments.



**Figure 1:** The nerd character in Afterland



**Figure 2:** Masked characters in Afterland

Adopting this level of abstraction allowed us some room for ambiguity. We did not want to announce the other mask-wearing characters as "evil" but wanted to create the cues that would activate the player's pre-programmed expectation based on other games and generate that assumption. In short, we wanted to give the players enough rope to hang themselves with. This meant leaving room for an impulsive interpretation but also having cues that pointed toward the uncommon pattern. We tried to do this in the world art by suggesting the post-apocalyptic context subtly. All the objects you collect in the game world are broken. They might be a cracked LCD television or a smashed lamp. Once you return with them to your house, they do not work. You cannot fix them. You can do nothing with them except place them around your house, which causes your house to get dirtier and gradually more unappealing (cf. figure 3 and 4).



**Figure 3:** Empty Home



**Figure 4:** Cramped Home

Alongside the "collecting makes things worse" motive, the "enemies" in *Afterland* behave in an unexpected manner, though, like the collecting, in a way that is not entirely clear at first. The player has what (deliberately) appears to be a "health bar" that decreases when the player gets too close to the other masked figures. The figures "look at" the player, and the player reacts by involuntarily grabbing his/her head and shaking. It is in this state that the meter goes down, though there is no label that explicitly says it represents "health" or "life". The masked figures do not chase you when you run away. They simply shrug at your behavior ("Why is he running away?") and go about their peaceful business.

As we developed these ideas, we began to see the game in terms of having two contradictory feedback systems. The first, supporting the uncommon patterns, would be embodied in the world, in the "enemy" behavior, in the "broken" objects, etc. The second, supporting the common patterns, would be embodied in the user interface design, in the on-screen elements that denote traditional game conventions like "score", "health", etc. Though risky, we felt this was a good way to prey on the biases of our more game-literate players, who had been taught to assume the on-screen UI never conveyed false information. So when the "health bar" extinguishes the player does not lose his life, he/she faints and the "enemy" helps him/her up, apparently concerned for the player's well-being (figure 5).



**Figure 5:** Shifting patterns from collecting and avoiding, to confronting, and befriending

It would not be entirely accurate to call this feeding "false" information to the player. In order to meet our learning goal of making the player feel as if misunderstanding the game was their fault, not ours, we could not simply have the UI "lie" to them. Rather, we had to construct the UI in such a way that, in hindsight, the player would feel they had simply misinterpreted it. To do this, we reimagined the on-screen UI as an extension of the protagonist's interior mental state. As the opening story cut-scene hints at, his collecting spree begins when he finds an old catalogue page, which sends him into a kleptomaniac fervor. The UI then appears as bits of magazine paper, which appear to have been "taped" to the screen with cello tape, as if they are not quite part of the game world. This is intended as a hint to the fact that the information they convey might be an extension of his consumer desire. In addition, we made sure the UI did not interpret its own meaning for the player. The "health bar" is simply a bar. Nowhere does it say "health" or "life", because it is not really tracking these things but "anxiety". The assumption was that the players' own preconceived biases would take over, and they would simply assume it was a health bar, but then realize, looking back on it later, that it never explicitly said so.

The game was constructed this way in prospect that, as people played it, they would gradually begin noticing the secondary feedback system (the world) and begin ignoring

the primary feedback system (the UI). The "goal", in a certain sense, is to destroy the common pattern by destroying the UI that tracks it. Again, by hoarding objects in their house, the player makes it dirty, and the only way to clean it is to throw things away permanently, the very things they have been collecting. To "win" the game the players have to overcome their habit of collecting, hording and avoiding the enemies and confront their expectations. This positive feedback that the player is moving towards this goal is the different UI elements – the meter for health, the backpack for picking up items, and the item counter for collecting – being "torn up" and falling off the screen when, through the player's behavior, their irrelevance is exposed.

## **5. REFLECTION OF THE DIALOGUE BETWEEN DESIGN AND THEORY**

All the decisions above, about what would be the "right" game design choices and theoretical framework to create a game-tool to observe recursive learning, were hypothetical, our best educated guess at what we felt would work given the expertise and experience of everyone involved. The design and creation of *Afterland* was just the first phase of a longer project, the second of which was the use of *Afterland* as a tool to systematically collect data about recursive learning. However, that does not mean user testing and observation was absent from the development process itself. GAMBIT's standards of professionalism require user testing to be an integral part of every project. *Afterland*'s creation therefore involved user testing quite extensively, to give us an idea of how well our ideas were or were not working as we made progress, allowing us to course-correct if necessary.<sup>ii</sup>

First of all, it was quite difficult and took a good while to even get players to understand the first pattern of the game (collecting items, hording them at home and avoiding enemies), which – as we hypothesized – proved quite necessary for them to even have a recursive learning experience. During early play tests not many players were even recognizing the first "obvious" goal. After adding things like the UI elements, effects feedback (like "sparkle" sound when you collect items), and the opening story cut-scene (which shows the protagonist finding an old catalogue clipping) did we reach a high probability of generating the expectations we intended. It was important to us not to "tell" the players what to do, but this presented a difficult design challenge in terms of communicating with the player. Nailing that communication became a major aspect of the design challenge, which was only improved after extensive user testing.

As the game began to come together, one thing we noticed quite clearly was a strong trend of players resisting the second set of patterns if they had already put a lot of effort into achieving the first. We found that players who hoarded items would tend to not want to throw them away, even when it became relatively clear to them that that behavior was "bad" and was being punished by the game system. Though not by any means conclusive, this sort of observation to us suggests a re-evaluation of the assertion that video games are "safe" spaces where failure is without consequence. We found when players are "in" a game, the rules of that world appear consequential to them. Spending time collecting does, of course, have "real" value, since players spent time doing it and would like to believe that time wasn't spent badly. Player's also want to "win" the game, making behavior they perceive towards that end as having real value within the context of the game. This suggests that things like resistance to learning, anxiety, etc. can be taken

seriously in video game despite their unrealness, given they are contextualized properly.

One thing we noticed was that player reactions, upon discovering the "twist" of the game, were surprising in very subjective ways. The most acute moment of this tended to manifest as the moment when the player "died", i.e. when their avatar slumped over and the screen went dark after their meter depleted, only to be (seemingly) resurrected a moment later and helped up by one of their "enemies". While some players were amused by this and started engaging with the second pattern almost immediately (collecting friends and cleaning the house), others were shocked or highly irritated. Some players even went on collecting items, annoyed that they were being followed around by their former enemies, and only in the end realizing, when their friends refused to enter their house until it had been cleaned of junk, that they were resisting the game's true goal. Their recursive learning process thus seemed highly related to the grade of trust they had in their expectations.

Interestingly, we observed that hardly any player recognized the setting as post-apocalyptic or that the UI represented the protagonist's interior mental world, yet still in the end seemed to experience the recursive learning all the same. This made us wonder whether such additional hints and context was perhaps too subtle or unnecessary, or that perhaps the feedback provided by the game system itself was enough. Also, while the "common" gameplay patterns were certainly common enough, *Afterland* still contained a few rules that felt uncommon, like the notion of having to bring collected items back to your house. Most platformers do not have this mechanic and therefore many players had to learn this aspect first, which was in some cases a speed bump (and sometimes worse) to players engaging in common patterns before they were subverted. One thing that did seem to make incredible difference was the "item counter" UI element. Even though most players didn't pick up on the fictional meaning, the way the different UI elements presented information had a profound effect on the player's desire to achieve certain goals. Earlier builds had an on-screen score, with collected items adding points. The concept of scoring is a well understood common pattern, but it wasn't motivating players toward the obsessive hoarding we wanted. We found that when we changed the score to a simple "current/total" tracker, showing how many items the player currently had out of a static total, almost all players became determined to collect everything. This was possibly the most important change we made to the game based on observing players, since it illustrated how simply reframing a single bit of information can have a decisive psychological effect on what sorts of behavior one is able to generate.

This was one final pattern that we could not implement exactly how we wanted to, mostly because of time constraints. After players get "disillusioned" and realize that the "enemies" are actually their friends, they need to search for their friends and bring them back home in order for the game to end. From a recursive learning theoretical point of view, it was important to us that the refutation of expectations opens to a further unexpected but logical activity in this way. While other video games with subversive design elements, like *September 12<sup>th</sup>*, often lead up to a single "aha"-moment they seldom change their mechanics based on the recursive learning insight. Originally we wanted there to be a whole second section of the game, where leading your friends back home became its own sort of challenge. However, because we ran out of time, we ended up

implementing the simplest version of this mechanic possible, i.e. to have the former enemies follow you home automatically, having them magically teleport around obstacles they would otherwise have trouble getting around. At first we felt this was a small failure of the research, since our second pattern – making friends – wasn’t really a game but more like a reward for “figuring out” the twist. However, given that our game implicitly critiques the ideology of “collecting” in general, we felt perhaps this sort of ending was for the best, since grafting a challenge/reward system onto the friend collecting would have turned those friends into “objects” to be collected in order to “complete” the game. On the whole, our testers did not seem confused or disappointed that collecting friends was so easy, which makes us feel like the “omission” of stronger gameplay in the second pattern may not have been contrary to the research at all.

## 6. CONCLUSION

There are many lessons we learned in conducting a subversive game design project based on the recursive learning concept. To summarize, one of the beneficial aspects was the enriching dialogue between research and design. By translating the theoretical concept to the sphere of game design, we were able to create a unique game using clear guidelines, gleaned from theory, that non-theorist practitioners were able to understand. The creation of the catalogue of common and uncommon design patterns in video games was essential to communicating the theoretical and practical challenges to the design team. The students never appeared to struggle to relate to the game design challenge and through the game examples they could also relate to the theoretical concept without becoming experts in this theoretical field themselves. The translation from theory, through the concrete design patterns, to the players’ feedback on their experiences, helped to establish a useful framework. Design-wise one of the greatest challenges was the introduction of two contradictory feedback systems: avoiding enemies and collecting items versus collecting friends and cleaning house. Providing room for impulsive interpretation but also having cues that pointed toward the uncommon patterns was tricky. The play testing showed the first common design patterns were easy to understand, challenging, and interesting for players and that the subversive design patterns enabled a recursive learning process for many of them. Nevertheless an empirical study is needed that shows on a qualitative level how the players experience the recursive learning process and what impact the game has on their thinking and learning in general.<sup>iii</sup>

---

<sup>i</sup> This paper will not discuss the second phase, in which we used *Afterland* to gather data on how various players responded to the recursive learning process. That paper will follow this one, though there will be some discussion of player testing during *Afterland*’s development, and how that affected the creation of the game.

<sup>ii</sup> Though the observations and subsequent tweaks we made based on mid-development testing should not be substituted for the more rigorous user testing we did afterwards for purely academic purposes, it did yield several insights that are worth mentioning here.

<sup>iii</sup> The game can be played online: <http://gambit.mit.edu/loadgame/afterland.php>

## BIBLIOGRAPHY

- Argyris, C., and Schön, D. (1974). *Theory in Practice. Increasing professional effectiveness.* San Francisco, CA: Jossey-Bass.
- Bacon, F. (2000). *Advancement of learning, Novum Organum* [1620]. Cambridge: Cambridge University Press.
- Bateson, G. (1972). *Steps to an Ecology of Mind*. Chicago: The University of Chicago Press.
- Beck, J. C., and Wade, M. (2004). Got game: How the gamer generation is reshaping business forever. Cambridge, MA: Harvard Business School Press.
- Benner, D. and English, A. (2004): Critique and Negativity: Toward the pluralisation of critique in educational practice, theory and research. *Journal of Philosophy of Education* 38, p.410-428.
- Bereiter, C., and Scardamalia, M. (1993). *Surpassing ourselves: An inquiry into the nature and implications of expertise*. La Salle, IL: Open Court.
- Buck, G. (1989). *Lernen und Erfahrung – Epagogik. Zum Begriff der didaktischen Induktion*. Darmstadt. Wissenschaftliche Buchgesellschaft.
- Choi, J.-I., and Hannafin, M. (1995). *Situated Cognition and Learning Environments: Roles, Structure, and Implications for Design*. ETR&D, 43 (2), p. 53-69.
- Gadamer, H.-G. (1998). *Truth and Method*. New York: Continuum.
- Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. New York, NY: Palgrave Macmillan.
- Juul, Je. (2005). *Half-real. Video games between real rules and fictional worlds*. Cambridge, MA/London: The MIT Press.
- Kegan, R. (2010). What "Form" Transforms? A Constructive-Developmental Approach to Transformative Learning. In: Illeris, K. (Ed.). *Contemporary theories of learning* (pp. 90-105). London: Routledge.
- Kirriemuir, J. (2002). The relevance of video games and gaming consoles to the higher and further education learning experience. Techwatch Report TSW 02.01. Online: [www.jisc.ac.uk/index.cfm?name=techwatch\\_report\\_0201](http://www.jisc.ac.uk/index.cfm?name=techwatch_report_0201) [01.08.2011].
- Lave, J. and Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Linderoth, J. (2010). Why gamers don't learn more An ecological approach to games as learning environments Proceedings of DiGRA Nordic 2010: Experiencing Games: Games, Play, and Players.
- Mezirow, J. (1996). Contemporary Paradigms of Learning. *Adult Education Quarterly*, 46 (3), 158-172.
- Mezirow, J. (2003). How critical reflection triggers transformative learning. In: Jarvis P. (Ed.). *Adult and Continuing Education: Teaching, learning and research* (pp. 199-214). London: Taylor & Francis.
- Mezirow, J. (2010). An overview of transformative learning. In: Illeris, K. (Ed.). *Contemporary theories of learning* (pp. 90-105). London: Routledge
- Mitchell, A. and Savill-Smith, C. (2004). The use of computer and video games for learning. Online: <http://www.lsda.org.uk/files/PDF/1529.pdf> [01.08.2011].
- Mitgutsch, K. (2009). Passionate digital play-based learning. (Re)Learning in computer games like Shadow of the Colossus. *Eludamos Journal for Computer Game Culture*, 1(3), p.9-22.
- Mitgutsch, K. (2011a). Playful Learning Experiences. Meaningful learning patterns in players' biographies. In: *International Journal of Games and Computer-Mediated Simulations*. 3(3), p. 54-68.
- Mitgutsch, K. (2011b, in press). Learning through play – a delicate matter. Experience-based

- Recursive Learning in Computer Games. In: J. Fromme and A. Unger. (Eds.) Computer Games/Players/Game Cultures: A Handbook on the State and Perspectives of Digital Game Studies. Springer: New York, In press September 2011
- O'Sullivan, E., Morrell, A., & O'Connor, M. A. (Eds.). (2002). Expanding the boundaries of transformative learning. New York: Palgrave.
- Squire, K. (2006). From content to context: Video games as designed experiences. *Educational Researcher*, 35(8), p.19-29.
- Suits, B. (2005). The Grasshopper: Game, life and utopia. Ontario: Broadview Press.
- Toffler, A. (1970). Future Shock. New York: Random House
- Wicklund, R. A., & Brehm, J. W. (1976). Perspectives on cognitive dissonance. Oxford, England: Lawrence Erlbaum.

## GAMES

- Adam Saltsman. (2009). Fathom. [Flash], Self-Pub., Internet Web Browser: played 3/3/11.
- Free Radical. (2004). Second Sight. [Playstation 2], Codemasters, United States NTSC Version: played 3/3/11
- Harmonix Music Systems. (2007). Rock Band. [Playstation 3], MTV Games/Electronic Arts, United States NTSC Version: played 3/3/11.
- Human Entertainment. (1989). Monster Party. [Nintendo Entertainment System], Bandai, United States NTSC Version: played 3/3/11.
- Jason Rohrer. (2007). Passage. [PC/Mac/Unix], Self-Pub., Internet Download: played 3/3/11.
- Konami Computer Entertainment Tokyo. (2004). Metal Gear Solid 3: Snake Eater. [Playstation 2], Konami, United States NTSC Version: played 3/3/11.
- Lea Schönfelder/Gerard Delmàs. (2009). Ulitsa Dimitrova. [PC], Self-Pub., Internet Download: played 3/3/11.
- Nintendo. (2006). Wii Sports. [Nintendo Wii], Nintendo, United States NTSC Version: played 3/3/11.
- Singapore-MIT GAMBIT Game Lab. (2010). Afterland. [Flash], Self-Pub. Internet Web Browser.
- Sony Computer Entertainment. (2005). Shadow of the Colossus. [Playstation 2], Sony Computer Entertainment, United States NTSC Version: played 3/3/11.
- Water Cooler Games. (2003). September 12th. [Flash], Self-Pub., Internet Web Browser: played 3/3/11.

## GRAPHS

- Table 1: Mitgutsch, K. and Matthew Weise (2010). Subversive Game Design Catalogue. Unpublished. Monster Party (Bandai, 1989) Online: [http://www.reviewbusters.net/images/game/monster\\_party\\_003.gif](http://www.reviewbusters.net/images/game/monster_party_003.gif); Fathom (Adam Atomic, 2009) <http://digitaltools.node3000.com/wp-content/uploads/2009/fathomgame.png>

Figure 1: The nerd character in Afterland (2010) Online:

[http://gambit.mit.edu/updates/assets\\_c/2011/02/FirstPlayable\\_6-2812.php](http://gambit.mit.edu/updates/assets_c/2011/02/FirstPlayable_6-2812.php)

Figure 2: Masked characters in Afterland (2010) Online:

<http://gambit.mit.edu/images/afterland2.jpg>

Figure 3: Empty Home. Online: <http://gambit.mit.edu/images/afterland1.jpg>

Figure 4: Cramped Home. Online: <http://gambit.mit.edu/images/afterland4.jpg>

Figure 5: Shifting patterns from collecting and avoiding, to confronting, and befriending.

Pictures from [http://gambit.mit.edu/updates/assets\\_c/2011/02/programmerscreenshot2-thumb-400x261-2847.png](http://gambit.mit.edu/updates/assets_c/2011/02/programmerscreenshot2-thumb-400x261-2847.png); <http://gambit.mit.edu/images/afterland7.jpg>