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Introduction to Game Development

Edited by Steve Rabin

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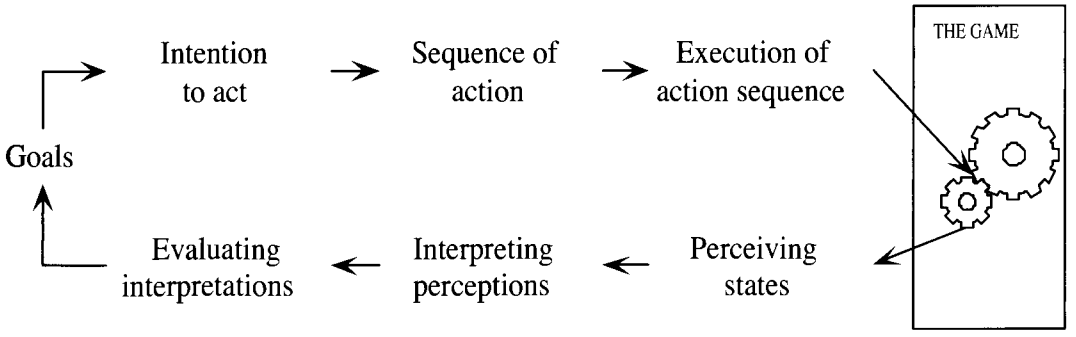
PART

2

GAME DESIGN



2.1 Understanding Fun—The Theory of Natural Funativity

In This Chapter

Overview

This chapter delves into a theory called "Natural Funativity" that explains why people enjoy entertainment in general and games in particular. Understanding the natural basis for fun provides an important tool that helps game designers craft more effective games. Supporting this theory is an analysis of Classic Game Structure, some rules for structuring the sequence of choices in a game to maximize players' enjoyment, and a discussion of The Flow Channel, a concept from psychology that is particularly useful in creating popular games. The chapter concludes with a discussion of Story and Character in Games, extending the previous topics to provide practical guidance for game designers and writers.

Throughout these sections, useful tips and quotes about how the theory can be applied to practical aspects of game design are highlighted like this:

Game design is both a logical and an intuitive process. Learning to use these tips consciously will, over time, foster an instinctive sense of how to apply them to future game designs.

Are We Having Fun Yet?

According to most dictionaries, *fun* is a synonym for *enjoyment*, or a source of amusement. However, on a deeper level, asking what is the underlying nature of fun, or more precisely, why we human beings find some things entertaining and others not, is a critical question that is rarely addressed when considering game design. Certainly, the ultimate test of a game's worth is often summed up in the question, "how much fun is it?" If we don't consciously know what fun is, then we are doomed to try to evoke it in our games by trial and error, or by copying successes of others and forever lurking in their shadows.

In the early 1980s when computer games were just starting to catch on with the public, the new manager of the Lucasfilm Games Division (which later became the LucasArts Entertainment Company) was Dr. Stephen Arnold. Steve had come to Lucasfilm from Atari, and had been a practicing child psychologist for years before that, training that qualified him to understand the game audience, and helped him to ride herd over a group of 20-something game developers. Steve's first question about any new proposal brought to him was, "what is the funativity quotient?" By coining this term, he prompted the designers to consider precisely what elements of the game contributed to the feeling of fun, and the degree to which each part of the design was important in that process.

However, the question of Fun (with a capital F) transcends game design. To get at the heart of what makes video games fun, we have to begin by looking at entertainment in general. Therefore, we'll explore the realm of all things that fall into the domain of entertainment as we look at its underlying foundations.

Evolutionary Antecedents

When dealing with practical answers to fundamental questions about human behavior and preferences, the logical place to start is with evolution. The basic drives for all creatures are survival and reproduction, and (with mammals like ourselves in particular) the social skills that let us interact successfully with others of our species. And to understand human evolution, it's necessary to look farther back than our current society, because from an evolutionary standpoint the last few thousand years of civilization are just a thin veneer on the millennia that have shaped our species, and the last few hundred years of technology have hardly affected our evolutionary heritage at all. Most of that legacy is in genes that helped our ancestors survive and reproduce in the hunter-gatherer societies that prevailed from the time they began to walk upright until the recent present. Therefore, we have to look at the way humans must have lived tens of thousands of years ago to see the survival significance of some of our evolutionary traits [Pinker97].

How does this relate to games? Games are an organized form of play, and the roots of play go deep into human history, and even further, beyond our species. Everyone has seen kittens or puppies playing with their littermates, stalking and pouncing, rolling and nipping. Their play focuses on practicing basic survival skills while also establishing social dominance and learning to live with their peers [Wills93]. People share much of that foundation, but our much larger brains and more complex social structures have caused us to extend play into adulthood. Human entertainment is also at its heart all about learning about survival and reproduction and associated social rules.

Marshall McLuhan, a communications theorist, proposed that there is little difference between education and entertainment. On its surface, that may seem like an extreme belief. However, examine the underlying assumptions. People tend to divide their lives into time spent doing what is necessary for survival, inactivity, and leisure time. In short, work, rest, and fun. It's easy to see why we have evolved to attend to our basic survival needs—our potential ancestors who weren't willing to do so didn't survive to become our ancestors in the first place. Moreover, even though in general people make a strong distinction between work and entertainment activities, their origins are very similar.

Consider our ancestor who has just come back from a successful hunt. He can go right back out and try to hunt some more, or attend to other basic survival needs. That has the benefit of keeping the larder full, but runs the danger of being hurt or even killed on a hunt that isn't strictly necessary. There are some people who are "wired" that way—today we might call them diligent workers or even workaholics. Alternatively, our ancestor might have just rested, conserving his strength and not being motivated to do much more until an empty belly forced him out again—also a personality type familiar today. Such a person would have the advantage of staying safer while resting, but runs the risk of running out of food if game is scarce when he finally goes to hunt, or if he's out of shape when running after an elk—or away from a sabertooth tiger. However, there's a third alternative. It turns out that foraging is a very efficient mode of subsistence, leaving many hours for other tasks [Leakey94].

If one of those early humans' brain and emotions happened to be structured to provide pleasure from practicing and perfecting survival skills or learning new ones in a comparatively safe way that did not endanger his life to the same degree as the actual survival tasks, he would be likelier than his fellows to survive to become our ancestor. After many entertainment-related activities, people's brains release chemicals known as enkephalins and endorphins that resemble opiates like opium and morphine, creating effects like the well-known "runner's high" [Dunbar96]. Moreover, it is because of that evolutionary innovation that modern humans seek entertainment and derive pleasure from it, including video games as one of the latest examples.

These games, as with all play and entertainment in general, involve learning new things. When people stop learning from a game, they stop playing it. Multiplayer games can extend the learning process as players learn to top each other's strategies and adapt, which helps explain their long-term play value. In addition, the skills are taught in a context that is safer than real life, particularly for some of the fighting, hunting,

and war games, because if they were just as dangerous as the real thing, there would be no evolutionary advantage to learning from a game instead of the actual activities. Consider when emotions flare and a playful game between friends suddenly becomes serious and confrontational—it might evoke the protest, "relax, it's only a game." This may well explain why the groundbreaking EA game *Majestic* failed to catch on—it managed to evoke actual real-world fear by generating threatening e-mails and phone calls to the player (and had the unfortunate timing of coming out around September 2001). Its highly touted innovation of being "the game that plays you" by intruding into the real world apparently backfired. The great majority of people want to feel safe in their entertainment, even (especially) when it involves violent conflict.

Consider what skills and information the player learns over the course of your game, and emphasize skills important to the player's survival in the game.

Sometimes the connection between a specific game or form of entertainment and learning survival skills is hard to see. For one thing, there can be many levels of abstraction present in games. For example, the modern game of chess is about moving pieces across a board, but its origins are in a simulation of war. Or a game might seem trivial on the surface, but evoke our hunter/gather ancestors' priorities, like *Pac-Man* that managed to combine both gathering (eating berrylike dots while avoiding dangerous predators) and hunting (turning the tables and chasing down—and consuming—those very predators). This very simple game was a huge hit in its era, even though there were more elaborate and sophisticated games available at the time.

So, is the secret to success to make games about hunting and gathering? Actually, that's not a bad place to start. Consider all the games that are directly or indirectly about those basic topics. Certainly, first-person shooters and games like flight sims, wargames, most fantasy role-playing games, and most real-time strategy games are very much about a violent kill-or-be-killed world, with a huge amount of gathering thrown in—gathering the tools, weapons, and armor to survive, gathering resources or information critical to prosper, even in some cases gathering in the sense our ancestors did it, finding food in the wilderness. The most popular PC game of all time is *The Sims*, which has very little to do with hunting, but much to do with both gathering and, unusual in games, the social rituals of mating and even reproduction that obviously fascinate a large number of people and are vital to our genes' survival.

Natural Funativity

This theory of how entertainment in general and how games in particular relate to learning about survival skills is known as Natural Funativity. Natural, as in natural selection, because it is based on evolutionary principles, and Funativity from the Lucasfilm Games anecdote, and because it elevates the simple term *fun* to one that seems more worthy of serious analysis—and because a theory about fun should sound a little silly and fun itself. However, to learn to apply these theoretical concepts to practical theory for game design, it helps to break the theory down into manageable pieces.

Everything that people do to entertain themselves falls into one of three categories. The first category is physical things that people do for fun.

Physical Fun

The physical realm has obvious and direct connections between our evolutionary past and what people do for fun. One of the strongest urges in people, and indeed in most animals, is the survival instinct. Anything that directly threatens our immediate survival will instantly capture our total attention. We have become hardwired to enjoy practicing physical activities that enhance our survival for the simple evolutionary logic that our potential ancestors, who were not that interested in practicing those skills, were less likely to survive to *become* our ancestors. If one looks at entertainment in general, activities that involve threats to survival and the means to deal with those threats have always been tremendously popular—think of the success of movies, books, TV shows, and even news features about violent criminals, soldiers, doctors, and police. Even when the point of the entertainment is abstracted—for example, scoring more points than another team at football—there are obvious concrete advantages to survival in a hunter-gatherer society of having the muscular development and coordination of an athlete.

Sports are in general another big area of physical fun. Solitary sports like running and bodybuilding have obvious survival advantages for the individual, while team sports also incorporate cooperative strategies that mimic group hunting expeditions of early humans—as well as tribal competitions and even war. For that matter, actual hunting and fishing have remained popular even when no longer directly necessary for survival. In 1997, the computer game *Deer Hunter* and its sequels were big hits, selling millions of units even though their technology and gameplay were fairly simplistic. This surprised many in the industry who had assumed that the tastes of computer game players were fixed solely on elaborate science fiction and fantasy themes along with state-of-the-art graphics.

Gathering is a component of many forms of entertainment. Pick almost any obscure item from buttons to Beanie Babies, and there are people who collect them. Gambling is an incredibly popular kind of gathering, showing that when people see the potential for a payoff that can actually help them survive, their interest in the activity goes way up. In video games, *Pac-Man* was probably the first hugely successful gathering game—with an element of "the hunted becomes the hunter" as well—and *Pokémon*'s slogan "Gotta catch 'em all!" points to its gathering roots. Many very successful games, from *Pokémon* to *Creatures* to various real-time strategy games include the idea of training and even breeding creatures with various helpful qualities—and not surprisingly, evidence suggests that the first domestication of animals goes back at least as far as 70,000 years ago, and learning to survive among potentially hostile creatures goes back much farther.

The survival skills crucial to our ancestors, as well as hobbies and pastimes popular today, are good sources of inspiration for new game themes.

In addition to these basic survival skills, one physical activity many people enjoy is exploring places—some like to travel to exotic locations, others prefer to stick to their own neighborhoods until they are extremely familiar with every home and store, but either way they gain pleasure from improving their knowledge of their surroundings, which is also a major feature of many games of almost every genre. There are obvious survival advantages to knowing where to find "good stuff" and what areas to avoid because of danger or of a lack of anything worthwhile.

Establishing a safe, familiar territory and then inviting players to explore its mysterious boundaries is a proven feature of many successful games.

Consider dancing, an activity popular across a wide range of human cultures, going back into prehistory. A skilled dancer develops strength, coordination, and stamina, all basic physical survival advantages. In addition, dancing is a way to demonstrate those advantages to others, and therefore has become an important social skill, a way for people to flirt, show off, and even attract possible mates. For many years, video games seemed almost the antithesis of dance, encouraging players to become solitary couch potatoes. However, the popularity of *Dance Dance Revolution* has shown that all that was necessary to extend dance into the video game realm was a good user interface device and some clever game design. Surely, there are other undiscovered opportunities where an understanding of the basis of one form of entertainment will help extend it into the video game field.

It makes sense that practicing physical activities gives people pleasure, particularly those that involve hand-eye coordination, as one of the key things that makes us human is our upright posture and the associated freedom we have had to develop tools and use our hands. Many important entertainment activities involve tool use, from the aggressive nature of something like hitting a fast-moving ball with a bat, to the more sedate things people do to use or create tools, from knitting to fencing to tying flies for fly-fishing. All of these involve hand-eye coordination. Since the vast majority of video games use hand-controlled inputs and video displays, this is particularly interesting for the games industry. And it's not only the direct actions of practicing survival skills that fascinates people, but even the indirect experiences of observing others in the process, or even reading about them, talking about them, or seeing them in movies or on TV.

Video games are about doing, not telling. Let the players control or initiate actions so they can learn physical skills instead of making them into a passive observer.

Reproduction and all the associated aspects of meeting and attracting a possible mate are also of course critical to evolution and part of our heritage, but until the rise of multiplayer gaming there was little opportunity for that dynamic to be central to video games. Recently, innovations like Internet gaming and games on cell phones have made it possible to integrate games with actual meetings with other people, as friends—or more.

Social Fun

That brings us to the diverse area of social fun. People organize themselves in groups and like to watch other people do things—other qualities we share with our primate relatives. However, we go one better than chimps and gorillas, and spend large amounts of time talking to each other—and about each other. There are many nongame entertainment activities that are based on social fun. These include cooperative gathering-type activities like shopping or trading collectibles (anything from stamps to plush toys to beer cans), talking about where to find the best bargains or the hottest dance club, or social bonding activities like chatting with friends in small groups or at parties. Language has allowed us to add levels of indirection to our participation in survival activities. We don't have to see something firsthand to learn a valuable survival lesson, we can hear about it from someone else who was there. With the development of storytelling, we were able to spread stories many times removed from the original teller, and what we know of early stories and epic poems suggests that matters of survival and finding mates have been of great interest as long as there have been storytellers. Storytelling is our first "virtual reality"—so much a part of all human cultures that it is taken for granted, and yet our unique ability to hear a story and learn important physical, moral, and social lessons has been one of humanity's most valuable mental tools. And it doesn't stop there—with the invention of writing we can experience stories without storytellers, painting pictures in our minds, while movies and related technologies have let us literally see someone else's story. Whether it's an interactive drama delivered over the latest high-tech platform or just one person recounting his day to another, storytelling has become one of people's favorite entertainment activities. A quick test of the basic principles of Natural Funativity shows that these too are methods for learning about how to deal with situations critical to survival, reproduction, and their social equivalents. There's more on this in the upcoming *Story and Character* section.

In games, social fun manifests itself in several ways. Many games have associated stories or story contexts, particularly including first-person action/adventure games and role-playing games, and of course older text and graphic adventure games. More recently the rise of multiplayer and massively multiplayer games has transformed video games from an often solitary pursuit to a true social experience, creating virtual communities, tribes, and even resulting in some marriages. Other games like *The Sims*, *EverQuest*, and *Ultima Online* have proven very popular as inspiration for storytelling about in-game adventures in Internet chat rooms, and it is common for people to play even single-player games together, competing or cooperating. This is an area that is subject to a great deal of expansion in the future through improved technology. Broadband connections are making multiplayer gaming easy and more prevalent, cell phone games allow people to play with others anywhere and any time. Better AI may even expand the social game space with more realistic and involving virtual people.

What is *The Sims* if not an opportunity to observe and interact with the social and basic survival and mating choices familiar to us in the real world? Some of the most

popular networked computer games by "number of users" are not the immensely complex massively multiplayer online games, but rather simple video versions of card games like hearts and poker—but with the ability for people to use text chat or even voice chat with their opponents. Many popular board games have similar social components that transcend their core game rules, serving mainly as an opportunity for social interaction.

Just as physical fun is associated with the unusual human qualities of an upright posture and the associated ability to use our hands and tools, social fun is associated with another major human quality, that of language. So, does that cover all types of fun? Some things we do for fun mix physical and social fun. Team sports are an obvious blend. People participate in sports, and turn them social by watching others participate, and by talking about them to their friends. Likewise, people can spend as much time talking about shopping and where to find bargains as actually going out and participating in this modern form of gathering. Dancing, going out to dinner, and dating in general blends physical and social fun (and sometimes that other pillar of evolution, reproduction!). Massively multiplayer online games also tend to be a seamless blend of active physical (simulated) hunting and gathering, and (actual) social interaction and conversation.

Adding secrets, Easter eggs, tradable objects, or characters to games that players can share with friends adds social aspects that can extend gameplay opportunities.

In analyzing video games and fitting them into this theory of fun, one apparently exceptional game is *Tetris*, one of the most successful games of all time, and unusually popular with a wide range of ages and with both men and women. There is not much physical fun in *Tetris*—some hand-eye coordination of course—but the main action doesn't resemble hunting or gathering like so many other very successful games, and neither is there a significant social or story-oriented component. In fact, *Tetris* is about as story free as a game can be. The answer to this riddle can also be found in our evolutionary past, with an organ that shows a major difference between us and the rest of the animal kingdom. Have you figured it out? You're using it right now.

Mental Fun

Our brains are the key. For although we use our intelligence with physical fun and social fun, there is a whole class of entertainment activities, including quite a few video games, which focus primarily on mental fun, improving our mental skills and intelligence just as physical fun improves our physical skills and social fun improves our social skills. This fits in well with the ideas that physical fun is often related to a human's ability to use tools, and that social fun is often related to language. The third, and arguably the most important unique human quality is the relative size of our

brains compared to the rest of our bodies. Some animals like blue whales have much larger brains—but proportionate to our body size, our brains are by far the biggest. Of course, our intelligence, hands and tool use, and language all complement each other. Our larger brains and higher intelligence allowed our ancestors to make and use more sophisticated tools, and to carry on more complex and useful conversations. Our tool use and our ability to talk and coordinate activities made our ancestors more efficient hunters and gatherers so they could find enough food to fuel their large brains (which consume as much as 25 percent of the food and oxygen despite taking up 5 percent of the body weight). Moreover, the ability to describe the use of tools and pass on tricks for the construction of those tools benefited both tool use and the intelligence and dexterity necessary to make them.

The essence of intelligence is the ability to perceive and use patterns. *Tetris* is one example of mental fun. So are other puzzle-related games like *Bejewelled*, or nonvideo games, toys, and pastimes like jigsaw puzzles, crossword puzzles, and physical puzzles like *Rubic's Cube*. Listening to music is a form of mental fun, for music is patterned sound, just as poetry and song are patterned words. By the logic of Natural Funativity, playing these mental games should teach us something useful for survival—so of what use to our ancestors was the ability to quickly recognize patterns and act on them? The literal theme of *Tetris* is hard to apply to our hunter/gatherer ancestors and see how it helps build survival skills. However, the abstract quality of simply training people to recognize patterns and manipulate them instantly and accurately is applicable to a huge range of survival skills. Even basic hunting and gathering benefits from being able to, for example, recognize the shape and meaning of tracks in the ground quickly and accurately, or recognize and grab only the ripe berries quickly while avoiding thorns. This also helps explain some *Tetris*-like hobbies that seem to have little survival use like stamp or coin collecting, as well as other pattern-appreciation activities like collecting and viewing art, or listening to music. Aside from the gathering aspects, these hobbies have a lot to do with identifying patterns in common items that make them rare and valuable—and the survival benefit is not in the actual collecting, but in the mental fun of training to recognize those patterns. It's like exercise for the brain.

Making underlying play patterns in games consistent and predictable makes them easier to learn, but adding new patterns as the game progresses keeps it fresh and fun.

Multipurpose Fun

It is rare for any form of entertainment to be purely in one of these three categories. Usually, they have aspects of all three, sometimes one or two most strongly. Table 2.1.1 shows how four diverse real-world entertainment activities and four video games each have physical, social, and mental learning aspects.

Table 2.1.1 Deconstructing Fun

Fun Activity	Physical Aspects	Social Aspects	Mental Aspects
Hunting	Using senses, weapons, tools, living off the land.	Cooperative hunting, discussing or reading about how to hunt.	Tracking, recognizing patterns in prey behavior.
Football	Gaining strength, practicing throwing, catching, blocking, running.	Team play, working effectively with others, intimidating other teams.	Game strategies, recognizing split-second opportunities, choosing responses.
Shopping	Finding best merchandise at lowest prices, learning to judge quality.	Discussing quality of purchases, trading information on good sales, stores.	Evaluating bargains, monetary or social value of purchases.
Dancing	Gaining agility, stamina, learning popular dance moves.	Meeting others, showing off prowess, sryle, flirting.	Choreography, memorizing best moves, synchronizing to music.
Playing *Quake*	Mastering mouse and keyboard, practicing moves.	Playing in teams or against other players, discussing game.	Developing tactics, applying strategies, adapting to others.
Playing *Halo*	Mastering controls, buttons, hand-eye coordination.	Following story, playing with or against humans.	Choosing weapons, tactics to use against different enemies.
Playing *The Sims*	Mastering interface, learning most efficient placement of furniture to provide pathways.	Sharing stories about *Sims*, playing with others, reading about tips and hints online.	Choosing most efficient skills, actions to grow family or meet player-set goals.
Playing *Grand Theft Auto*	Learning to move, fight, drive, and navigate through the world.	Dealing with game characters, discussing tactics, tips with friends.	Choosing and planning strategies, selecting routes.

Harnessing Natural Funativity

Does Natural Funativity explain the reason behind all sorts of fun? The jury is still out, but certainly it covers the core aspects that are of interest to game designers. It also explains the appeal of jokes, puns, and slapstick, as well as more serious areas like art, music, and religion—but that's beyond the scope of this chapter. Other game designers are expanding on this theory or proposing their own overlapping ones, such as Raph Koster [Koster05], Chris Crawford, Nicole Lazzaro, and Jesse Schell. It's an exciting area that promises much more in the future.

How does this theory help us make better games? There are several ways:

- By understanding why some activities are fun, it helps us to know what aspects of popular games can be best adapted to make new ones.

- It helps us analyze concepts and proposals, and could save a lot of trouble. For example, this theory helps show why *The Sims* and *Tetris* were successful, both games that almost didn't get published. It can also show why *Majestic* was not, which might have saved a lot of money.
- It suggests new areas for designers to consider for game design, particularly in the social area on new interpersonal technologies like cell phones or instant messaging.
- It gives game designers a mutual language to use to discuss the concept of fun.

The next section, *Classic Game Structure and the Flow Channel*, demonstrates how understanding of Natural Funativity can help designers craft better games by influencing the player's natural rhythms of learning and perception.

Classic Game Structure and the Flow Channel

Natural Funativity shows us how games entertain by teaching us survival skills in the physical, social, and mental arenas. However, the theory by itself doesn't say much about how a game should be structured to maximize its effectiveness (and hopefully consequently its popularity as well!). This next section focuses on what constitutes a classic game; classic in the sense of serving as the established standard and having great significance or worth.

What Are the Essential Elements of a Great Game?

Here is a working definition of a great game (with thanks to the legendary designer Sid Meier for inspiration):

"A great game is a series of interesting and meaningful choices made by the player in pursuit of a clear and compelling goal."

Let's analyze that sentence carefully, starting with the idea of a series of choices leading to a goal. A game must consist of choices or it is not interactive, and a single choice, like the flip of a coin, may be interactive but is too simple to be called a game. A series of scenes without choice would be a movie, not a game. Likewise, a series of choices without a goal would be a toy. Will Wright has designed many games that lack explicit goals, including his best-known hits *Sim City* and *The Sims*. He has in fact referred to them not as games but as software toys. When the subjects of these software toys have been abstract and beyond the everyday knowledge of players, their appeal has been limited, as with ecology in *Sim Life* or cosmology and geology in *Sim Earth*. However, in the cases of *Sim City* and *The Sims* where their respective settings of a city or a household are part of everyone's common experience, players bring their own goals to the process and in doing so create a game out of the toy. It is not a coincidence that these particular titles have been big hits.

Make sure the player is aware of both short-term and long-term goals at all points of the game.

Next, consider the qualifiers *interesting and meaningful.* It may seem obvious that the choices in a good game need to be interesting, but many games allow the player to make deadly dull choices just because it is easy to program or because the designer lacks imagination. The previous section *Natural Funativity* suggests some ways to select topics or actions that are inherently interesting. The psychologist Csikszentmihalyi, who figures prominently later in this chapter, defines an experience as meaningful "when it is related positively to a person's goals" [Csikszentmihalyi90]. If a player believes that to reach a goal, one alternative is better than another, it is a meaningful choice.

On the other hand, if the player can choose from among three weapons but they all work equally well to accomplish his goal, the choice is functionally meaningless. It is also meaningless if there is an opportunity to insult, flatter, or ignore a game character, but the response from the character is identical in each case. However, "meaningful" in this definition requires only that the player perceives the choices subjectively as meaningful. If a gnarled tree branch and a polished mahogany club are functionally identical in a game, with the same availability, weight, and combat results, but a player mistakenly thinks the club is more effective, or has a goal of carrying only the most aesthetically pleasing weapons, that may be a meaningful choice *to that player.* The meaning is in the mind of the player, and it is the game designer's job to provide cues to put it there. Conversely, if two different objects in a world have different functions but the player does not notice the difference, the choice between them is not meaningful for that player.

Finally there is the point of having *clear and compelling* goals. Having clear goals for the player to pursue is greatly preferable to indistinct or confusing ones. Players who have no idea what to do next in a game can quickly become bored or frustrated. Making sure those goals are compelling and not arbitrary or disagreeable is also a very useful principle that somehow gets left by the wayside in poor games. Natural Funativity is a good tool for picking goals that appeal to players and compel them forward.

Test your game regularly with people who have never seen it before. Periodically ask them what they think they are supposed to accomplish next, and why it is important. That will tell you if your goals are clear and compelling.

Game Structure Basics

Let's delve deeper into the concept of a game being a series of choices. There are quite a few possible ways to structure that series, but after many years of experimentation and trial and error, only a few variations of one basic structure have proven to be most effective and popular. Many different designers have converged on a few basic structures that are present in the skeletons of most successful games.

It's helpful to look at game structures visually. The following figures use circles to show possible actions or decisions the player may take.

Theoretically, the simplest structure for a game would involve no choice at all, as shown in Figure 2.1.1.

FIGURE 2.1.1 *No choice.*

In this case, each player action results in a single possibility, with no choice involved. Many first-time designers who come from linear fields, like novelists or screenwriters, have made the mistake of proposing games like this. Let's pick on a hypothetical designer named Phil. A narrative section of Phil's game design document description might go something like this:

The player is confronted by two demons. He attacks the left demon with his sword, cutting him on the leg and sending him sprawling to the ground. Then he whirls to the right and beheads the second demon. But the first demon is just close enough to swipe at the player with a claw, so the player jumps just in time and stabs downward to impale his attacker.

Sounds exciting, just like a movie! However, a designer always has to ask, "what if?" In this case, what if the player goes after the demon on the right first, or attacks the first demon on the left but misses, or runs away instead of fighting at all?

Our friend Phil considers this. Perhaps his suggestion is that no matter what the player tries to do, the demon on the left will jump in front of him and confront him first, and the player will be forced to swing his sword. If he aims high, the demon will jump, ensuring that his leg is always hit. The game structure would look like Figure 2.1.2.

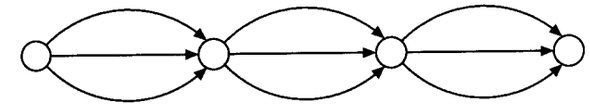


FIGURE 2.1.2 *Meaningless choices.*

Although the player may seem to have choices, they are actually meaningless. Some early experiments in interactive movies used this format—no matter what the viewers chose, the storyline folded back to the same place. They were not successful.

Another common mistake is the opposite approach going from no choice to an infinite number of choices, which can look like Figure 2.1.3.

Here, each choice the player makes leads to new ones. At first, this sounds pretty good. After all, life is full of similar infinite variety. However, the problems pop up when we study Phil's game design document that uses this structure:

The player is confronted by two demons. She can flee or attack, and if she attacks, she can choose either demon, and attack low or high, and if attacking low, strike the leg or the foot, and if the leg, aim at the thigh or shin, striking with the flat of the sword, or throwing it point first, or hilt first, or tossing it end over end, or melt it down to use the metal to make a plowshare instead...

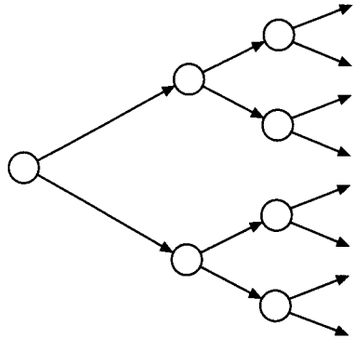


FIGURE 2.1.3 *Infinite choices.*

The problem of course is that the game must have code and artwork to support each variation that the player can choose, and the interface must also be capable of incorporating an infinite variety of moves. This is just not possible, and in fact, all games are severely restricted in the range of things the player can do compared to real life. The artistry in game design consists of structuring the restrictions so that they seem natural and even transparent to the player. How can such restriction be accomplished? One way was often used in early adventure games and "choose your own adventure" books (see Figure 2.1.4).

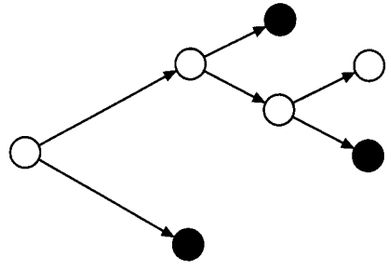


FIGURE 2.1.4 *Choose wisely.*

The solid circles in Figure 2.1.4 indicate choices that kill the player off, requiring her to start again. Phil's game design document says:

The player is confronted by two demons. She can flee or attack, but if she flees, she is killed immediately. She can attack either demon, but if she starts with the one on the right, the one on the left will kill her immediately. If she attacks the one on the left and aims high, it will duck below her blade and kill her immediately. If she aims low...

It's easy to see that this quickly becomes a frustrating version of the Figure 2.1.1 "no choice" option. Yet it's not hopeless; it does do the job of restricting the player's choices to a subset that can actually be developed, and it's very easy to implement so that developers can afford to put more choices into the game. One of its biggest drawbacks is that it rubs the player's nose in the fact that this is just a game. If you've designed an elaborate world intended to capture the player's imagination, it erodes the illusion of reality by constantly saying, "You're dead, but since this is just a game, you can try again." Over the years, players have become accustomed to this, yet all but the most hard-core game players resent having to start over again and again. The arcade game *Dragon's Lair* was infamous for using this structure. The novelty of this first videodisc-based game with full-screen video cartoons brought players to the arcades, only to send them away again in frustration over the task of memorizing an often arbitrary series of joystick moves and button presses.

Classic Game Structure

So, what is the ideal structure? After much experimentation, designers around the world have all converged on some similar configurations. At the heart of most games is a structure where the player starts with just a few choices that in turn lead to more. Then the inherent rules of the design and the physical setting cause the choices to gradually narrow back down again to a few, and often down to a single choice or action the player must accomplish. This core structure can be called a *convexity* because of its outwardly curving shape, as shown in Figure 2.1.5.

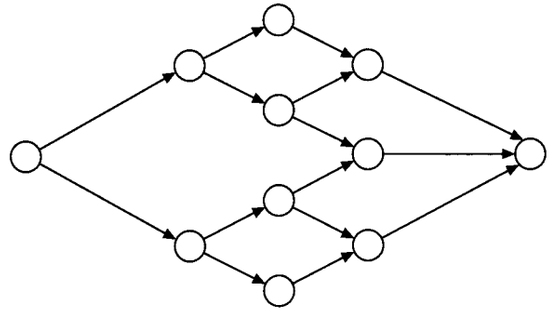


FIGURE 2.1.5 *A single convexity.*

The best way to limit player choices is to design the world or environment so that the limitations seem natural, perhaps even inevitable. For example, one convexity of choices would be made in the exploration of a small island. The player starts at one end, gradually moves to the middle as more places to explore become visible, and at

some point most of the island has been explored, leaving only a few places to look, and finally only one. In this case, the physical layout of the island roughly matches the shape of Figure 2.1.5, but that's not necessary to form a convexity. The domain of the choices can be shapeless, or even abstract. The build trees in real-time strategy games or the skill trees in role-playing games are often shaped as convexities, with one or two initial choices growing to several or many, but eventually all the new possibilities are exhausted and the choices shrink back to one. The key thing is to be creative enough to come up with game rules or settings that make the player's limitations seem logical, or better yet, seem inevitable or even imperceptible. Other examples of limited settings might be a limited number of enemies to fight in a building, or a quest to collect several key items and bring them back to a character.

Change the story, setting, or interface if necessary to make limitations invisible.

Many classic games like checkers, chess, and backgammon have the structure of a single large convexity, with a limited number of movies at first opening to many and finally converging back down toward the end of the game. Often, these games are played repeatedly, so one play session may include a series of games linked together. Successive games or challenges require the same basic set of skills, but offer variations on the central theme of the game to allow the players to gradually increase their skill level as they play.

Video games often use that structure too, calling the individual games "levels," "episodes," "acts," or "worlds," whatever is appropriate for the game setting. Figure 2.1.6 is a diagram of such a series, with the arrows removed to keep the size manageable, but the choices as in Figure 2.1.5 are still implied.

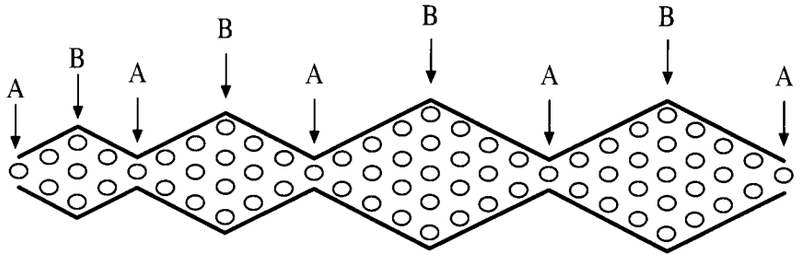


FIGURE 2.1.6 *A series of convexities.*

This structure, consisting of narrow points of a single decision (A) alternating with wide points with many decisions (B) is at the core of nearly all successful games. And each of the circles shown in Figure 2.1.6 can be single action or decision points but are more likely to be entire convexities of such choices, resembling Figure 2.1.5.

For instance a large-scale decision in a level of a game like *Age of Empires* may be "take a defensive stance" or "attack aggressively." The decision "take a defensive stance" is not a single action, but a convexity of smaller actions, including "create a small squad to defend the left flank," which in turn may consist of convexities like "gather enough resources to build an archer unit" and so on. Big, complex games often have this shape (mathematically known as *fractals*) where the large-scale structure is repeated on progressively smaller scales as well. In addition, often the first levels, missions, or regions of a game are smaller than later ones to give the player a simpler task to accomplish and get used to the game. Similarly, sometimes the final levels are small as well to speed up the pace of the game near the end so the player does not bog down in an ever-lengthening series of challenges.

As an example, consider the game *Diablo II*. On the largest scale, it is organized into four acts, much like Figure 2.1.6. Each act is set in a new part of the world, and the player can choose from among a handful of regions to explore in each act. A circle on Figure 2.1.6 might represent the player's choice to enter a region in the game. However, that region is a convexity too, with multiple areas to explore in turn. Moreover, each of those areas has multiple enemies. Even the decision to attack a single enemy can result in a convexity of choices for the player, ending in defeat of one of the combatants. *Diablo II* also layers in other kinds of convexities of choices, in the form of skills a character can use, quests the characters can undertake in each act, and so on. These convexities overlap, so that when the player is reaching a narrow point (A) in enemies (e.g., fighting Andariel, a boss monster who must be defeated to end the first act), the character may be at a widening point (B) in the skill tree, having just reached experience level 18 where a set of new skills can now be selected when investing experience points. Even that apparent single choice of fighting the boss monster is not a true bottleneck, as the player can always choose to go back to an earlier level and refight the same monsters as before—and this is a meaningful choice because the player's character will grow stronger and the player will gain skill, both of which may make the defeat of Andariel easier.

Give players alternatives to tough challenges that let them improve their skills or gather new resources to avoid frustrating bottlenecks.

Sid Meier's *Civilization* series of games also use the idea of overlapping convexities on many levels. It is typical in those games to be finishing up one task, like completing a wonder of the world, in the middle of a second task like assembling an army to invade a neighboring company, and just beginning a third task, researching the discovery of gunpowder. Each of these tasks conveys clear advantages to the player as well. This type of structure ensures that the player always has a compelling short-term goal as a reason to keep playing, and plenty of meaningful choices to make at all times.

This same classic structure of overlapping series of convexities is present in just about every popular video game. It is critical to both PC and console games, including *Halo*, *Fable*, *Super Mario 64*, and the *Zelda* games (indeed, almost all of Shigeru

Miyamoto's wildly popular Nintendo games use this structure or variations). Many other designers have endorsed this structure. Bob Bates, game designer and former head of Legend Entertainment compares this to a series of sideways hourglasses [Bates01].

Why Is the Classic Structure So Effective?

There are several practical reasons why this structure works well. It gives the player choice, but limits the choice so that the developer does not have an infinitely expanding job. It provides places where things can happen in any order (the B points) so the player has freedom to choose, as well as places where things happen strictly sequentially (the A points) where the designer can add time-critical narrative or introduce new technologies, tools, or weapons in a specific order. This is particularly useful for story-based games, where major plot points almost always occur at the A points.

Some designs require the player to eventually select most or all of the choices in a wide part of a convexity before moving on to the next section, while others require completion of only a small subset. A player may need to defeat a tough enemy at the end of a level at a narrow A point, but is free to collect as many resources as she wishes in the wide B section to do it. In general, the larger the budget of the game, the more latitude the designer has to relax the requirement of seeing every part of the level before moving on. A big-budget game in *The Sims* or *Grand Theft Auto* franchises can spend enough overall to ensure that a player who only plays a subset of characters or completes a fraction of the missions can still have a satisfactory experience. That in turn means the game can include a wider range of such characters and missions to appeal to various types of players instead of having to shoot for the lowest common denominator.

The smaller your budget, the more critical it is for you to make sure the player sees and uses everything you can afford to put into the game.

A series of convexities is also a great way to allow for a gradual increase in difficulty, with each successive level or area having slightly tougher challenges for the player to master—and as we saw in the "Natural Funativity" section, mastering these new challenges is at the heart of what makes games fun.

That in turn brings up an interesting psychological reason why this structure is so universal. Since Natural Funativity shows us that we play to master new skills and knowledge, it follows that a game must be accessible to new players, and then must provide continuing fresh challenges for players to learn. This is the idea behind the old truisms, "Easy to learn, difficult to master," and the directive of Trip Hawkins, founder of Electronic Arts, to make games simple, hot, and deep.

Flow

A more specific analysis of the enjoyment we get from mastering skills in games can be found in the life work of the psychologist and University of Chicago professor

Mihaly Csikszentmihalyi, particularly in his book *Flow, The Psychology of Optimal Experience*. He uses the term *flow* to refer to a kind of optimal experience, which includes a sense of exhilaration along with a deep sense of enjoyment [Csikszentmihalyi90]. This is a state familiar to most avid game players, and is something that designers strive to provide to players. Further, he claims that the best moments occur when the body or mind is willingly stretched to accomplish a difficult and worthwhile task. This is an accurate description of what goes on in any popular game, and is certainly a major source of that popularity.

Csikszentmihalyi provides a chart to describe the transformation in consciousness of a person in a flow state, choosing the example of someone learning to play the game tennis. He shows that a player begins with a low set of skills and seeks an appropriately low level of challenge, but as time progresses and his skills improve, he is driven to seek progressively higher levels of challenge. If the challenge becomes too difficult too quickly, the player experiences anxiety—although "frustration" is a more typical and accurate term for computer games. If the challenge does not increase over time, boredom can set in. He calls the path between these extremes "The Flow Channel," as demonstrated in Figure 2.1.7.

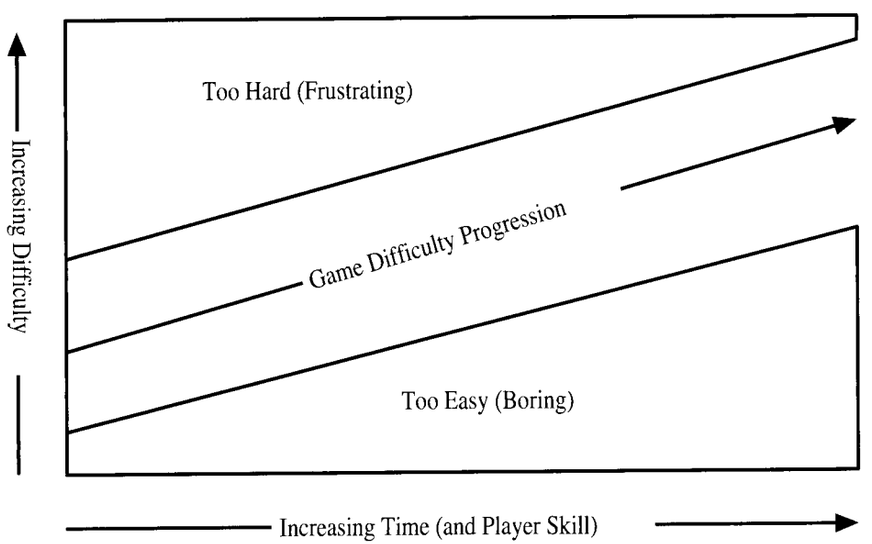


FIGURE 2.1.7 *The flow channel.*

A good game is carefully designed to have its difficulty increase over time so that as the player gains skill, he or she does not drift into boredom or frustration. A game that starts and ends with the same degree of difficulty quickly becomes boring and unappealing, as with tic-tac-toe. However, while it is better to have a straight-line

increase in difficulty over time than no increase at all, it is better still to impose some variety on the slope of the line so there are periods of fast difficulty increase alternating with slower increase, or even a slight decrease. This gives players a chance to catch their breath between tougher challenges, and in fact, learning improves with the rhythm of challenging the players and providing immediate feedback on the results of their efforts [Ratey01].

Csikszentmihalyi also reinforces the basic assumptions of Natural Funativity, noting that the flow state can help develop physical and sensory skills, relationship skills, and symbolic skills (e.g., poetry and mathematics) [Csikszentmihalyi90], echoing the three basic areas that entertainment addresses of physical, social, and mental fun.

Many great games also make sure to introduce skills one or two at a time; for example, letting the players master a long jump before requiring them to make three long jumps in quick succession to get across a crumbling bridge. Professor James Paul Gee calls this a "cycle of expertise," one of the many ways games encourage learning [Gee03].

This staggered increase in difficulty could look like Figure 2.1.8.

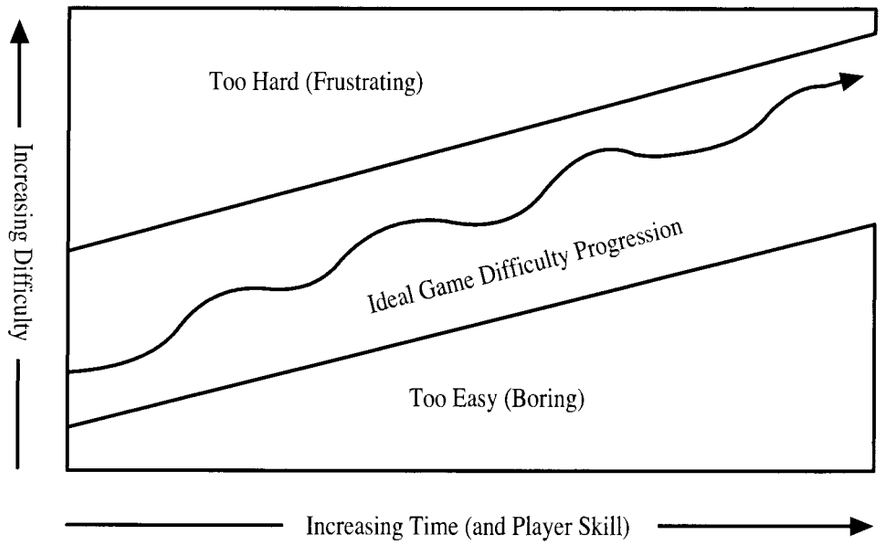


FIGURE 2.1.8 *A better flow.*

By periodically including particularly tough sections, a game adds excitement and challenge, increasing the player's exhilaration when the challenge is overcome. In addition, by alternating those sharp increases with flatter, easier, or quieter sections, it gives the player a chance to learn new skills or review older ones without the potentially frustrating threat of imminent failure.

Introduce new skills to master one at a time, and give players a chance to enjoy their sense of mastery (if they so choose) before challenging them with a tough obstacle or opponent and then moving on to the next skill and challenge.

When we compare Figure 2.1.6's series of convexities with this curving difficulty progression, we can see another reason why the classic structure works so well, as shown in Figure 2.1.9.

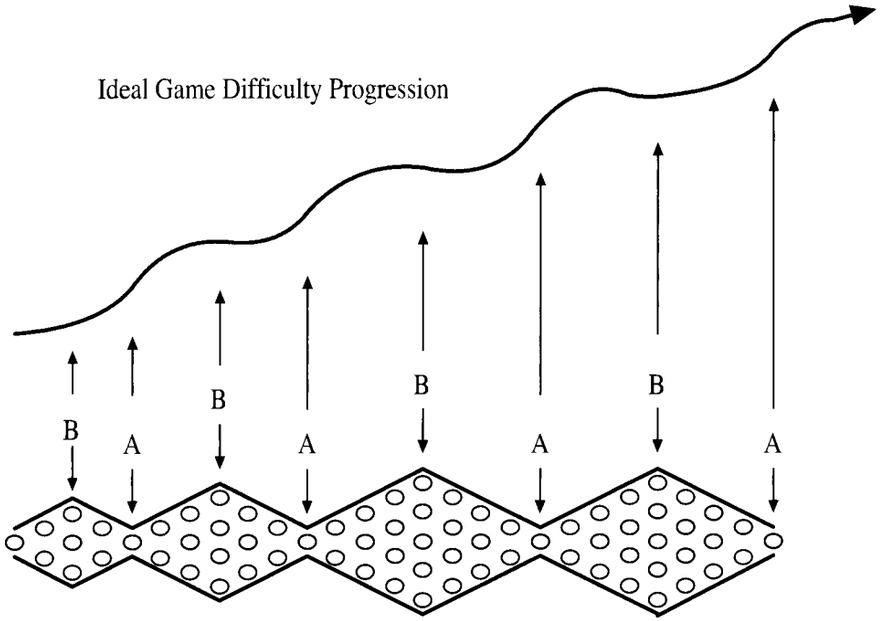


FIGURE 2.1.9 *Better flowing through convexities.*

The narrow decision points (A) in the convexities where players' choices are limited can be set to correspond to the difficult parts of the game. Designers have come up with many game mechanisms to make this happen, tough boss monsters or climactic battles or quest resolutions being common ones for many games. The wider points (B) where there are many alternatives give the player more discretion, and typically difficulty increases more slowly, or even decreases a bit to provide a break for the player and let him or her rehearse new skills. There are proven game mechanisms for that too, like bonus levels, unlocking new treasure-rich areas, or even simply providing more resources to gather or a succession of easy enemies to overcome.

This variable difficulty curve can arise interactively simply because of the structure of the convexities. Assume a stereotypical mission where a player is sent off into a city to find the five crystal shards, so that they can be brought together to form the legendary gem of power. The five shards can be found in any order, and are defended by guardians with different qualities that are, as far as the designer can manage, roughly equally easy to find and defeat. In fact, this will create a convexity where the player gradually explores the city and finds the locations of the shards (widening out in choices), and then one by one defeats the guardians until only one is left (narrowing down). There is tremendous variation between players, and each person will have his or her own particular strengths and weaknesses that will show up in the way he or she approaches challenges in games. The player will naturally find some guardians easier to locate and some easier to defeat, so as the choices widen, the game may feel subjectively easier, but the last to be defeated will, through human nature, quite likely be the hardest *in the subjective opinion of the player*. This can create a self-adjusting game that tunes itself to adapt to the skills of the player. The player gains experience and perhaps weapons or information defeating the first guardians, and uses those to help defeat the final guardian, left for last at the choice of the player. Many game designers don't leave this to chance and make sure that the ends of levels or regions have the toughest bosses or biggest battles, and that the explicit placement of challenges allows players to alternate between tough challenges and easier sections of consolidation. In either case, this structure manages to match the natural human rhythms and encourage the flow state by matching increasing challenge to increasing skills.

Always include variations in type and difficulty of challenges and actions the player must accomplish to account for the range of players' skills and abilities to make your games accessible and popular to a wide audience.

This important element of classic game structure—intense pieces alternating with quieter sections, organized sequentially into a series of variations on a theme—applies to many other forms of human endeavor, notably popular songs, classical symphonies, even theater, novels, and films, which are relevant to our next section.

Story and Character

If we go back to the definition of a great game at the start of the last section, some of the key points are that the choices in the game must be interesting, and that the eventual goal be compelling to the player. *Interesting* and *compelling* are subjective, emotional terms. Natural Funativity gives us some ideas about the kind of conflicts, themes, and challenges that players find interesting and compelling, but the question remains, how can a game designer incorporate those themes in a game? Often the answer lies in story and character.

To do sufficient justice to the study of storytelling requires a lot more than a few pages of text. Unlike video games, storytelling has been a part of our culture for tens

of thousands of years, and even the specific use of storytelling for entertainment can be traced back at least 2500 years to the ancient Greeks and beyond. Therefore, instead of trying to provide a complete examination of the broad nature of storytelling, this section covers only some of the most essential things a game designer should know about story and character.

Don't Try This at Home!

Storytelling is difficult, and the art of writing takes years to perfect. Game developers often forget that, sometimes with disastrous results. Game designers are particularly prone to fall in love with their own prose and to try to turn games into their chance to prove themselves as a great novelist or screenwriter. However, games are not books or movies. If your game requires writing, work with a professional writer who has already invested time learning the craft, preferably someone who has experience with the particular challenges of writing for the interactive medium. And don't bring the writer in to the process late in the course of development. The very best examples of games with strong storytelling elements invariably have incorporated the expertise of professional storytellers right from the early stages of design, when it is still possible to let the gameplay and story shape each other. *Halo* does a nice job of integrating the storyline into the need to teach the player how to control his character in the first act of the game. The designers made that character a soldier freshly unfrozen from suspended animation and suggested that he might have some difficulty remembering things upon being thawed.

Designers should work with experienced writers (and vice versa) to take advantage of the best integration of gameplay and story.

Do, Don't Show

Beginning writing classes always include the admonishment to "Show, don't tell." Inexperienced writers have a tendency to write long sections telling the readers what they should know; for example, saying, "Largo LaGrande was an evil man, the type who would trip a blind man and laugh or steal candy from a baby." It's better to show the action and let the readers form their own conclusions, letting them read, "LaGrande watched the blind beggar hobble slowly down the sidewalk, and stuck out his foot at just the right instant to send the graybeard sprawling on the pavement. LaGrande chuckled and grabbed a lollipop from a little boy who had stopped to gape in horror."

However, games are not stories, and with games the adage is "Do, don't show." It's much better to accomplish your storytelling by letting the player experience the events interactively. In fact, Largo LaGrande is a character from Ron Gilbert's game *Monkey Island 2: LeChuck's Revenge*. LaGrande is a henchman of the chief villain of the game, and Gilbert wanted the player to actively resent him. He arranged for the

player to begin the game stranded on an island, having to strive to collect the elements necessary to get a boat to escape (the first convexity). Then, LaGrande abruptly takes the boat away from the player, through his action directly imperiling the player's hard-won gains. In the parlance of Hollywood, "this time it's personal!" *Starcraft* also does a great job of integrating storytelling into gameplay, and even uses a similar mechanism, having a General in the game betray not only the character the player controls but to directly affect the player by leaving him to fend for himself at a critical early point in the game.

Whenever possible, reveal character and advance the storyline through gameplay, not exposition.

It's All about Interactivity

The previous example illustrates the point that games are about choices and interactivity. In a movie or book, the interesting choices are the ones that the protagonist makes, unaffected by anything the moviegoer or reader does. However, in a game, the player becomes the protagonist, and so the interesting choices are the ones given to the player. It's critical for a designer to remember to give the player the chance to make those interesting choices, and not make them for him. Storytelling and character can add an emotional context to those choices, and if done well, that context can greatly enhance or even provide essential meaning to them, but ultimately it's all about the gameplay and choices that the player makes. Over the years, the trend has been to incorporate storytelling more and more into the gameplay and the choices the player can make, as in the *Monkey Island* example. Long cinematic scenes that take control away from the player have been giving way to shorter in-game scenes. There is still a place for these noninteractive scenes (in fact, Gilbert himself coined the term "cut-scenes" to refer to these sequences in his first game, *Maniac Mansion*), but they are like strong spices in cooking—best used sparingly lest they overwhelm the final result. Hal Barwood, a game designer who can claim both multiple game design and screenwriting credits, has a useful rule of thumb about the length of noninteractive cinematic scenes in games. His advice is to cut, edit, and cut some more until the writing is just as brief and concise as possible—and at that point, the scene is probably about twice as long as it should be. Often, it can be helpful to have someone else do the final edit on a scene to condense it even further, or better yet, replace it with an interactive equivalent. It has been shown that designers can greatly increase player's emotional involvement in a scene by breaking up a long, noninteractive scene into a dialog where the player triggers half of the responses, *even when the player has just a single option to choose*. This apparent contradiction of the desirability of providing meaningful choices to the player shows how destructive to the players' attention a noninteractive scene can be.

Let the player play. Delete nonessential cut-scenes, and minimize those that cannot be deleted.

The Relevance of Characters

Another element from the realm of storytelling that has bearing on games is the use of characters and characterization. Game designers make a distinction between the *player character* (PC), a character the player controls, and the *nonplayer characters* (NPCs) that are controlled by the computer. Both types of characters serve in a game to provide emotional context to the choices the player makes [Ratey01]. NPCs are the antagonists, allies, and inhabitants of the setting of the game, and can increase the player's enjoyment by making the game world feel more real and consequential. The PC is the player's alter ego, and often represents an idealized or exaggerated hero to provide an attractive avatar to control, or to provide the player with a chance to experience a virtual role in life that is impossible or too dangerous or difficult to pursue in real life. Often, game characters are bold stereotypes, taking the shortcut of building on common exaggerated preconceptions to convey character with as little exposition as possible. One reason why games based on movie licenses have been so popular is that the exposition and character development has already happened in the players' minds when they watch the movie, letting them dive right into choices in the game while benefiting from their emotional associations with the established character.

Make your PCs and NPCs memorable, and give them colorful and fun qualities.

Gameplay Trumps Story

To summarize these points, when a designer has to choose between serving the choices or gameplay a player can make, or the needs and requirements of a story, it's important to let the gameplay win. Often, the best solution is to find some other way to structure the game so that the story elements complement and reinforce the choices the player can make, instead of fighting against them. Story is often more malleable than gameplay, too, and from a practical standpoint it can be much cheaper to modify story elements to fit gameplay or technical requirements. For example, it is often better to restrict the size of the game world by changing the story setting than to try to create the technology to show an immense world, or to use most of the available computer memory sustaining that large world dictated by the story requirements alone.

If faced with a conflict between a design decision that will favor gameplay or story, first look for a compromise that favors both, and failing that, favor gameplay.

Fundamental Incompatibility

In conclusion, it is apparent that some elements of storytelling and gameplay are fundamentally incompatible. The main function of storytelling in all its forms is to let us know of the events that happened to someone else, the choices they made, and the consequences of those choices. A movie character who stops and turns to the audience to ask, "What would you do next?" is shattering not only the audience's absorption in the story, but their very enjoyment of the process. Conversely, a game is about the choices the player makes firsthand. A game that abruptly wrests control away from the player to show the character the player has been controlling suddenly acting autonomously can be just as jarring to the player's enjoyment of the game.

When making the transition between interactive and narrative modes, be sure to warn the player with visual and auditory cues, and try to minimize or eliminate those transitions.

Summary

Game design is still a blend of science and art, of accepted convention and mystery. It's a bit like the art of seafaring navigation a few hundred years ago. Back then, there was knowledge of how to steer by the stars, but a lack of reliable clocks and the vagaries of storms and tides made each voyage uncertain. Like those early navigators, game designers today find their way through the shoals and hazards by following in the path of earlier successful explorers, and gradually establish a map of the world that shows useful destinations. Gradual improvements in technology and craft make the process safer and more reliable, and better understanding of the underlying processes helps as well.

With an understanding of the principles behind fun, the most successful structures for games and some of the psychological reasons for their success, and a careful application of story and character, game design may eventually become as predictable as modern navigation. However, for now there are still some uncertainties, and happily also some wonderful discoveries awaiting us. With the lore and tips in this chapter and a little luck, aspiring game designers may be able to chart the course to those new lands and avoid the reefs and rocks along the way.

Exercises

1. Pick a popular video game (not shown in Table 2.1.1) and list five various actions it makes available to the player, breaking them down into areas of physical, social, and mental fun (or combinations of two or all three).
2. Choose an activity or hobby that people do for fun that is rare or nonexistent in current video games. Write a two- or three-paragraph description of a new game that uses that activity as a basis. Be sure to describe the choices the player makes, and what the player actually does to progress through the game.
3. Suggest three ways that good-quality speech-recognition software coupled with sophisticated artificial intelligence might aid in creating a new game based on principles of social fun.
4. Many sequels improve on the original titles by adding more choices for the players, and often those new choices form convexities where the original game had a straight line of progression with no choice. Take an existing game that is linear in some aspect of its design and describe how that aspect could be made into a convexity by adding choices.
5. Identify a popular video game that introduces a new skill for the player to master at a slow-paced point of the game and then requires mastery of the skill at a climactic moment later in the game.
6. Take a common, popular card game like solitaire, blackjack, bridge, or something else, and write a few paragraphs of description to give it a story context with the objective of providing an emotional significance the game currently lacks.
7. Pick one of your favorite characters from a book or movie who has not yet been featured in a video game, and list 10 interesting choices or actions that would be available to a player controlling that character.

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