Facilitator Resources for:

GAMING THE SYSTEM
DESIGNING WITH GAMESTAR MECHANIC

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Foreword by James Paul Gee
Overview & Explanation

For your convenience, we have gathered together here the projection sheets, cards, and formal assessment used in supporting the activities found in *Gaming the System*. See the Design Challenges within the book for detailed information on how these materials may be used. The headings and page numbers match the same within *Gaming the System*.

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**NOTE:** Within the book you may see a handout listed as suitable for duplication or projection. If you wish to project any, those items may be found within the Youth Handouts and Worksheets collection.

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**Cards**

(Cut apart and laminate for durability)

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Design Challenge Two

Designing Top-Down Games
DESIGN CHALLENGE 2, PART 1

SCREENSHOT OF WORKSHOP

Level Editor allows you to change:
- perspective
- scrolling
- edge bounding
- background
- music

Sprite Inventory includes:
- avatar
- enemy
- block
- item
- system

Tools:
- select
- wrench
- eyedropper
- erase
DESIGN CHALLENGE 2, PART 2

TOP-DOWN VIDEO GAME EXAMPLES

Pac-Man
Space Invaders
Plants vs. Zombies
GAMING THE SYSTEM
DESIGNING WITH GAMESTAR MECHANIC

Design Challenge
Three

Designing Platform Games
DESIGN CHALLENGE 3, PART 1

PLATFORM VIDEO GAME EXAMPLES

Super Mario Brothers
Sonic the Hedgehog
Appendix C

Gaming the System
Assessment
1. What is the relationship among the following three things? You can explain your answer in words or pictures.

(a) studying, (b) grades, and (c) interest in the subject matter.

Based on your answer, what do you think would happen to studying and grades if your interest in the subject matter went *down*?
2. Think about the game of Musical Chairs. Identify the components of the game and how those components interconnect to affect the overall goal of the game. What would happen if you removed one of the components of the game of Musical Chairs?

3. Carla and Jordan are having an argument about what will make the game shown here more challenging:
Explain whether Carla is right or whether Jordan is right, and why.

What are some other ways that you could make this game challenging? Please explain.

4. What is the relationship between the amount of grass that is growing in a field, the number of rabbits who live in the area (rabbits eat grass), and the number of wolves in the area (wolves eat rabbits). Explain your answer in either words or pictures.

If someone decided to kill all the wolves, what would happen to the rabbits and the grass?
5. Here is a game that Jordan created. He is having trouble beating the game so is not yet allowed to publish it to Game Alley. Every time he plays, he loses after colliding with enemies twice. How could you adjust Jordan’s game so that he has a better chance to collect all the coins and win? Explain your answer in words.
6. Carla suggested that Jordan remove some of the blocks to open up the game space a bit more. This is a diagram of the game based on Carla’s suggestions. How do you think this will affect the game? Explain your answer in words.
Appendix D

Systems Thinking
Concept Cards
### 01. Identifying a System

Identifying a system and distinguishing it from other kinds of things that aren’t systems. Specifically, a system is a collection of two or more components and processes that interconnect to function as a whole. Speed and comfort in a car, for example, are created by the interactions of the car’s parts and thus are “greater than the sum” of all separate parts of the car. The way a system works is not the result of a single part but is produced by the interaction among the components and/or individual agents within it. A key way to differentiate things that are systems from things that aren’t is to consider whether the overall way something works in the world will change if you remove one part of it.

### 02. Identify the Way a System is Functioning

The function of a system describes the overall behavior of the system—what it is doing or where it’s going over time. A system’s function might emerge naturally based on interconnections among components, or it might be the result of an intentional design (in which case, we might also refer to the function of a system as its goal). Regardless, the function of a system is the result of the dynamics that occur among components’ interconnected behaviors.

### 03. Distinguishing the Goal of a System

The goal of the system is what a system that was intentionally designed is intended to do. Sometimes this might be the same as the functioning of the system... other times the goal and the function are not aligned. A given system might have multiple goals or purposes that are at play simultaneously, and come into conflict. Being able to understand system purpose or goal gives a sense of the ideal state of a system from a particular perspective.

### 04. Identifying Components

Identifying the parts of a system that contribute to its functioning. Components have certain qualities and/or behaviors that determine how they interconnect with other components, as well as define their role in the system. Without being able to effectively identify the parts of a system, it’s hard to understand how a system is actually functioning and how it might be changed.

### 05. Identifying Behaviors

Identifying the specific actions, roles, or behaviors that a component of a system displays under various conditions. Being able to identify behaviors becomes important when we change systems, as often a component will look the same after the change, but its behavior will be different.
06. **IDENTIFYING INTERCONNECTIONS**

Identifying the different ways that a system’s parts, or components, interact with each other through their behaviors, and through those interactions, change the behaviors of other components.

07. **PERCEIVING DYNAMICS**

Perceiving a system’s dynamics involves looking at a higher level at how the system works. Dynamics in a system are often characterized by circles—patterns that feed back on another. These are called feedback loops. Understanding dynamics gives insights into the mechanisms and relationships that are at the core of a system and can be leveraged to create systemic changes.

08. **CONSIDERING THE ROLE OF SYSTEM STRUCTURE**

Understanding how a system’s components are set up in relation to one another gives insight into the behavior of a component. A system’s structure affects the behaviors of its components and the overall dynamics and functioning of a system. For instance, how a city’s highway system is structured affects overall traffic patterns and car movement within it. Being able to see a system’s structure gives insights into the mechanisms and relationships that are at the core of a system, which can be leveraged to create systemic changes.

09. **MAKE SYSTEMS VISIBLE**

When we learn to “make the system visible” – whether modeling a system on the back of a napkin, through a computer simulation, a game, a picture, a diagram, a set of mathematical computations, or a story—we can use these representations to communicate about how things work. At their best, good pictures of systems help both the creator and the “reader” or “audience” to understand not only the parts of the system (the components), but also, how those components work together to produce a whole.

10. **SYSTEMS DIAGRAM**

Is a diagram used to visualize the dynamics that occur between components in a system, intended to capture how the variables interrelate. One way of diagramming a feedback loop uses an “R” with a clockwise arrow around it to indicate a reinforcing feedback loop. A “B” with a counterclockwise arrow around it would indicate a balancing feedback loop, which “counters” something in a system. The plus sign indicates an increase in that amount of a component in a system, and a minus sign indicates a decrease in the amount of a component in a system. There are other ways to create systems diagrams, but the most important thing about a good systems diagram is that it not only shows the components in a system, but is able to show the relationships between the components through the arrows, symbols, and text.

11. **FEEDBACK LOOPS**

Are relationships between two or more components of a system, where actions by these components interact in a circular fashion – something that component A does effects component B, which then circles back and effects component A. There are two types of feedback loops, Balancing and Reinforcing.
REINFORCING FEEDBACK LOOPS

Relationships where two or more components of a system cause each other to increase, such as in escalation cycles, or decrease, such in resource drain cycles, in a way that’s “out of control” or creates a “snowball effect”. Reinforcing loops encourage a system to reproduce certain behaviors, though these behaviors always “exhaust” themselves after the resources fueling the growth or diminishment run out. This is also called “limits to growth”. There are two types of reinforcing feedback loops: “vicious” cycles and “virtuous” cycles.

VICIOUS CYCLES

Reinforcing feedback loops that cause a negative outcome in terms of the perceived goal of the system. One thing to keep in mind is that the same thing might be a vicious cycle to one person, but a virtuous cycle for another person who has different goals.

BALANCING FEEDBACK LOOPS

Relationships where two or more elements of a system keep each other in balance, with one (or more) elements leading to increase, and one (or more) elements leading to decrease. These processes keep a system at the desired state of equilibrium, the system goal. Usually, balancing feedback processes stabilize systems by limiting or preventing certain processes from happening. Having a sense of how balancing feedback loops operate can give a person a sense of what will make a system stable.

STOCKS & FLOWS

Stocks are an accumulated amount of something within a system (like money in a bank account, fish in a pond, trees in a forest, or jobs in an economy), and flows are the rate at which stocks in a system change either through increasing or decreasing (money comes in and out of a bank account due to wages paid, interest, and purchases. Fish come in and out of a pond due to birth rates, death rates, and fishing rates, etc.). Stocks are always nouns; they’re the “stuff” of systems, while flows are always verbs; they’re the “movement” of systems. Understanding Stocks and Flows gives someone an insight into how different parts of the system change over time.

LIMITED RESOURCES

In any system, it is important to understand which resources are finite, ones that will run out at a certain point. Keeping in mind which resources are limited helps people make decisions about how best to maximize resources.
18. **NESTED SYSTEMS**

Systems that are a smaller part of other systems. Almost all systems are nested within larger systems. With nested systems, a larger system will affect the way that a subsystem behaves, and the subsystem will affect the way that the larger system behaves. Having a sense of nested systems helps people keep an eye on how systems interconnect and are always part of bigger pictures.

19. **DYNAMIC EQUILIBRIUM**

A state in which stocks and flows are balanced so the system is not varying widely, but still has internal dynamic processes that are continually in flux even though the system is stable overall. For example: in economics dynamic equilibrium might be used to talk about the constant flux of money movement in otherwise stable markets; in ecology, a population of organisms stabilizes when birth rate and death rates are in balance.

20. **DESIGNING A SYSTEM**

Creating a system through engaging in an iterative design process, one that entails iterative cycles of feedback, troubleshooting and testing. One of the most effective means of developing systems thinking is to regularly create and iterate on the design of systems, and doing so in a way that creates opportunities for students to think about generic systems models that apply across multiple domains and settings.

21. **FIXES THAT FAIL**

Any kind of solution to a problem that fixes the problem temporarily but fails to fix it in the long term, and might even make it worse over time. Fixes that Fail are often put in place quickly, usually without much reflection on what consequences they’ll have for the system. They’re important to see since they’re often the ways that people respond to problems in a system.

22. **LEVERAGE POINTS**

Particular places within a system where a small shift in one thing can produce big changes in everything. Leverage points are difficult to find because they often lie far away from either the problem or the obvious solution. It is because of the multitude of cause and effect relationships, feedback loops and system structures that a seemingly small change can be amplified, often in unexpected ways. Not every place in a system is a leverage point - sometimes changing one thing in a system will just have small effects that aren’t felt throughout the system. Leverage points are important since they let us know where to focus our energies when we try to change systems.

23. **UNINTENDED CONSEQUENCES**

The unexpected result of an action taken in a system that the actor taking that original action did not want to happen. Unintended Consequences are often the result of fixes that fail or someone aiming to find a leverage point in a system but not considering long-term implications to those actions — someone failed to keep in mind time horizons. Having a good sense of potential unintended consequences means that someone will carefully consider before too hastily intervening in a system.
24. CONSIDERING HOW MENTAL MODELS SHAPE ACTION IN A SYSTEM
The ability to consider the assumptions, ideas, and intentions that a given actor might have in relation to a system, and how these affect that actor’s behavior within the system. Mental models are often correct about what components are included in a system, but frequently draw wrong conclusions about a system’s overall behavior.

25. LOOKING AT A SYSTEM FROM MULTIPLE PERSPECTIVES
The ability to understand that different actors in a system will have different mental models of the system and consider each of these perspectives when engaging in action within a system. This is also called “thinking across the table.”

26. CONSIDERING MULTIPLE LEVELS OF PERSPECTIVE
The ability to move fluidly between different levels of perspective within a system, from events, to patterns to system structures, to mental models. The most visible level of systems are events, visible instances of elements interacting in a system. Using the metaphor of a system as an iceberg, events are “above the waterline” – they’re easy to see. When we start to think “below the waterline,” we start to see three other levels of perspective: patterns (recurring sets of events), structures (ways the elements are set up in a system which give rise to regular patterns), and mental models (which shape systems structures). Switching between different levels of perspective when looking at a system deepens understanding of how a system operates.

27. TIME DELAYS
Are the time lag between an action in a system and the evidence of its effects. For example, there’s a long delay between the point when you plant a seed in the ground and the appearance of a fruit-bearing tree.

28. TIME HORIZONS
Are the overall period of time that you look at something in order to understand it. For example, if we only look a complex system like an economy for a short period of time, we might misunderstand how it’s behaving and miss the effects of actions taken far into the past.
Appendix E

Gaming the System
Challenge Cards
OVERVIEW

Game design challenge cards offer a series of jumping off points for the creation of digital or non-digital games.

The cards in this deck allow budding game designers of all levels to design games inspired by simple challenges. Challenges are rated from easy to hardcore and come with some hints to help get things started.

Remember—all games are systems that change over time, so think DYNAMIC!
01 ROOM WITH A VIEW

Create a game made of a room with a view.

EXPLANATION
Games can include both interior and exterior spaces. The Legend Of Zelda is a great example, as is Animal Crossing.

HINTS
Try creating a series of rooms that lead to a window. Customize each room by using different kinds of blocks and enemies. Think about the different attributes you can give each space to distinguish it as a unique component in the system.

SYSTEMS THINKING SPOTLIGHT
modeling a system

02 ZOOM

Create a game about the fastest person you know.

EXPLANATION
There are many ways to express speed in games: fast music, fast enemies and racing spaces with a timer ticking away.

HINTS
In addition to using a fast avatar, try using a timer and timer bonuses to add an element of time pressure. Adding these system sprites not only makes the game more challenging, but also adds to the feeling of a quick, fast paced game.

SYSTEMS THINKING SPOTLIGHT
designing a system, system dynamics/interconnections

03 FORTRESS IN THE SKY

Create a game that takes place in a fortress in the sky.

EXPLANATION
Fortresses are well defended with high walls and plenty of guards. They can be built so that each space inside is smaller and more secure the closer you get to the center.

HINTS
Games that take place in the sky often use heavy gravity to create a danger of falling. Try changing the gravity parameters to create a feeling of lightness—you’ll find a dramatic change in the relationship between the components of avatar, ground, and sky.

SYSTEMS THINKING SPOTLIGHT
modeling a system, component relationships.
04 SUPERHERO

Create a game for a lost superhero.

EXPLANATION
Helping a superhero find their way home is no easy task! Well-designed spaces and helpful items can make their journey swifter.

HINTS
Maps can be useful if your superhero is lost in a maze. Imagine landmarks that might help your superhero or consider leaving a path of breadcrumbs—all are discrete components of a system.

SYSTEMS THINKING SPOTLIGHT
designing a system, role of system structure.

05 FALLING FOREVER

Create a game about falling forever through time.

EXPLANATION
High vertical spaces or wrap-around spaces with unbounded edges can create a feeling of endlessness. Use timer bonuses to extend the plummet.

HINTS
What kind of a system expresses the concept of infinity? Try turning a small space into an infinite one that loops back on itself. If you were to imagine falling forever through time, what do you imagine yourself doing, seeing, and feeling?

SYSTEMS THINKING SPOTLIGHT
designing a system, system dynamics/interconnections.

06 DRIFT

Create a game about floating through an infinite landscape.

EXPLANATION
Use gravity, speed, and color to create a feeling of floating on air, or design a flying landscape.

HINTS
Imagine your avatar floating or drifting—what mechanics or relationships between system components might create this feeling in a game? How might a landscape be designed to feel like it goes on forever?

SYSTEMS THINKING SPOTLIGHT
designing a system, role of system structure.
07

**BFF**

**LEVEL**

EASY

Create a game for your best friend.

**EXPLANATION**

Games can be used to paint a portrait of people you know.

**HINTS**

Think about attributes or adjectives you can use to describe your friend: fast, tricky, quiet, tough? What kind of personality does your best friend have (what kind of a system to all those adjectives add up to)? What kinds of activities does your best friend enjoy most? Build a game around these things.

**SYSTEMS THINKING SPOTLIGHT**

designing a system, considering a system’s purpose or goal

08

**DAZED AND CONFUSED**

**LEVEL**

EASY

Create a game to make a player feel dazed and confused.

**EXPLANATION**

Sometimes it can be fun to design a game that is completely chaotic, where confusing the player is part of the fun.

**HINTS**

Try making a top down, wraparound game with unbounded edges: the player may have a hard time knowing where they are. Think about the attributes of the edge component of your system—how can you create relationships between the edge and an avatar that seem utterly confusing?

**SYSTEMS THINKING SPOTLIGHT**

designing a system, role of system structure

09

**SOUTH POLE**

**LEVEL**

EASY

Create a game that takes place in a frozen landscape.

**EXPLANATION**

Sometimes game designers can be clever in how they choose to use sprites in their games. Cloud blocks, for example, can be used to create a level covered in snow. Glass blocks become sheets of ice.

**HINTS**

Imagine types of activities that could happen in a frozen landscape: ice-skating, sledding, snowball fights. Are there components like igloos, polar bears, or snowmen?

**SYSTEMS THINKING SPOTLIGHT**

modeling a system, component relationships
10  
BLACK AND WHITE

Create a game of black and white.

EXPLANATION
Black and white are colors in stark contrast to each other. One is the combination of all colors; the other contains none.

HINTS
What do the colors black and white make you think of? A newspaper? An old movie? A copy machine? Work with background and block components to create a distinctive look and feel for your game.

SYSTEMS THINKING SPOTLIGHT
designing a system, role of system structure

11  
FEEL THE RHYTHM

Create a game based on one of the soundtracks in the level editor.

EXPLANATION
You can create enemy patterns to sync with background music tracks. The visual design of the game can also capture the feeling.

HINTS
Movement style, turn direction, speed, and start direction are great tools for creating a rhythm. Choose a soundtrack and listen carefully. What player actions do you think would go well with this music? How might the music complement or contrast the system you’ve designed?

SYSTEMS THINKING SPOTLIGHT
designing a system, component relationships

12  
HAPPY BIRTHDAY

Create a game for a friend’s birthday.

EXPLANATION
Birthdays involve many different kinds of objects and rituals, like singing "Happy Birthday," blowing out candles, and eating cake.

HINTS
Create a party atmosphere: consider the soundtrack, the decoration, and most of all, the fun as key components of your system. Puzzles can be enticing birthday gifts; blocks can be used to spell out a special birthday message.

SYSTEMS THINKING SPOTLIGHT
designing a system, considering a system’s purpose or goal
**GAMING THE SYSTEM CHALLENGE CARDS**

**13**

**AMAZING RACE**

**LEVEL**

**EASY**

Create a game about an amazing race.

**EXPLANATION**

The design of the racecourse can make the difference between winning and losing in games of speed.

**HINTS**

Timers create pressure and mark the beginning and ending of a race. Design a racecourse that is either long and flat or wide and windy. Think about making shortcuts and detours to give racers some choice in where they go in your system.

**SYSTEMS THINKING SPOTLIGHT**

designing a system, balancing feedback loops

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**14**

**DO NOT PASS!**

**LEVEL**

**EASY**

Create a game with barriers and obstacles that you have to get by in order to win (or move to the next level).

**EXPLANATION**

Puzzles and complex enemy movements create obstacles that can help you control progress through a game.

**HINTS**

Think about ways of building obstacles into your system by stopping movement or causing sprites to change direction.

**SYSTEMS THINKING SPOTLIGHT**

designing a system, component relationships, balancing feedback loops

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**15**

**LEAGUE APPLICATION**

**LEVEL**

**MEDIUM**

Apply to your favorite Gamestar district by making a game for it.

**EXPLANATION**

Knowing the genre or style of game specific to a district can help you fit in.

**HINTS**

Figure out which genres of games match each school: puzzles, racing games, mazes, and platformers—all represent very different kinds of systems. What is an innovative way to approach the design of a game that combines genres? A racing maze? A puzzle platformer?

**SYSTEMS THINKING SPOTLIGHT**

designing a system, component relationships, role of system structure
Create a game about time travel.

**EXPLANATION**
What if time was like a loop? Where would you go? What would you do when you got to the past or future?

**HINTS**
Levels are parts of a system that can be used to express different time periods; doors and keys are components that can work like portals or black holes. Time travel is about exploration, too, so design the system of components making up your game space with many hidden features.

**SYSTEMS THINKING SPOTLIGHT**
modeling a system, system dynamics/interconnections

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Create a game with unexpected encounters and misleading staircases.

**EXPLANATION**
Designing surprise in a game can be accomplished in many ways. Game spaces can create paths to unexpected places, ghosts can appear from nowhere, and complex mazes can lead players astray.

**HINTS**
Random settings create variation in the behavior of components in a system, leading to unexpected outcomes. Adding randomness to spawning and movement is perfect way to create surprise. Similarly, wraparound spaces can lead to unexpected encounters with the enemy.

**SYSTEMS THINKING SPOTLIGHT**
designing a system, component relationships, system dynamics/interconnections

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Create a game with a beginning, middle, and end. Earn bonus points for a surprise ending.

**EXPLANATION**
Levels can be used to create the beginning, middle, and end of a story, dividing your system into parts. Long or tall platformers can work like a scroll: begin the story at one edge and finish it at another.

**HINTS**
Entry and exit points are important indicators of progress in a system. Endings are often best communicated by reaching a goal—level complete!

**SYSTEMS THINKING SPOTLIGHT**
modeling a system, role of system structure, unintended consequences
19
JOURNEY TO FOREVER

Create a game about a fantastic journey.

EXPLANATION
Games can tell the story of an incredible journey, one filled with excitement, conflict, action, and reward!

HINTS
Are you seeking something that has been lost, exploring hidden lands, or visiting imaginary friends? Imagine the types of things you might run into, or see along the way. Are these things the same from level to level? What are the components that would make a system feel fantastic?

SYSTEMS THINKING SPOTLIGHT
modeling a system, component relationships

20
THUD

Create a game about feeling and falling like a heavy rock.

EXPLANATION
Gravity is a powerful force that pulls everything down, down, down. Heavy gravity means its pull is even more powerful.

HINTS
Create a space open enough in your system for objects to fall a long way. Can you create a level that makes it easy to fall down but difficult to climb up? How might you set the parameters of gravity in your system—very heavy or super light?

SYSTEMS THINKING SPOTLIGHT
modeling a system, role of system structure, system dynamics/inter-connections

21
STRANGE PLANET

Create a game about three weird things.

EXPLANATION
Weird things can be depicted in the design of a strange game space, series of events, or interaction between sprites.

HINTS
Randomness often leads to unexpected behavior, since random means unpredictable. What are some really weird things you have seen or experienced? Play with sprite parameters around randomness and movement to see if you can create some unusual interactions.

SYSTEMS THINKING SPOTLIGHT
designing a system, reinforcing feedback loops
22 RELAX

LEVEL MEDIUM

Create a game for relaxation.

EXPLANATION
Relaxation is all about a lack of tension: soothing music, slow movement, and open-ended play.

HINTS
Think about the kinds of things you like to do after a long, tiring day. Make a game that is easy to play but is fun in a relaxing, meditative way. Perhaps the visuals or music in your system are soothing; or a small, repetitive activity mesmerizing. Design interesting spaces for your player to explore without the threat of enemies or time pressure.

SYSTEMS THINKING SPOTLIGHT
designing a system, balancing feedback loops

23 BRAVE AT HEART

LEVEL MEDIUM

Create a game for the brave at heart.

EXPLANATION
Players feel brave when they can successfully overcome obstacles. Bravery can come from how an avatar is designed to face off against an enemy.

HINTS
Design a game filled with challenges that must be overcome by taking chances. Players experience a feeling of risk in a system where there are no second chances or where they must act quickly without taking time to think. Consider designing a game with no extra lives, or with components that do high amounts of damage when touched.

SYSTEMS THINKING SPOTLIGHT
modeling a system, component relationships, system dynamics/interconnections

24 TUNNELS! WAVES! ELEVATORS!

LEVEL MEDIUM

Create a game with tunnels, waves, and elevators.

EXPLANATION
Use movement speed and turn direction to create rhythmic waves with your enemies.

HINTS
Create unique wave patterns by modifying enemy movement parameters. This creates interesting and predictable relationships between components in your system. Vertical scrolling spaces are terrific for creating tunnels. Elevators can be placed throughout a level as part of an escape route.

SYSTEMS THINKING SPOTLIGHT
modeling a system, component relationships, system dynamics/interconnections
GAMING THE SYSTEM CHALLENGE CARDS

25 DIVE! DIVE! DIVE!

**LEVEL**
MEDIUM ★★★★★

Create a game that takes place 20,000 leagues under the sea.

**EXPLANATION**
What are you doing so deep under the sea? Searching for treasure? Hunting a sea monster? Gravity paired with the right combination of sprites can express a variety of underwater adventures.

**HINTS**
Experiment with the gravity setting to recreate the feeling of swimming. How can you use sprites to represent different underwater objects? What kinds of relationships do you need to create through movement and placement to model a deep sea paradise?

**SYSTEMS THINKING SPOTLIGHT**
modeling a system, component relationships, role of system structure

GAMING THE SYSTEM CHALLENGE CARDS

26 BRING IT ON!

**LEVEL**
MEDIUM ★★★★★

Create the hardest game possible that is still beatable.

**EXPLANATION**
A master game mechanic knows how to balance challenge, making games that are truly hard but also possible to win.

**HINTS**
Test out the use of timers to allow the player to finish just as time is about to run out. Build in traps that require players to be clever but give them enough clues to figure out the answer. Design the space in such a way that the player has to explore all parts of the system.

**SYSTEMS THINKING SPOTLIGHT**
modeling a system, balancing feedback loops, reinforcing feedback loops

GAMING THE SYSTEM CHALLENGE CARDS

27 OPPOSITES ATTRACT

**LEVEL**
MEDIUM ★★★★★

Create a game about things that are opposite.

**EXPLANATION**
X vs. O, top vs. bottom, right vs. left, happy vs. sad, fast vs. slow. A game of opposites is a game of contradiction. Are friends really enemies? Is up really down?

**HINTS**
The different districts in Gamestar offer many options for creating patterns of opposites. Or think about pairing components with opposite colors, behaviors, or roles in your system—black vs. white, up vs. down, controlled vs. random, avatars vs. enemies.

**SYSTEMS THINKING SPOTLIGHT**
modeling a system, component relationships
Create a game about a prison break.

**EXPLANATION**
Prisons are systems full of people, cells, locked doors and solid walls to prevent escape. They are designed to keep prisoners in—many of whom really want to get OUT.

**HINTS**
What components of the system work as obstacles preventing escape? Are there guards everywhere, or only in certain locations? Does a player need to search for and find the exits or find hidden keys? Is the prison a maze or a tower, a dungeon or an island?

**SYSTEMS THINKING SPOTLIGHT**
modeling a system, role of system structure, considering a system’s purpose or goal

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Create a game that takes place in a garden.

**EXPLANATION**
What kinds of things grow in a garden? Flowers? Vegetables? Man-eating plants? Is the garden a community garden, a vegetable patch, or field of flowers?

**HINTS**
Use points or bonus points to represent seeds, flowers, or vegetables in your system. The grass and dirt blocks create a great foundation for you to build on. Spawning can create a feeling of change over time and allow for new patterns to emerge.

**SYSTEMS THINKING SPOTLIGHT**
modeling a system, component relationships, balancing feedback loops, reinforcing feedback loops

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Create a game made up entirely of words that change.

**EXPLANATION**
Blocks on a grid can be used to embed secret messages in your game, or to tell a story with words built from sprites.

**HINTS**
Build a maze made of words—letterforms made of blocks are simple systems. Create a platformer that takes place in a city of letters. Use the matching blocks to create a word scramble. Think. Write. Communicate.

**SYSTEMS THINKING SPOTLIGHT**
designing a system, component relationships, unintended consequences
31
NEXT STOP JUPITER

LEVEL
HARD

Create a game about a virtual tour of the solar system.

EXPLANATION
Earthlings battling hostile life forms or tourists tracking hidden constellations? Whatever your take, the design of space in your game will be important.

HINTS
Scrolling spaces can offer a powerful canvas for intergalactic exploration. Use short-term goals to keep your players excited throughout the journey and design a system full of space-like hazards.

SYSTEMS THINKING SPOTLIGHT
modeling a system, identifying components, identifying behaviors, role of system structure

32
SNEAKY PANTS

LEVEL
HARD

Create a game that would make the player feel sneaky.

EXPLANATION
A feeling of being sneaky can be achieved through movement style: hiding behind obstacles or moving slowly while being hidden from view.

HINTS
Create opportunities to play hide and seek. Consider ways of making the player feel clever in your system by giving them clues the enemy can’t see.

SYSTEMS THINKING SPOTLIGHT
designing a system, considering a system’s purpose or goal, component relationships

33
THIS OR THAT

LEVEL
HARD

Create a game that can be played two different ways.

EXPLANATION
System sprites can define certain ways of playing a game, whether it’s racking up points or racing through space to beat the timer.

HINTS
Design a game space with different points of entry and exit. What combination of components can be used to create different goals or choices within the system?

SYSTEMS THINKING SPOTLIGHT
designing a system, component relationships, looking at a system from multiple perspectives
Create a game about your neighborhood.

**EXPLANATION**
Spaces in the real world can be great inspiration for games.

**HINTS**
Think about who lives in your neighborhood and how you would represent them as a system of interrelated parts. Ask, “What is unique about my neighborhood? How can I model the system in the form of a game?” Think about what people like to do there, how they move around, and the places you like to go.

**SYSTEMS THINKING SPOTLIGHT**
modeling a system, identifying components, identifying behaviors, nested systems

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Create a game in which a world goes topsy-turvy.

**EXPLANATION**
Imagine a world that is topsy-turvy. What do you think would be going on there? What would it look like and how would it make you feel?

**HINTS**
Try using a wraparound space and ghosts as components. Randomness can help lend a chaotic edge to the behavior of your system. The design of a space that looks the same right side up and upside down is sure to confuse.

**SYSTEMS THINKING SPOTLIGHT**
designing a system, considering a system’s purpose or goal, component relationships

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Create a game about a haunted forest.

**EXPLANATION**
Design a game to capture the isolation and creepiness of a forbidden forest.

**HINTS**
Design a system full of unexpected outcomes by exploring randomness, patterns, and complex relationships between components. What types of things make up your system: creepy crawlies, caves, or strange weather?

**SYSTEMS THINKING SPOTLIGHT**
designing a system, designing behaviors, component relationships, nested systems
37 VOLCANO!

**LEVEL** HARD

Create a game that takes place inside of an erupting volcano.

**EXPLANATION** Volcanoes are filled with hot, liquid lava. They can be explosive and dangerous.

**HINTS** Imagine a story placing your player inside the volcano. Is the player a scientist studying the volcano and its patterns of eruption over time? Has he or she fallen inside? Is someone guarding the volcano? Might it contain secret treasure?

**SYSTEMS THINKING SPOTLIGHT** modeling a system, component relationships, system dynamics/interconnections

38 SAFARI

**LEVEL** HARD

Create a game about being on a jungle safari.

**EXPLANATION** Game spaces can be designed to model different types of terrain. Level parameters related to edge bounding, scrolling, and gravity are all useful tools. Imagine the kinds of things you would see on a jungle safari—creatures, trees, and people.

**HINTS** Think about all of the components that make up the system that is the jungle—landscape, weather, plants, animals, and humans? What might be the challenge of moving through a jungle? What obstacles and surprises might you encounter in the system?

**SYSTEMS THINKING SPOTLIGHT** modeling a system, component relationships, role of system structure

39 THE FOUR SEASONS

**LEVEL** HARD

Create a game about the change of seasons.

**EXPLANATION** Winter, spring, summer, or fall, seasons express feelings, landscapes, weather, and the passing of time.

**HINTS** Create a system that shows the cyclical nature of seasons. Use more than one level to show changes in a landscape over time. Think about the role soundtracks can play in evoking a mood or style.

**SYSTEMS THINKING SPOTLIGHT** modeling a system, component relationships, system dynamics/interconnections
**40 SUNRISE TO SUNSET**

**LEVEL**
HARD

Create a game that starts in the morning and ends at night.

**EXPLANATION**
Changes in the day can be expressed through a change in mechanic (do you do different things in the morning than at night?), the use of backgrounds, music, or a sequence of levels.

**HINTS**
Use a horizontal scrolling space that starts and ends with dark colored blocks to represent the sunrise and sunset. Use the brightest colored blocks to the midday sun. Consider time as a core component in your system.

**SYSTEMS THINKING SPOTLIGHT**
modeling a system, identifying components, identifying behaviors

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**41 TICK TOCK CLOCK**

**LEVEL**
HARDCORE

Create a game that works like a clock.

**EXPLANATION**
Use enemy movement patterns to represent the parts of a working clock. The relationship between seconds, minutes, and hours can be expressed in the design of the game space.

**HINTS**
Consider what kinds of components make up a clock as a time-keeping system. How might this system be recreated in a game? Think about various materials used to create clocks: sand through an hourglass, numbers on a clockface, light and shadow on a sundial—and use blocks to model their material properties.

**SYSTEMS THINKING SPOTLIGHT**
modeling a system, identifying components, identifying behaviors, balancing feedback loops

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**42 STORY CENTRAL**

**LEVEL**
HARDCORE

Create a game based on the plot of your favorite movie.

**EXPLANATION**
In a narrative, the plot is the primary sequence of events. Games can have plots too, which can unfold within a single level or across several.

**HINTS**
Pick a movie and choose a sequence of events that describe the action of the film. Game descriptions, intro and outro screens are all useful components in helping to tell the story.

**SYSTEMS THINKING SPOTLIGHT**
designing a system, component relationships, system dynamics/interconnections
43
HIDDEN TREASURES

Create a game about plundering ancient Mayan treasures.

EXPLANATION
Treasure hunters rely on tricks of the trade: code breaking, puzzle solving, and outsmarting clever enemies.

HINTS
Create a challenging puzzle your treasure seeker will have to solve in order to advance through the system. Doors and keys can be useful components to make sure the treasure is well guarded. Ruins can be made from blocks of alabaster.

SYSTEMS THINKING SPOTLIGHT
modeling a system, identifying components, identifying behaviors, system dynamics/interconnections

44
KALEIDOSCOPE

Create a game that is like a kaleidoscope.

EXPLANATION
Kaleidoscopes work with mirrors and color to create patterns. Games can be designed with a similar idea, especially those where the spaces scroll.

HINTS
Play around with the idea of constantly changing patterns—patterns of blocks, enemies, and items. Imagine how patterns in a system can be altered through player interaction.

SYSTEMS THINKING SPOTLIGHT
modeling a system, identifying components, identifying behaviors, system dynamics/interconnections

45
TURNABOUT TALE

Create a game where the character is moving backwards through a story.

EXPLANATION
What can be done better backwards—spelling your name or reading a book? The elements are the same, only the order is different.

HINTS
Design the first level to be the most difficult and the last level the easiest. The intro and outro labels can be very useful, allowing the designers to reverse the usual flow of information in a system.

SYSTEMS THINKING SPOTLIGHT
modeling a system, component relationships, role of system structure
PLAGUE BUSTERS

**LEVEL** HARDCORE

Create a game about controlling or releasing a plague.

**EXPLANATION**
A plague will spread and infect others if it is not controlled.

**HINTS**
Enemy sprites that spawn or enemy generators are components that can be used to create a virus spreading out of control. Control the pacing of the outbreak by controlling the speed of spawning and enemy sprites. Plan for unexpected interactions between components and ways of bringing those interactions under control.

**SYSTEMS THINKING SPOTLIGHT**
modeling a system, system dynamics/interconnections, reinforcing and balancing feedback loops

PRISM PLANET

**LEVEL** HARDCORE

Create a game that works like a prism.

**EXPLANATION**
Metaphorically, a prism can refer to anything that is used to look at the world differently. Like a friend with interesting opinions, a prism separates colors by bending them by different degrees.

**HINTS**
Color can be used to express the idea of a prism, as can a story that has a special point of view, or more than one! Pay special attention to the relationships between parts in your system, which can model the scientific principles behind color and light.

**SYSTEMS THINKING SPOTLIGHT**
modeling a system, system dynamics/interconnections

EXCELLENT ADVENTURE

**LEVEL** HARDCORE

Create a game about traveling through time to a different historical era.

**EXPLANATION**
Why are you traveling through history? Are you trying to change the past? Are you chasing someone? Are you trying to trace your family tree?

**HINTS**
Your choice of block sprites might depend on the historical era you choose to model as a system. Use the alabaster block for ancient Rome, the dirt block for the Stone Age, and the cement block for the middle Ages.

**SYSTEMS THINKING SPOTLIGHT**
designing a system, modeling a system