DESIGNING THE PUZZLE

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In the beginning… there were puzzles. At the dawn of adventure games, stories were practically non-existent, characters were heard from but rarely seen, and the measure of a game lay almost solely in the mental challenge it presented.

Those days are over.

As the genre has matured, people are more likely to evaluate a game by the quality of its story and graphical presentation than by the ingenuity of its puzzles. When today's game buyer does think about puzzles, he is more likely to ask if they get in the way of the story. Are they so difficult they will prevent him from finishing the game? Do they make any sense? Are they fair? Are they fun?

But puzzles still lie at the heart of adventure gaming. Good puzzles contribute to plot, character, and story development. Good puzzles draw the player into the fictional world. Good puzzles can make a game great. Bad puzzles, however, do none of those things. They are intrusive and obstructionist. Like bad writing, they draw attention to themselves and divert the player's attention from the story, destroying the magical experience the author is trying to create.

In this paper we'll look at the different types of puzzles, what distinguishes good design from bad, how to adjust the level of difficulty, and how to use puzzles to enhance your story.

TYPES OF PUZZLES

The art of puzzle design lies in creating an original set of problems and solutions that are appropriate to the story you are telling. Even so, puzzles fall into recognizable categories and it is important to know what they are and when you can use them. Here are some of the categories:

Ordinary use of an object in the way it was obviously designed. This is the simplest puzzle of all. You enter a dark room and discover an empty light socket. You check your inventory and discover a light bulb. You screw in the light bulb, turn on the switch, and now you have light. This is the most straightforward kind of activity you can ask a player to perform.

Unusual use of an object. This takes advantage of secondary characteristics of objects. It relies on players recognizing that things can be used in other ways than their creator intended. Diamonds make pretty rings, but they can also cut glass. A candle can light up a dark room, but its wax can also be collected to make an impression of a key, or it can light a fire that will set off a smoke alarm, or the heat from its flame can be used to expose secret writing on a piece of paper.

"Building" puzzles. Sometimes you need to create a new object out of raw material that is available in the game. You can do this either by converting one object into another, or by combining two or more objects to create something totally new. In the first case, if

there is a crevasse to cross and a tree growing next to it, perhaps you can give the player an ax to cut down the tree and create a bridge.

In the second case (courtesy of designer Ken Rolston), let's say there is a baby crying in a cradle and you want to calm her down. You can take a few strips of kindling, tie them together with thread, attach a few brightly colored trinkets, and hang the resulting mobile over her bed.

The most common danger with "building" puzzles, however, is that a designer often assumes that players will automatically jump to the solution the designer wants them to. Perhaps the player thinks the baby is crying because she is hungry, or cold, or wants to be rocked, or just held? Building a mobile is far down on the list of things a player may think of to try to calm a baby. What you must do is give the player the information he needs to nudge him towards the solution. In this case, you can have the infant's father tell you that the baby is well rested and fed, but that he left her favorite toy - a mobile - back home.

Information puzzles. These are puzzles in which the player has to supply a missing piece of information. It could be as simple as supplying a password, or as complex as deducing the correct sequence of numbers that will defuse a bomb.

Codes, Cryptograms, and other "word" puzzles. These are a subset of Information Puzzles that define the boundaries of the kind of information the player is looking for. It is important that the designer let the player know when he is trying to solve a word puzzle, as they are generally unrelated to the game's mood and setting. One way to do this is to establish the character demanding the information as someone who relishes wordplay. In the case of cryptograms, anything more complex than a single letter substitution should probably be considered out of bounds.

Excluded middle. This is one of the hardest types of puzzles. It relies on setting up dependable cause-and-effect relationships, and then requiring the player to recognize that one particular action will kick off a chain of events that will culminate in the desired action taking place. Stated in terms of logic; "a" always causes "b", and "c" always causes "d". So when the player finds himself in a situation that requires "d", in a location where he has reason to believe "b" and "c" would be linked, then hopefully, he will perform "a".

Preparing the way. A wrinkle on the excluded middle that makes it even more difficult is to require the player to create the condition that would cause the final link in the chain to occur. The longer the logical chain, and the more conditions the player has to create, the harder the puzzle gets. Be careful of this, however, because it can quickly become a case of asking the player to "read the designer's mind," (see the discussion "What Makes a Bad Puzzle" later in this chapter).

People puzzles. The most satisfying puzzles are those which involve people. This is because while trying to solve them, the player inevitably learns more about the game's characters, and good characters are the backbone of good stories. These puzzles usually involve a person who is blocking your progress or who holds a piece of information that you need. In order to progress in the story, you have to learn the "key" to their desires. If it is a guard, perhaps he can be bribed. If it is a spy, perhaps you can uncover the secret piece of information he has been seeking. If it is a megalomaniac, perhaps you can find something to stroke his ego. If it is a child, perhaps you can find a toy.

Timing puzzles. This is a difficult class of puzzle that requires the player to recognize he must take an action that will not yield an instant effect, but instead will cause

something to happen at a particular point in the future. This gets even harder if more than one location is involved.

Sequence puzzles. These are puzzles that rely on performing a series of actions in just the right order. Mostly they are comedic, as in the Babble Fish puzzle in Hitchhiker's Guide to the Galaxy by Steve Meretzky. Usually, the player is presented with a simple means of achieving a simple goal. When he performs that action, however, something suddenly pops up to prevent it. The situation then resets, and the player must put something in place to solve the new problem before kicking off the sequence again. This can get quite elaborate.

Logic puzzles. If Mr. Robinson is a dentist, and Mr. Smith drives a brown car, and Mr. Jones only opens doors on Wednesdays, then you get the idea.

Classic game puzzles. These aren't true adventure game puzzles, but they seem to find their way into many games anyway. Examples are magic square puzzles, move-the-matchstick puzzles, or jump-the-peg-and-leave-the-last-one-in-the-middle puzzles. The thing to remember about them is that there should be an easy way to "re-set" them so that the player can return quickly to the opening position if he gets hopelessly tangled. I also believe they are sufficiently outside the genre that the designer should provide either a "help" system or an alternative to completing the puzzle so that players who are not adept at them (like me) don't get stalled

Riddles. This is one of the least satisfying kinds of puzzles, because if the player doesn't get it, he doesn't get it. If you're going to do a riddle puzzle, be sure to include plenty of hints in nearby locations.

Dialog puzzles. A by-product of dialog trees, these puzzles require the player to maneuver a conversation down the correct path until a character says or does the right thing. The big advantage of dialog puzzles is that nothing brings out character like talking to someone. The big disadvantage is that the solution is always lying in front of the player if only he has the patience to pursue every option of every dialog. This is tedious at best, and promotes a feeling of player paranoia. ("Gee, I wonder if I missed some crucial piece of information because I didn't go down every path of the dialog tree. Maybe I'd better restore and go back and do that.") The best solution to this problem is to acknowledge that you're not really presenting a puzzle here, and to manage things so that the player cannot exit until he has acquired whatever crucial piece of information he needs to proceed.

Trial and error puzzles. A player is confronted with an array of choices, and with no information to go on, he must try one thing, find it doesn't work, and keep trying new things until suddenly one of them clicks.

Machinery puzzles. These are puzzles in which the player must figure out how to operate the controls of a machine. Sometimes it involves trial and error, sometimes logic. In Mission Critical, by Mike Verdu, there was a rupture in the pipes that supplied coolant fluid to the spaceship's nuclear reactor. The player had to manipulate the controls of the machine that pumped the fluid through the pipes to re-route the fluid past the rupture and prevent a melt-down.

Alternate interfaces. These can be anything from machinery puzzles to maps. You remove the normal game interface and replace it with a screen that the player has to manipulate in order to reach a pre-defined condition. The coolant fluid puzzle mentioned above provided an excellent opportunity to create an alternate interface.

Mazes. "You are in a maze of twisty passages, all alike." Mazes used to be a staple of adventure games. They required the player to take a pencil and paper and map the locations, usually by dropping inventory items in them. Over time, mazes have become cliché. Now I recommend doing them only if there is a unique twist to mapping or finding your way through the maze.

Overall "gestalt" puzzles. Sometimes a puzzle comes not from performing a specific action but from recognizing a general condition. The best of these that I recall is the "sundial" puzzle in Trinity, by Brian Moriarty. At the beginning of the game, you are standing next to a sundial in Kensington Gardens. After a sequence of extraordinary events, you find yourself transported to a completely bizarre world. As you explore, you find some parts of the world shrouded in darkness. Later, those same areas are bathed in light. After a while, the player realizes that this new world exists on the face of the sundial, and the darkness is the shadow cast by the gnomon as time passes.

WHAT MAKES A BAD PUZZLE?

The key to the reasonableness of puzzles is to make their circumstances fit the world you have created. You wouldn't have malfunctioning nuclear plants in a sword-and-sorcery fantasy game. Nor would you try to summon a magical wizard in a hard science fiction game. Good puzzle design involves looking around the world you have created, and using obstacles, objects, and characters that would naturally occur in that environment. Bad puzzles violate not only this, but potentially several other rules:

"Restore" puzzles. It is unfair to kill off a player for not solving a puzzle, and only then provide him the information he needed to solve it. For example, let's say a player innocently opens an unmarked door and walks into a room. The door swings shut and the room fills with poisonous gas. As he chokes and dies, he sees someone else entering the room wearing a gas mask.

It may be reasonable enough to have a gas-filled room at that point. And it certainly is easy enough for the player to restore (or "undo") to the point before he entered the room and to find a gas mask. But it is not fair. You gave him no reason to think that opening the door was dangerous ahead of time. Ideally, a player should be able to complete a game without ever having to restore. In this case, you could put a warning sign outside the door, or show tendrils of smoke escaping from under the door, or any of a thousand other ways to avoid putting the player in a position where you say without warning, "Bang! You're dead."

Arbitrary puzzles. Effects should always be linked to causes. Events shouldn't happen because the designer decides it's time for them to happen. This happens most frequently when the designer doesn't want to let the player leave an area until he has solved all of the puzzles there. So he simply waits until the last of these puzzles has been solved, and then magically allows the player to proceed, without explaining how solving that set of puzzles logically led to his new capability.

"Designer" puzzles. Avoid, too, those puzzles that make sense only to the designer. Just because the connections are clear in your head does not mean they will make sense to the player. The best defense against designing these kinds of puzzles is a good testing corps. Bounce your ideas off people. If you have to explain how the puzzle works (or why) more than twice, you should either simplify or abandon it.

Problems also arise when the designer sets out to prove that he is smarter than the player. Perhaps you know some arcane bit of information, or are aware of a little-known relationship between two people or events. It is tempting to make this the core of a puzzle, and when the player fails to solve it, only then reveal the information. Resist this temptation. You are as much the player's partner as his adversary. He is relying on you to give him the information he needs to play the game. He will admire you more for playing fair than for parading your storehouse of unusual knowledge.

Binary puzzles. Avoid binary puzzles. These are puzzles with a "yes" or a "no" answer that yield instant success or failure. If you open door #1, you die; if you open door #2, you win. It becomes but the work of a moment to try door #1, fail, restore, and open door #2. This is one of the most common errors that inexperienced designers make. They create "Lady or the Tiger" puzzles that gamers will blow right by without expending more than two seconds of creative thought. In cases where you give the player choices, give him lots of choices, and make it difficult to simply choose, fail, and restore.

"Hunt the pixel" puzzles. With the advent of graphical interfaces, another trap has been created for designers who don't work closely enough with their artists - the "hunt the pixel" problem. Sometimes an important object on the screen is so small that it is easy to overlook. This is usually created by problems of scale. If the room is large and the object is small, the player may overlook it.

Solutions to this problem are to a) Make the object stand out against the background through contrasting color or animation, b) Move the object into the foreground, or as a last resort, c) Make the "hot spot" for the object larger than the object itself. Thus, when the player is "scanning" the screen (running the mouse back and forth across the picture to see what object names light up), he has a better chance of stumbling across the item. This will also help reduce player paranoia, which I discuss elsewhere.

It is very unsettling for a player to worry that the reason he can't solve a particular puzzle is because there is some tiny area of the screen he has overlooked. If he finds out that this is the case, he will get mad at you.

WHAT MAKES A GOOD PUZZLE?

Many of the above design problems yield puzzles which a player not only fails to solve, but which he eventually learns he never could have solved. This leads to a "poisoning of the well," an unhealthy skepticism in players' minds that the designers aren't playing fair. It is essential to learn the elements of good puzzle design so that players will learn to trust you.

Fairness. In a fair game, the answer to every puzzle is contained within the game. In addition, a player should theoretically be able to solve it the first time he encounters it simply by thinking hard enough (assuming he has been presented with all the information). Like a good mystery novel, it isn't fair to wait until the last page, only to have the author reveal previously-withheld information that identifies the murderer.

Natural to the environment. With due respect to games which plop logic or mathematical puzzles into the middle of the story, that is not the way to move a narrative along. The best puzzles fit naturally into the story and give the player the opportunity to learn more about the people, the setting, and the world they are exploring.

If you enter a room and the first thing you encounter is a "magic square" puzzle that seems to have dropped out of nowhere, all suspension of disbelief is gone, all the magic of the environment evaporates, and the player might as well be reading Games Magazine.

Instead, imagine that you enter a room and discover a door blocked by a woman whose head is bent in sorrow, tears falling from her eyes. To get through the door, you need to dislodge the woman, but she is so distraught that you cannot get past. NOW you've got something. Who is this woman? Why is she crying? What will it take to make her stop crying?

To find the answers you will have to talk with her or someone else, learn a little about her background, or look around in other spots to find something that might mollify her grief. All these activities are drawing you into the story. They make you explore the setting and the motivations of the characters that populate this world. If the backbone of good fiction is character, the backbone of good interactive fiction is puzzles that involve those characters.

Amplify a theme. Ideally, a puzzle should amplify the theme of the game, if there is one. You shouldn't have the player taking actions contrary to the character you have set up. The actions must be reasonable things for his character to do. You wouldn't expect an animal rights activist to gain access to a high-security compound by shooting the guard dog.

The "V-8" response. The sign of a great puzzle is the V-8 response. When the player finally gets the answer he hits his hand to his forehead and says, "A HA! Of COURSE!! How could it have taken me so long to figure it out?" The sign of a bad puzzle is when he says, "There is no way I could ever have solved that. I don't even understand it now! Why does this work? Oh well, either I'm just stupid or this game is really unfair."

LEVELS OF DIFFICULTY

In the early days, games were difficult. Now games are easier. Whether it's due to the advent of the mass market, the "poisoning of the well," or a shortened player attention span, you have to be very aware of how difficult your puzzles are. Fortunately, one of the easiest parts of designing a puzzle is adjusting its level of difficulty.

Bread Crumbs. One of the easiest ways to adjust the level of difficulty is to change the amount or directness of the information you give the player. Remember Hansel and Gretel walking through the forest, dropping bread crumbs behind them so that people could pick up their trail? The bigger the bread crumbs and the more frequent they are, the easier it is for the player to find his way through the woods.

For example, let's say you have created a wall safe that the player knows contains vital information. If you tape the combination on the wall next to the safe, it is scarcely a puzzle at all for the player to read the combination and use it to open the safe. If you hide the combination under the rug in that room, the puzzle becomes a little more difficult, because the player has to lift the rug to find it. Still not all that difficult however.

Now let's say that instead of writing out the combination, you put a picture on the desk in the room of a smiling older couple with the inscription "Happy Anniversary: 6-9-93" It would be a little more difficult for the player to make the jump that the date on the picture might be the combination of the safe. Now let's change the inscription to "Happy 50th Anniversary, June 9, 1993." It requires even more thinking for the player to think that the person owning the safe might consider the wedding day more memorable than

the anniversary of it, and therefore he should subtract 50 from the 93 to get a combination of 6-9-43.

The next step would be to put the picture not on the desk, but in the owner's wallet, which you discover in a trash can on the other side of the city. Finally, if you really want to be cruel, you could make the man British, so the combination should be 9-6-43, because the English order their dates by day/month/year, rather than month/day/year. (If you don't mention this idiosyncrasy elsewhere in the game, however, you are falling victim to the "designer puzzle" trap mentioned earlier.)

Proximity of puzzle to solution. Although in a fair game, the answer to every puzzle is contained within the game, how close the designer puts the answer to the problem will determine how easy the puzzle is. This is true both psychologically and geographically. If it's late in the game and the answer involves remembering an arcane bit of information you supplied in a side comment back at the beginning of the game and half the world geography away, that puzzle will be difficult. The more attention you drew to that side comment, the easier the puzzle will be. When confronted with the puzzle near the end of the game, if a character pipes up and reminds the player of that side comment, the puzzle gets easier.

Alternate solutions. Another way to make a game easier is to provide alternate solutions to puzzles. The problem with this is that they can be expensive to implement because of the increased graphic requirements, and they may make the game too easy. Also, it's hard enough for the designer to robustly handle one solution, much less two.

Red Herrings. One way to make a game harder is to include red herrings, although I seldom do. I believe players spend so much time making up their own scenarios that it is completely superfluous for me to do so as well.

Steering the Player. This brings us to responding to player inputs that don't actually solve puzzles. You should constantly be steering the player toward the right answers to the puzzles by providing little (or big) clues in the responses you make to his inputs.

Responses should contain little nuggets of information, so that the longer a player sticks to it and the more things he tries, the more knowledge he accumulates about what might work. You should help him circle in on the solution, never being entirely obvious, but providing enough bits of data that eventually a critical mass will be reached and he will realize what he is supposed to do, all without feeling he has cheated by going off and looking for a hint.

HOW TO DESIGN THE PUZZLE

Having learned about different puzzle types, good and bad design, and adjusting levels of difficulty, how do you go about actually creating the puzzles?

In any story, the author creates a character and gives him a goal. But in a good book, the path to the goal is never easy. Myriad opponents stand in the way - bad guys, nature, internal conflicts, fate - all these conspire to litter the hero's path with obstacles. If the path were easy, the book would be dull. The same is true of adventure games. If the player can click through a game in two hours, he is not making significant choices, and he is not getting his money's worth.

Creating the puzzle. So you begin where any author begins, with your story and characters. You create a setting and populate it with interesting characters. Then you create the role of the player, and give him an overall goal. As you break the story down

into scenes, you establish a sub-goal for each scene that fits into the overall story. Within the scene, you must create obstacles that hinder the player from reaching the sub-goal. Those obstacles are the puzzles.

Consider the opening sequence of the movie Raiders of the Lost Ark. In the movie, Indiana Jones emerges from the jungle to stand before a waterfall. He puts together two pieces of paper to form an old map. This establishes the goal - treasure!

In the next few minutes he flicks a gun away from a man with his bullwhip, enters a cave full of poisonous spiders, puts his hand in a shaft of light to set off a booby-trapped wall of pointed spikes, swings on his whip over a bottomless pit, uses a torch to spring a paving stone trap, swaps a weighted bag of sand for the golden idol, and then runs for his life to outsprint a huge rolling boulder.

In each of these cases, the hero was presented with threats or obstacles that were appropriate to the exotic setting. And in each case, he used the material at hand to overcome the problem.

The job of the puzzle designer is exactly that, to create threats and obstacles that are appropriate to the story and the setting, and to give the player the means to solve those problems in a way that make sense within the story's genre.

So as you approach the problem of puzzle design, think of the character you have created. Think about where he is trying to go and what he is trying to do. Then think about reasonable obstacles to place in his path. Finally, using the principles of good design to make the task fair and reasonable, give the player the means to get past the obstacles.

Player Empathy. To determine what is "fair and reasonable" you need to be able to put yourself in the player's shoes. You need to develop what I call "player empathy." This is the ability to look at the game from the player's point of view, even though the game is still nothing more than a swirling design in your head. You must, as the potential player, be able to say, "This is the situation I'm in, and here is what I've been told. I know my long term goal, and I know my short term goal within this scene, but right now I'm being blocked by these two problems. Now… how am I going to solve them?"

Once you can look at the game from the player's point of view, you can anticipate the kinds of things he is going to want to try. And once you have learned to anticipate his moves, you can give him a better game experience by writing non-default reactions to them.

Another part of player empathy is letting the player know where the puzzles are. In a game, anything the player can't do is likely to be perceived by him as a puzzle. It's up to the designer to let him know when this is true and when it's not. Players have enough trouble solving the real puzzles in the game that we don't need them chasing off to solve puzzles that aren't really there.

For that reason, it is sometimes useful to let the architecture of the game show through. "You can't go that way" used to be a response that would annoy game players because they wanted a reason. But when the player has bumped up against the limits of the world, it is important to let him know, so that he doesn't think this limit is just another obstacle to be circumvented. If you had said instead, "A large boulder blocks your path", it is reasonable for the player to think that his next task is to move that boulder. If this isn't a puzzle you want him to be solving, you must say so in the most unambiguous language you can muster.

This idea of player empathy is so important that I consider it to be the single greatest indicator of whether or not a person can be a successful game designer. If you cannot learn to put yourself inside the player's head, you will never be able to design a game that will capture and hold someone's attention. You must learn to "play the movie in your head" and anticipate what the player is going to try. Only then can you "steer" him towards the right answers, respond to his off-the-wall inputs, and ensure at every turn that he is always having fun.

SUMMARY

As a puzzle designer, make sure your puzzles enhance the game, rather than detract from it. Use puzzles to draw the player into your story and learn more about your characters. Don't withhold the information he needs to solve the puzzle. Develop player empathy and strive for that perfect level of frustration that drives a player forward instead of turning him away.

And above all – Play Fair!