

# Game **DESIGN** Workshop

A PLAYCENTRIC APPROACH TO  
CREATING INNOVATIVE GAMES



2ND  
EDITION

by Tracy Fullerton

with a foreword by Eric Zimmerman



# WHAT IS A PUZZLE?

by Scott Kim

*Scott Kim has been a full-time puzzle designer since 1990 with his company, Shufflebrain. His work includes puzzles for Tetris, Bejeweled, and Collapse!, as well as game design for computer games Heaven & Earth and Obsidian. He also writes a monthly puzzle column for Discover magazine, and he has designed many games, including Sudoku 5x5, for the toy company ThinkFun. He has degrees in music and computers and graphic design from Stanford University, and he lectures widely on puzzle design and math education.*

*An earlier version of this article originally appeared in The Games Cafe, a now defunct Web site devoted to lovers of board games and puzzles.*

From casual games to 3D action games, puzzles are an important part of many electronic games. Whether you are designing or producing games for the Web, mobile phones, computers, arcades, or console games, you need to know how to create good puzzles. In this article I define what a puzzle is, explain how it differs from other types of games, and offer suggestions for how to design good puzzles.

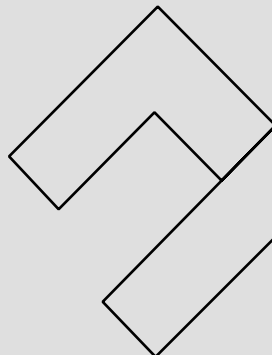
## What Is a Puzzle?

The Random House Dictionary defines a puzzle as “a toy or other contrivance designed to amuse by presenting difficulties to be solved by ingenuity or patient effort.” A humorous but insightful definition is “a simple task with a bad user interface.” For example, twisting the faces of a Rubik’s Cube is a deliberately bad user interface for the simple task of turning all the faces solid colors.

My favorite definition of “puzzle” came out of a conversation with puzzle collector and longtime friend Stan Isaacs:

1. A puzzle is fun,
2. and it has a right answer.

Part 1 of the definition says that puzzles are a form of play. Part 2 distinguishes puzzles from other forms of plays, such as games and toys. This deceptively simple definition has some interesting consequences. For example, here’s the first puzzle I invented. (Martin Gardner first wrote about it in *Games* magazine.) The figure below is a letter of the alphabet that has been cut out of paper and folded just once. It is not the letter L. What letter is it?



**Figure 1** What letter has been folded once to make this shape?

Take a moment to solve this puzzle if you like. The answer is given at the end of this article. Now let's see how well our definition applies.

### ***Is It Fun?***

There are several things that help make this puzzle fun.

- *Novel*: Puzzles are a form of play. And play starts by suspending the rules of everyday life, giving us permission to do things that are not practical. Folded letters certainly don't have any practical value. They take something familiar and give it a novel twist—a good way of inviting you to be playful.
- *Not too easy, not too hard*: Puzzles that are too easy are disappointing; puzzles that are too hard are discouraging. You know there are only 26 letters in the alphabet, so it seems that this puzzle can't be too difficult. In fact this puzzle is hard enough that many people never get the answer. Nonetheless, the perceived lack of difficulty helps keeps you interested.
- *Tricky*: To solve this puzzle, you must change how you interpret the picture. Personally, I enjoy puzzles that involve such perceptual shifts.

But, like beauty, fun is in the eye of the beholder. What may be fun for one person may be torture for another. For example, some people prefer word puzzles and won't touch visual or logical puzzles. Puzzles that are too easy for one person might be too hard for another. Chess puzzles are fun only if you know how to play chess. Consequently, my first job as a puzzle designer is to tailor puzzles to the interests and abilities of my audience. For example, my monthly puzzles for *Discover* magazine all revolve around science and math themes. To reach both scientific lay people and experts, I break each puzzle into several questions, ranging from very easy to very hard. Finally, I include three puzzles in each column—usually a word puzzle, a visual puzzle, and a mathematical puzzle—to reach readers who prefer various types of puzzles.

Another consequence of the subjective nature of fun is that what might seem like an everyday problem to you can seem like a delightful puzzle to someone else. Is washing the dishes a chore or a game? That depends on whom you ask. It tickles me to think that for every problem in the world, no matter how tedious, there is someone who would leap at the chance to figure it out. If fun is a state of mind, then you can make your life more enjoyable by finding ways to turn work into play. When I was in school, I used to hate to take notes. Then I learned about mind mapping, a technique of capturing ideas in diagrams and cartoons instead of transcribing every word the teacher says. Not only were my notes more useful, taking notes became an enjoyable game of translating words into pictures. On the flip side, even the best game can be ruined if the players do not play it with a spirit of fun. Game designer and philosopher Bernie Dekoven recommends in his book *The Well Played Game* that players be willing to alter the rules to keep the game fun for everyone. For example, an expert chess player playing with a beginner can level the playing field by starting with fewer pieces or letting the other player take back moves.

### ***Does It Have a Right Answer?***

So does my letter puzzle have a right answer? It does in the sense that when shown the answer, most people will agree that this is the best answer. But there are several loopholes.

First, exactly what shape constitutes a letter is a subjective matter. For example, in a squarish typeface, the following shapes could be interpreted as a lowercase R or a capital J:



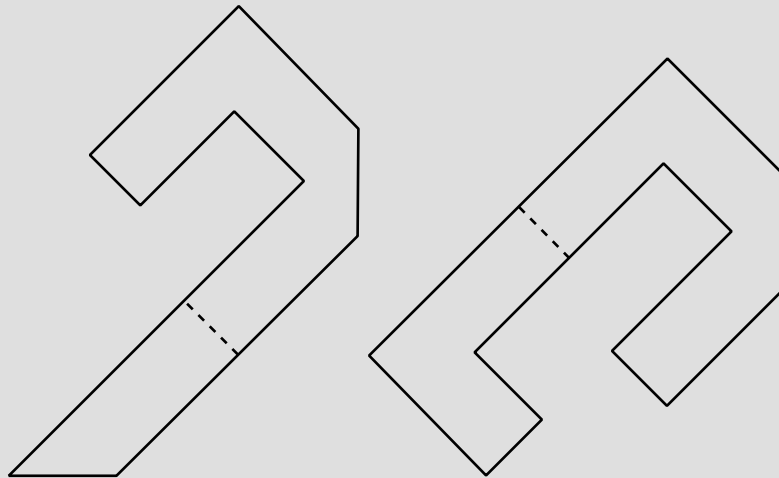
**Figure 2** These shapes could be the letters R or J

I could plug this leak in my puzzle by showing the particular alphabet of letters I have in mind:

**A B C D E F G H I J K L M**  
**N O P Q R S T U V W X Y Z**

**Figure 3** The answer comes from this typeface

Another subtlety is that my definition doesn't insist that there be only one right answer. If you interpret the diagram differently, there are many other possible answers. For example, the following shapes, which could be interpreted as the letters J and G, can all be unfolded from Figure 1 if we interpret the edges a bit differently:



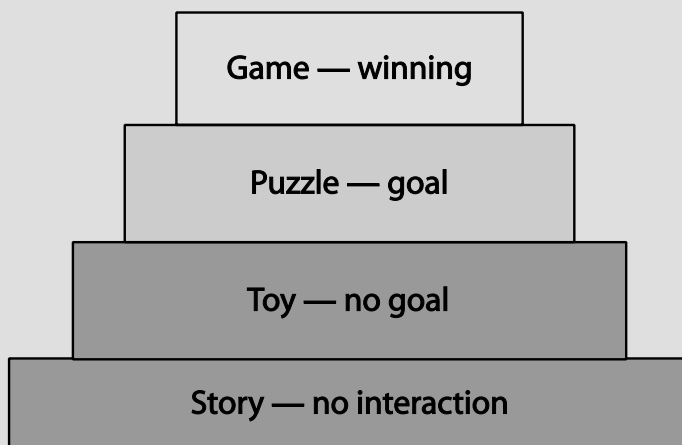
**Figure 4** Other ways to unfold Figure 1

### Puzzles versus Games

The purpose of “has a right answer” is to distinguish puzzles from games and other play activities. Some game designers categorize puzzles as a subspecies of games. I prefer a finer-grained definition from Chris Crawford, veteran game designer and author of *Chris Crawford on Game Design*.

Chris distinguishes four types of play activities, ranging from most to least interactive:

- Games are rule-based systems in which the goal is for one player to win. They involve “opposing players who acknowledge and respond to one another’s actions. The difference between games and puzzles has little to do with mechanics; we can easily turn many puzzles and athletic challenges into games and vice versa.”
- Puzzles are rule-based systems, like games, but the goal is to find a solution, not to beat an opponent. Unlike games, puzzles have little replay value.
- Toys are manipulable, like puzzles, but there is no fixed goal.
- Stories involve fantasy play, like toys, but they cannot be changed or manipulated by the player.



**Figure 5** Four types of play, each built on the previous

For example, in the realm of computer entertainment software:

- Quake is a game that includes some puzzles.
- The Incredible Machine is a series of puzzles that includes a toylike construction set for building puzzles.
- SimCity is a toy that players make more puzzle-like by setting their own goals.
- Myst is a story that happens to be told partly through puzzles.

This hierarchy leads me to a useful rule of thumb for puzzle designers: To design a good puzzle, first build a good toy. The player should have fun just manipulating the puzzle, even before reaching a solution.

For example, players can enjoy rotating and manipulating blocks in the action puzzle game Tetris even if they don't understand the goal. The card game Solitaire is an interesting borderline case between game and puzzle. We normally call Solitaire a single player game, but in fact it is a kind of puzzle because any given deck has a definite solution (or sometimes no solution). Shuffling the cards is a way to randomly generate a new puzzle. Other types of puzzles that walk the line on the issue of right answers include trivia questions (which require knowledge of the world), dexterity puzzles (which could be classified with sports), puzzles involving chance (in which the player does not completely control their own fate), and poll-based questions (in which the rightness of an answer depends on what everyone else answers).

## **Designing Puzzles**

Here are some tips for designing good puzzles.

First, there are two aspects of puzzle design. Level design, as it applies to puzzles, is crafting a particular puzzle configuration within a fixed set of rules. For example, composing a crossword puzzle is a form of level design. The level designer's challenge is to craft a puzzle with a distinct sense of drama and coherence that is tailored to a particular difficulty level.

The other type of puzzle design is rule design: inventing the overall rules, goal, and format of a puzzle. For example, Ernő Rubik was a rule designer when he invented Rubik's Cube. Note that some rule sets, like Sudoku, are reusable forms that yield thousands of puzzles, while other rule sets yield only a single unique puzzle. Generally speaking, rule design is harder than level design.

Second, puzzle design has the same goal as game design in general: to keep the player in a pleasurable challenging state of flow. That means capturing the player's interest with an attractive goal, teaching the player the rules in a seamless and interesting way, giving feedback during gameplay that keeps the player engaged, and rewarding the player appropriately at the end.

Finally, be creative. Don't limit yourself to imitating the puzzles you have seen. There is an infinite supply of puzzles waiting to be invented. Puzzles can be as varied and expressive as songs, movies, or stories. For inspiration, look beyond other computer games to puzzle books, mystery stories, physical puzzles, science, mathematics, and anything else that captures your imagination.

## **Exercise: Invent a Puzzle**

Your challenge is to invent a computer-based puzzle inspired by a headline from today's newspaper. After you have invented the rules, craft at least two levels for your game: one easy and one hard. Remember that you are designing a puzzle, not an action game, so the puzzle must have a precisely defined solution.

Make a paper prototype of your puzzle and test it on other people. Be sure to explain what the goal of the puzzle is, what the rules are, and how the player controls the action. What do your testers enjoy? Where do they get stuck or confused? How can you change the puzzle or the rules to make the game better?

## **Answer to the Letter Puzzle**

Just to make things more exciting, the answer to the quiz above is the only letter that does not appear in this sentence.