INFT3960 – Game Production

Week 07

Module 7.1

Puzzles

Course Overview

Lec	Start Week	Modules	Topics	Assignments
1	3 Aug	Mod 1.1, 1.2	Course Overview, Design Process	
2	10 Aug	Mod 2.1, 2.2, 2.3, 2.4	Unity3D Introduction, Introduction C#, Variables and Components, Hello World	
3	17 Aug	Mod 3.1, 3.2, 3.3	Booleans, Loops, Lists and Arrays	Assign 1 21 Aug, 11:00 pm
4	24 Aug	Mod 4.1, 4.2	Functions and Parameters, Debugging	
5	31 Aug	Mod 5.1, 5.2	Classes, Object Oriented	
6	7 Sep	Mod 6.1, 6.2, 6.3	Agile Processes, Risks and Prototypes, Testing	
7	14 Sep	Mod 7.1, 7.2	Puzzles, Guiding the Player	Assign 2 18 Sep, 11:00 pm
8	21 Sep	Mod 8.1	Game Physics	
9	12 Sep	Mod 9.1	AI for Games	
10	19 Oct	Mod 10.1, 10.2	Game Interface, Storytelling in Games	
11	26 Oct	Mod 11.1, 11.2	Graphics Pipeline, Animation in Games	Assign 3 1 Nov, 11:00pm
12	2 Nov	Mod 12.1, 12.2	Networked Games, Course Review	

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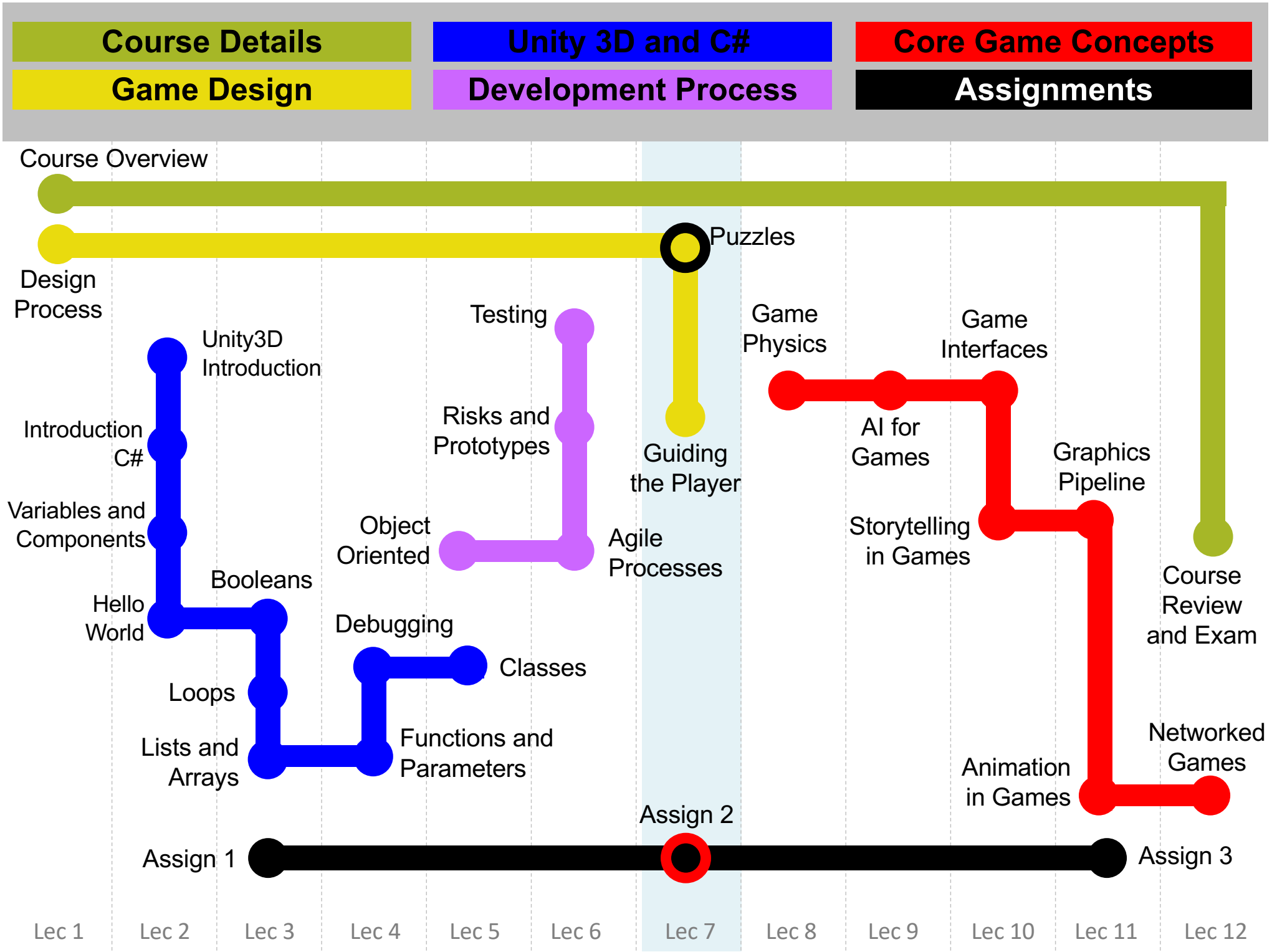
Next week (Wk8) you should present your assign2 game/video in the tutorial


Course Details
Unity 3D and C#
Core Game Concepts
Game Design
Development Process
Assignments
Course Overview
Puzzles
Design Process
Testing
Unity3D Introduction
Game Physics
Game Interfaces
Introduction C#
Risks and Prototypes
Guiding the Player
AI for Games
Graphics Pipeline
Variables and Components
Object Oriented
Agile Processes
Storytelling in Games
Course Review and Exam
Booleans
Hello World
Debugging
Classes
Loops
Functions and Parameters
Lists and Arrays
Networked Games
Animation in Games
Assign 2
Assign 1
Assign 3
Lec 1
Lec 2
Lec 3
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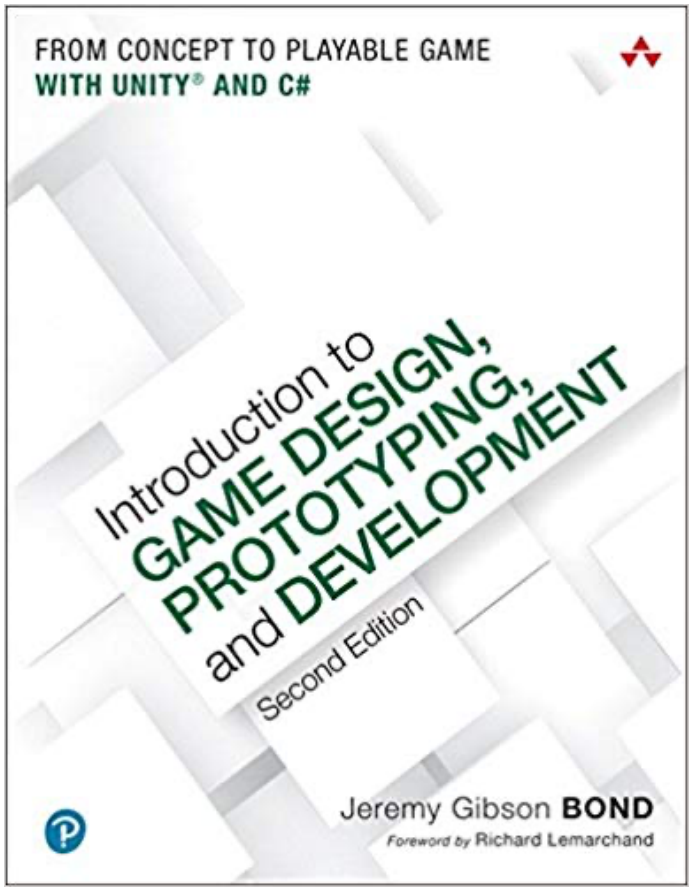
Lec 5
Lec 6
Lec 7
Lec 8
Lec 9
Lec 10
Lec 11
Lec 12

Puzzles – (Chapter 12)



PUZZLES

Puzzles – Topics

- Puzzles Are Almost Everywhere
- What is a Puzzle?
- Genres of Puzzles
- Four Major Reasons People Play Puzzles
- Modes of Thought Required by Puzzles
- Eight Steps of Digital Puzzle Design
- Seven Goals of Effective Puzzle Design
- Puzzle Examples in Action Games

Puzzles Are Almost Everywhere

Most single-player games include puzzles
(But non-cooperative multiplayer games often do not)

Both single-player games and puzzles rely on the game system to provide challenge to the player
(Multiplayer games often rely on other players)

Learning to design puzzles will aid your design of any game with a single-player mode

Scott Kim on Puzzle Design

Designed the puzzle modes of several games including Bejeweled 2

"The Art of Puzzle Design"

- A full-day workshop at GDC 1999 & 2000
- Delivered with Alexey Pajitnov (the creator of Tetris)
- The basis of most of the content in this chapter

What is a Puzzle?

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

– Scott Kim
Puzzle Designer

A Puzzle is Fun…

Three elements of fun for puzzles

1. Novelty

- Many puzzles rely on a certain, specific insight to solve them
- Once the player has gained that insight, finding the puzzle's solution is rather simple
- A large part of the fun of solving a puzzle is that flash of insight

A Puzzle is Fun…

Three elements of fun for puzzles

2. Appropriate difficulty

- Puzzles must also be matched to the player's skill, experience, and type of creativity
- Each player has a level of skill and a certain level of frustration that she is willing to experience before giving up
- Some of the best puzzles have both an adequate solution that is of medium difficulty and an expert solution that requires advanced skill
- Best to create a puzzle that appears to be simple though it is actually quite difficult

A Puzzle is Fun…

Three elements of fun for puzzles

3. Tricky

- Many great puzzles cause the player to shift her perspective or thinking to solve them
- Even after having that perspective shift, the player should still feel that it will require skill and cunning to execute her planned solution
- Example: Mark of the Ninja by Klei Entertainment
  - Puzzle-based stealth combat game
  - The player must use insight to solve the puzzle of how to approach a room full of enemies
  - Once she has a plan, she must execute that plan with precision

…And It Has a Right Answer

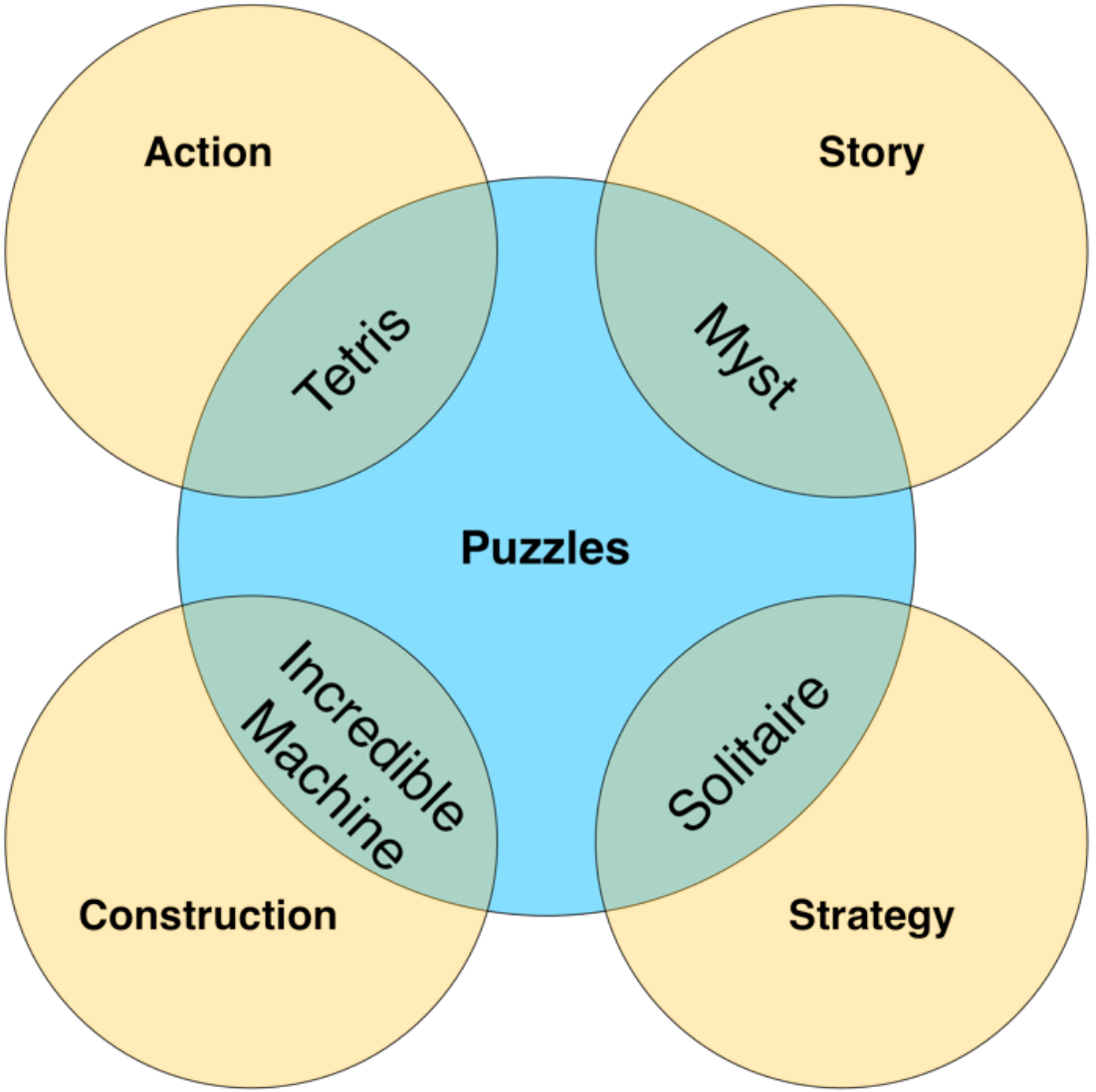
Every puzzle needs to have a right answer - Many puzzles have several right answers

Once the player has found the right answer, it should be clearly obvious to her that she is right

- If the correctness of the answer isn't easily evident, the puzzle can seem muddled and unsatisfying.

Genres of Puzzles

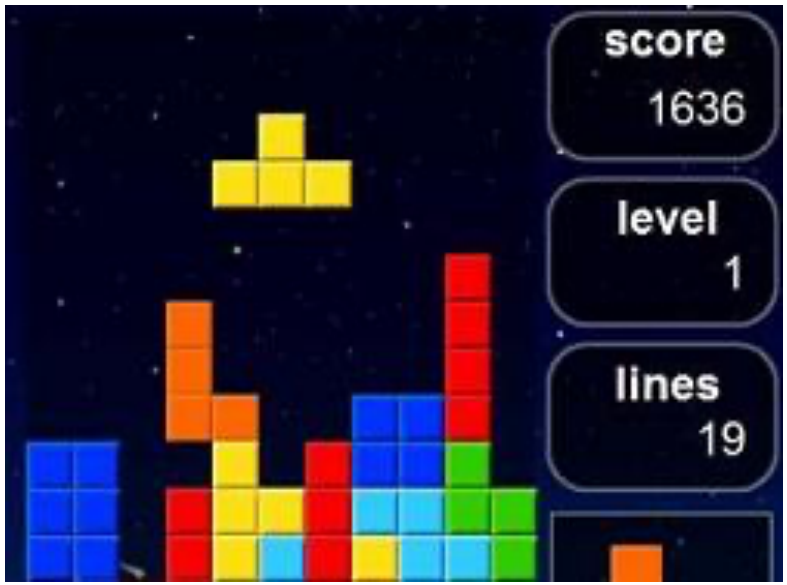
Each causes the player to take a different approach and use different skills



Genres of Puzzles – Action

***Examples*: Tetris**

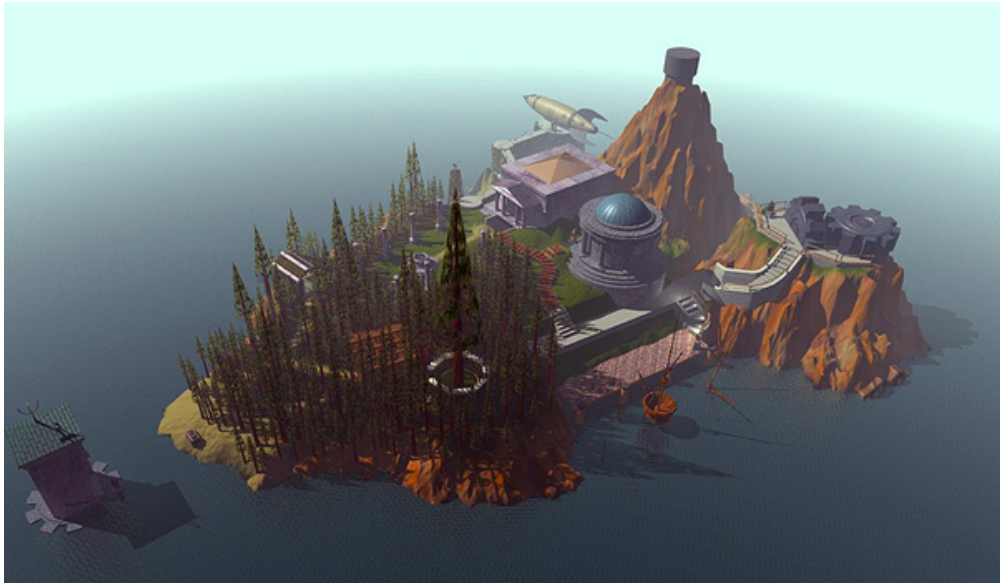
- Have time pressure and allow players a chance to fix their mistakes
- Combine an action game with a puzzle mindset



Genres of Puzzles – Story

***Examples*: Myst, Professor Layton, hidden object games**

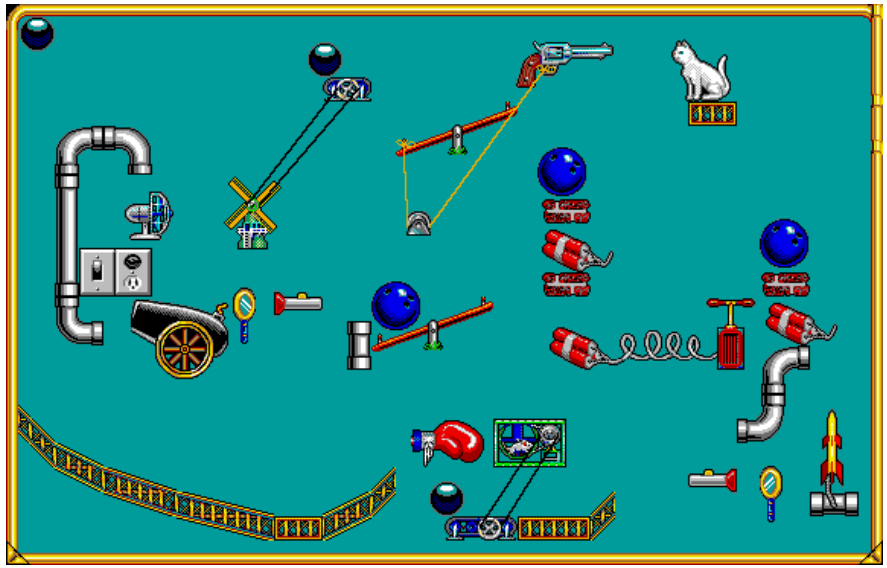
- Players must solve puzzles to progress through the plot and explore the environment
- Combine narrative and puzzles



Genres of Puzzles – Construction

***Examples*: The Incredible Machine**

- Players build an object from parts to solve a certain problem
- Some construction games include a construction set that allows the player to design puzzles
- Combine construction, engineering, and spatial reasoning with puzzles



Genres of Puzzles – Strategy

***Examples*: Chess & Bridge puzzles**

- Solitaire versions of the kinds of puzzles that players encounter in games that are traditionally multiplayer
- Include things like
  - Bridge puzzles present players with various hands in a bridge game and ask how play should proceed
  - Chess puzzles give players a few chess pieces positioned on a board and ask how the player could achieve checkmate in a certain number of moves
- Combine the thinking required for the multiplayer version of the game with the skill building of a puzzle to help players train to be better at the multiplayer game

Genres of Puzzles – Pure

***Examples*: Sudoku & Crossword**

- Don't fit any of the other four genres
- Don't combine puzzles with any other genre

Four Reasons People Play Puzzles

1. Challenge

- People like to feel challenged and the joy of overcoming those challenges
- Puzzles are an easy way for players to feel a sense of achievement, accomplishment, and progress.

Four Reasons People Play Puzzles

2. Mindless distraction

- Some people are more interested in having something interesting to do to pass the time
- Puzzles like Bejeweled and Angry Birds don't provide the player with a big challenge but rather a low-stress interesting distraction
- Puzzle games of this type should be relatively simple and repetitive rather than relying on a specific insight (as is common in puzzles played for challenge).

Four Reasons People Play Puzzles

3. Character and Environment

- People like great stories and characters, beautiful images, and interesting environments
- Puzzle games like Myst, The Journeyman Project, the Professor Layton series, and The Room series rely on their stories and art to propel the player through the game

Four Reasons People Play Puzzles

4. Spiritual journey

Some puzzles mimic spiritual journeys in a couple of different ways

- A Rubik's Cube and many mazes can be seen as rites of passage - Either you've solved them or you haven't
- Puzzles can mimic the archetypical hero's journey

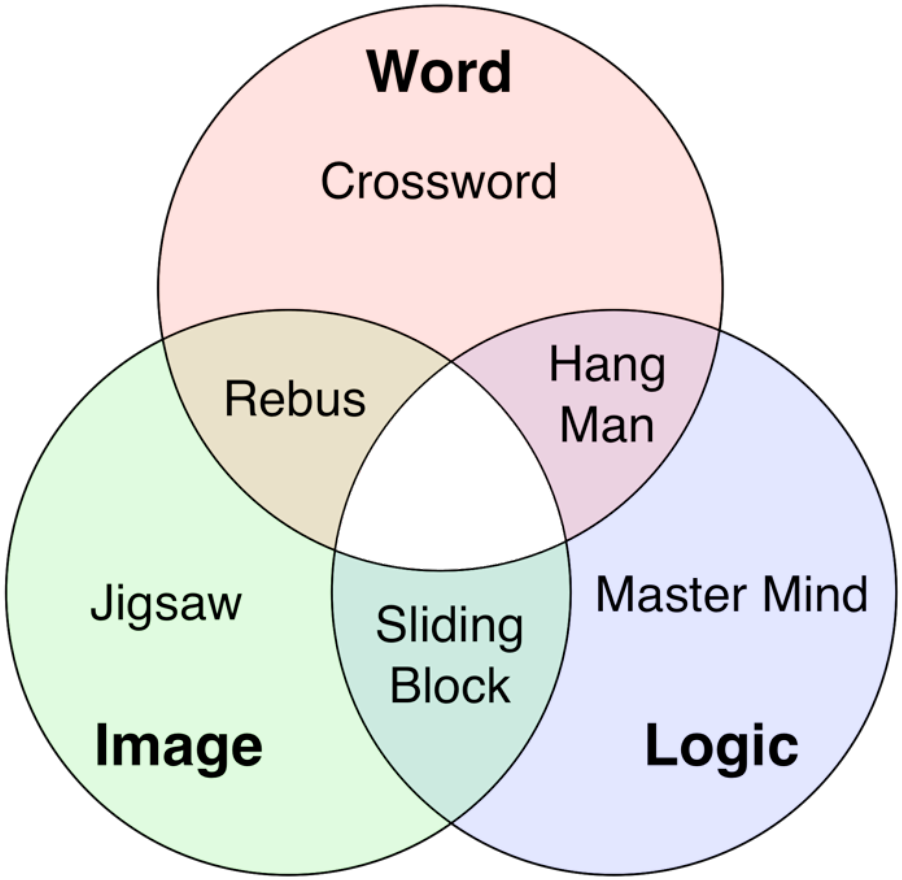
  The player starts in regular life and encounters a puzzle that sends her into a realm of struggle

  She fights against the puzzle for a while, gains an epiphany of insight, and then can easily defeat the puzzle that had stymied her just moments earlier

Modes of Thought Required

Puzzles require players to think in different ways to solve them

Most players have a preferred mode of thought



Modes of Thought Required

Word - Examples: Crossword, Prototype 6 - Word Game

Many different kinds of word puzzles

Most rely on the player having a large and varied vocabulary

Image - Examples: Jigsaw, Hidden-object games

Exercise the parts of the brain connected to visual/spatial processing and pattern recognition

Modes of Thought Required

Logic - Examples: Bulls & Cows, Clue

Many based on **deductive reasoning** - Deductive logic leads to certainty

Top-down elimination of several false possibilities, leaving only one that is true

Example: "I know that all of the other suspects are innocent, so Colonel Mustard must have killed Mr. Boddy")

Far fewer games use **inductive reasoning** - Inductive logic makes an educated guess based on reasonable probability

Bottom-up extrapolation from a specific certainty to a general probability

Example: "The last five times that John bluffed in poker, he scratched his nose; he's scratching his nose now, so he's probably bluffing"

Modes of Thought Required

Word / Image – Example: Scrabble, rebuses, word searches

Incorporate both word and image modes of thought to solve

- Scrabble is a mixed-mode puzzle, but crossword puzzles are not
- In Scrabble the player is determining where to place the word and attempting to arrange it over score multipliers on the board
- These are two acts of visual/spatial reasoning and decision-making that are not needed to play a crossword puzzle

Modes of Thought Required

Image / Logic – Example: Sliding block puzzles, laser mazes

Combine logic and image modes of thought

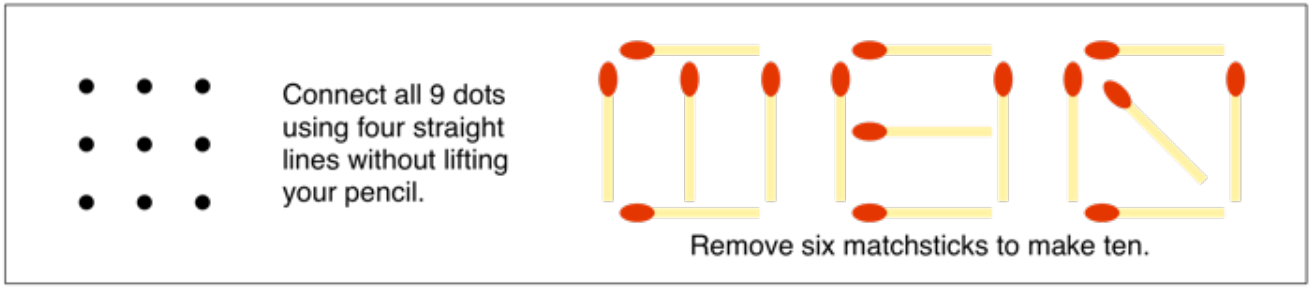
Logic / Word – Example: Most riddles

Require player to use logic and vocabulary

More Examples

Word / Image Rebus:

Image / Logic Puzzles:



Logic / Word Puzzles:

What walks on four legs in the morning, two legs in the day, and three legs at night?

What gets wetter and wetter the more it dries?

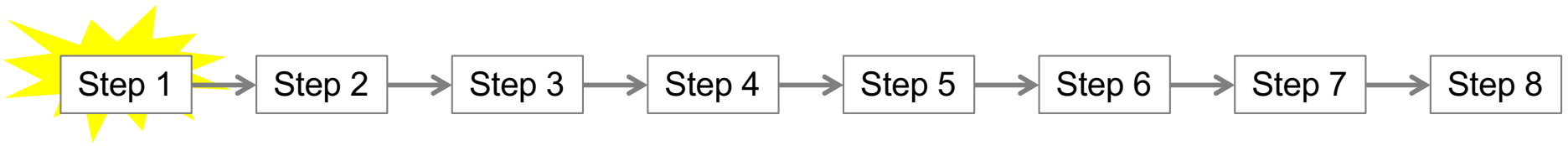
Eight Steps of Puzzle Design

Step 1 – Inspiration

Inspiration for a puzzle can come from anywhere

Alexey Pajitnov says his inspiration for Tetris was the mathematician Solomon Golomb's concept of pentominoes

- 12 different shapes, each made of five blocks, that could be fit together into an optimal space-filling puzzle
- Pajitnov wanted to use them in an action game



Eight Steps of Puzzle Design

Step 2 – Simplification

Usually need to simplify to get from your original inspiration to a playable puzzle

- Pajitnov felt there were too many different five-block pentomino shapes
- He reduced it to the seven four-block tetrominoes found in Tetris

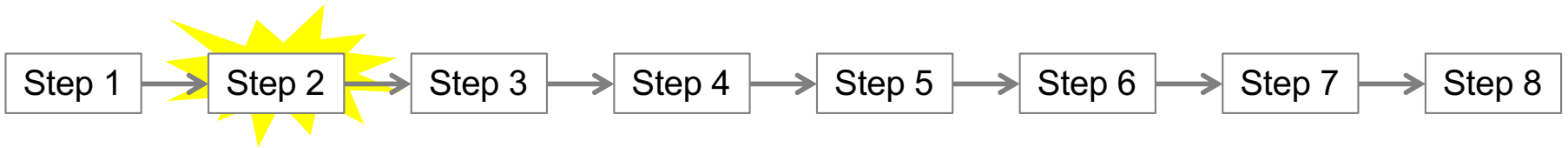
Identify the core puzzle mechanic, essential tricky skill required.

Eliminate any irrelevant details, narrow the focus.

Make pieces uniform

Simplify the controls

Ensure the controls for the puzzle are appropriate to the interface



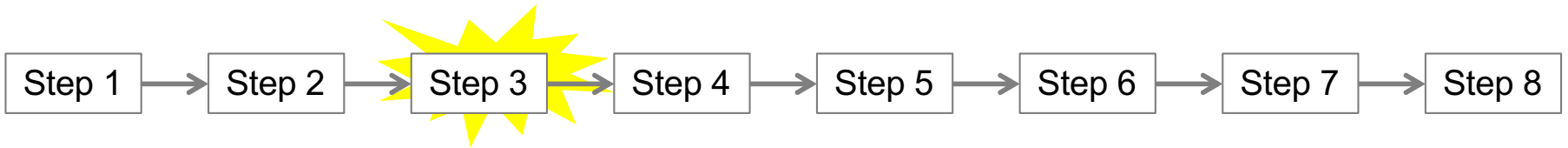
Eight Steps of Puzzle Design

Step 3 – Construction Set

Build a tool that makes construction of puzzles quick and easy

Many puzzles can be built and tested as paper prototypes

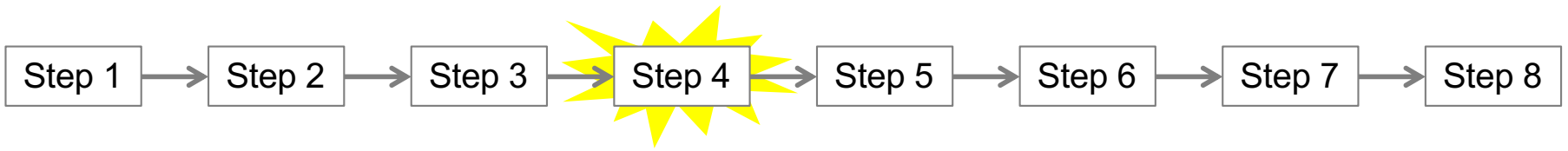
If that isn't the case for your puzzle, this is the first place that you will need to do some programming



Eight Steps of Puzzle Design

Step 4 – Define and clarify the rules

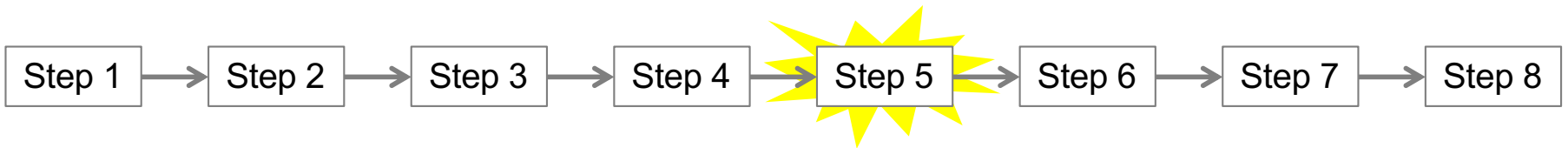
Includes defining the board, the pieces, the ways that they can move, and the ultimate goal of the puzzle or level



Eight Steps of Puzzle Design

Step 5 –Make some levels of the puzzle

Create different levels that explore various elements of your design and game mechanics



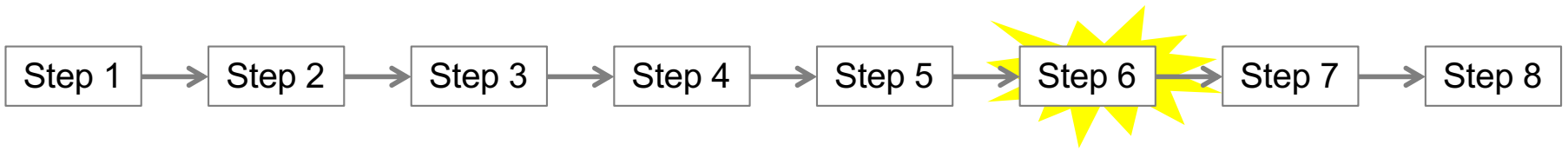
Eight Steps of Puzzle Design

Step 6 – Testing

Just like a game, you don't know how players will react to a puzzle until you place it in front of them

- Even with his many years of experience, Kim still finds that some puzzles he expects to be simple are surprisingly difficult, while some he expects to be difficult are easily solved

Playtesting and iteration are key in all forms of design!



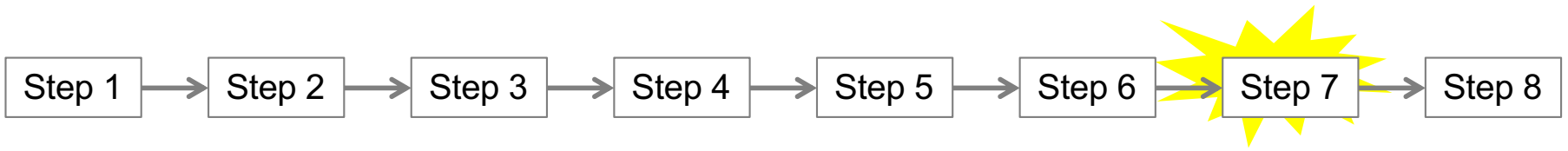
Eight Steps of Puzzle Design

Step 7 – Put the levels in a Meaningful Sequence

Introduce a new concept in isolation - Require the player to use just that concept in the most elementary way

Progressively increase the difficulty of the puzzle that must be solved using that concept

Finally, create puzzles that mix that concept with other concepts that the player already understands



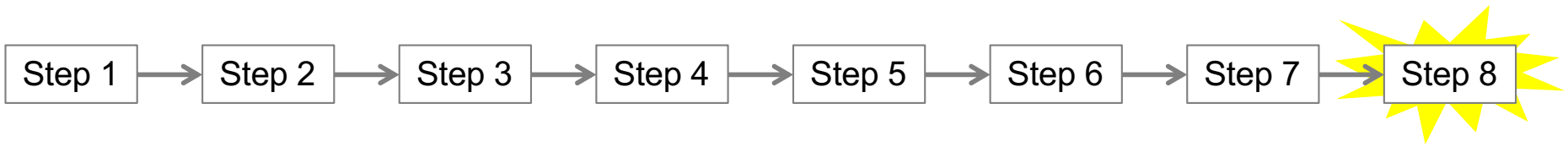
Eight Steps of Puzzle Design

Step 8 – Presentation

Refine the look of the puzzle

Refine the interface

Refine the way that information is displayed to the player



7 Goals of Effective Puzzle Design

1. User Friendly

Puzzles should be familiar and rewarding to their players

Can rely on tricks, but shouldn't take advantage of the player or make the player feel stupid

2. Ease of Entry

In 1 minute, the player must understand how to play the puzzle

In 4 minutes, the player should be immersed in the experience

7 Goals of Effective Puzzle Design

3. Instant Feedback

Should be "juicy" in the way that Kyle Gabler (co-creator of World of Goo and Little Inferno) uses the word

The puzzle should actively react to player input in a way that feels physical, active, and energetic

4. Perpetual Motion

Player should constantly be prodded to take next step

There should be no clear stopping point

- At Pogo.com, all games ended with a "Play Again" button instead of a game over screen

7 Goals of Effective Puzzle Design

5. Crystal Clear Goals

Player should always clearly understand the primary goal

Also useful to have advanced goals for players to discover over time

Hexic and Bookworm are good examples of this

6. Difficulty Levels

Player can engage the puzzle at an appropriate difficulty

Appropriate difficulty is critical to making the experience fun

7 Goals of Effective Puzzle Design

7. Something Special

Most great puzzle games include something that makes them unique and interesting

Tetris combines apparent simplicity with the chance for deep strategy and steadily increasing intensity

World of Goo and Angry Birds have juicy, reactive gameplay

Puzzle Examples in Action Games

Sliding Blocks / Position Puzzles

Usually in third-person action games

Require the player to move large blocks around a gridded floor to create a specific pattern

Alternative version involves positioning mirrors that are used to bounce light or laser beams from a source to a target

Common variation is a slippery floor that causes the blocks to move continuously until they hit a wall or other obstacle

Examples

- Soul Reaver
- Uncharted series
- Prince of Persia: The Sands of Time
- Tomb Raider
- The Legend of Zelda: The Ocarina of Time

Puzzle Examples in Action Games

Physics Puzzles

Involve using the physics simulation built into the game to move objects around the scene or hit various targets with either the player character or other objects

Core mechanic in the Portal series

Increasingly popular as reliable physics engines like Havok and the Nvidia PhysX system (built into Unity) have become ubiquitous in the industry

Examples

- Portal
- Half-Life 2
- Super Mario Galaxy
- Rochard
- Angry Birds

Puzzle Examples in Action Games

Traversal

Show you a place in the level that you need to reach but make it less than obvious how to get there

Player must frequently take detours to unlock gates or open bridges that will allow her to reach her objective

Racing games can also be seen as traversal puzzles

- Player must discover the perfect racing line that will enable her to complete each lap as efficiently and quickly as possible
- Critical to the Burning Lap puzzles of the Burnout series
- Players are asked to traverse a racecourse that includes sections of oncoming traffic and hairpin turns without making a single mistake

Examples

- Assassin's Creed
- Oddworld: Abe's Oddyssee
- Gran Turismo

Puzzle Examples in Action Games

Stealth

Extension of traversal puzzles - Became important enough to merit its own genre

Players must traverse a level while also avoiding detection

Enemy characters usually patrol a predetermined path

Players usually have a way to disable the enemy characters
- This can also lead to detection if performed poorly

Examples

- Metal Gear Solid
- Oddworld: Abe's Oddyssee
- Mark of the Ninja
- Fallout 3
- The Elder Scrolls V: Skyrim
- Assassin's Creed

Puzzle Examples in Action Games

Chain Reaction

These games include physics systems in which various components can interact, often to create explosions or mayhem

Players use tools to set traps or other series of events that will either solve a puzzle or harm enemies

The Burnout series include a Crash Mode puzzle game - Player must drive her car into a specific traffic situation and cause the greatest amount of monetary damage through a multicar collision.

Examples

- Pixel Junk Shooter
- The Incredible Machine
- Red Faction: Guerilla
- Bioshock

Puzzle Examples in Action Games

Boss Fights

Many boss fights involve some sort of puzzle - especially in classic games

Player must learn the pattern of reactions and attacks used by a boss and determine a series of actions that would exploit this pattern and defeat the boss

Especially common in third-person action games by Nintendo

Common element: The Rule of Three

Examples

- God of War
- Metroid
- Guacamelee
- Shadow of the Colossus
- Multiplayer cooperative raids in World of Warcraft

Puzzle Examples in Action Games

Boss Fights – Rule of Three

The first time the player performs the correct action to damage the boss, it is often a surprise to her

The second time, she is experimenting to see if she now has the insight to defeat the puzzle/boss

The third time, she is demonstrating her mastery over the puzzle

Most stages of boss fights throughout the modern Legend of Zelda series can be defeated in three attacks, as long as the player understands the solution to the puzzle of that boss.

Summary

Puzzle design can be useful for single-player games

Puzzle design shares many of the same processes with game design

Iteration and listening to feedback are key

Puzzles are fun to different people for different reasons

Be sure to understand your audience