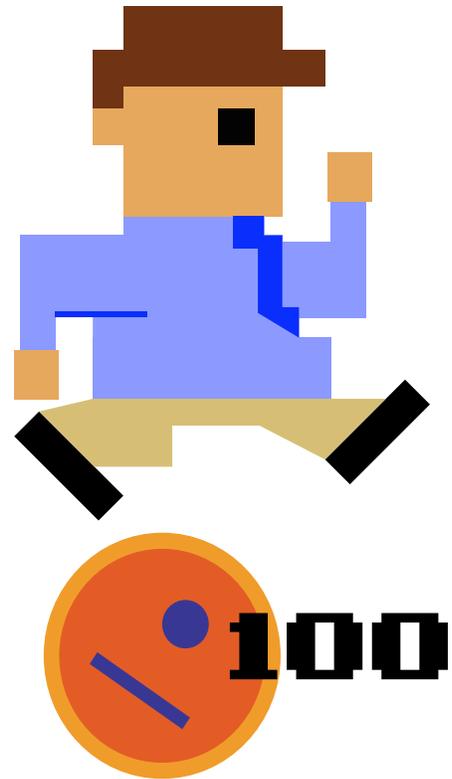


# A Primer on Learning Game Design

By Sharon Boller, President, Bottom-Line Performance  
September 2011

The gamification of learning is a hot, hot trend with great potential to improve the quality of learning experiences for adults – not just kids. In the corporate environment – where “rapid elearning” and the NEXT button now dominate – learning games offer a compelling difference in terms of user experience and results. We are sold on the value of games in learning, and we want to actively promote their use. This paper’s intent is to give readers basic knowledge of game design and how to get started with it.

Here’s what you’ll find and where you’ll find it:



## TOPIC

The What and the Why of Gamification

Mastering the Jargon of Game Design

What Makes for a Meaningful Game?

Getting Started at Creating Games

Getting Ideas for Games

Constraints that Affect Design

Play Testing Games – An Essential Step

When You Play Test...And You Find Out the Game Is Not Fun

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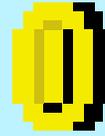
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# The What and the Why of Gamification

**Gamification** of learning can mean a few different things:

- Creating learning games INSTEAD of courses and allowing people to play as they learn.
- Creating highly realistic simulations that mirror real-world environments. These simulations allow people to gain and grow skills in a “safe” environment as opposed to an actual work environment where mistakes could cost money...or even lives.
- Adding common game elements to courses without creating a game.

Bottom-Line Performance's *The Knowledge Guru* is a learning game with most of the elements described below



What “common game elements” are we talking about? Here are a few, all of which are interrelated:

1. **Competition** – creating leader boards or achievements that let learners compare their progress against other learners or simply against a previous “personal best.” The badges available to Google news readers\* are an example of this.
2. **A social component** – creating a means for people to dialogue and showcase their progress in a game.
3. **Points and scoring features** – so people can measure progress as they go.
4. **Missions, quests, or challenges for people to master** – ways to capture people’s imaginations and immerse them in an experience. They may go through various levels of play with each level becoming more complex.

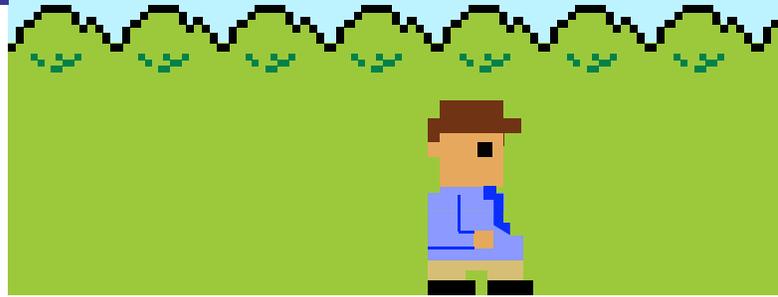
\* <http://www.allgeek.tv/2011/07/15/google-badges-the-gamification-of-news/>

## The What and Why of Gamification (cont)

When we take those game elements and develop a learning game, we create a powerful tool that can motivate and engage learners in ways that “Click NEXT to continue” learning experiences never will (whether online or courtesy of a lecturer with PowerPoint slides).

There are numerous articles and papers on the “why” of using learning games. Jessica Trybus, the Director of Carnegie Mellon’s Center for Edutainment wrote a terrific white paper that outlines the “why” of learning games. Some of the research-documented benefits she cites:

- The ability to add meaning and motivation to the learning experience; learners engage in games in a way they simply don’t in a traditional course. People frequently tune out in traditional courses. Their goal may be to get through this as fast as they can. They often are much less motivated or engaged.
- The ability to simulate emotion; learners experience emotions that can mirror the emotions they might experience in the workplace – creating a very realistic practice situation.
- The ability to offer frequent and meaningful feedback to learners so they can self-adjust their performance to improve their game play.
- The ability to create safe practice zones for using skills.
- The ability to create “levels” of play that can equate with learners gaining increasing proficiency at a skill and requiring less support as they execute the skills.



Many people dismiss games as frivolous or don’t see them as legitimate learning tools. They see games as sacrificing solid instructional design for fun. On the contrary, Karl Kapp, in his book *Gadgets, Gizmos, and Games* (Pfeiffer, 2007), does a nice job of refreshing readers on Robert Gagne’s learning hierarchy\* and linking different kinds of games to this hierarchy. I’ll go further and point out that serious games (the most robust, realistic experiences) can take learners all the way through the hierarchy – helping them gain “declarative knowledge” in early levels of the game and build to using principles and problem-solving in later levels of play.

The “why” of learning games is well-documented by research. Therefore, the remainder of this paper focuses on explaining the “what” of game design and how you get started. We start by defining what “game” and “game design” mean and we then move on to describe some of the key elements of creating effective games.

\*This hierarchy organizes knowledge/learning from simple to complex: declarative knowledge, concepts, rules, procedures, principles, and problem-solving. Gagne says you have to master the simplest levels before you can master the more complex ones.





# Mastering the Jargon of Game Design

Game design and development is a thriving industry with its own jargon and terminology. If you want to create learning games, a logical starting point is to master basic terms and definitions. The definitions I've included are drawn from an excellent book for game design novices called *Challenges for Game Designers* by Brenda Brathwaite and Ian Schreiber. I'm going to cover several terms, starting with the most fundamental term...game.

## Game

What's a game? It depends on who you ask. In *Game Design Challenges*, the authors define a game as **an activity with rules**. It is a form of play that often, but not always, involves conflict - either with other players, with the game itself, or with randomness/fate/luck (e.g. the Community Chest cards and Chance cards in Monopoly). Some people categorize simulations as games; others do not unless that simulation has rules and scoring attached to it. For our purposes, we are encompassing simulations into the genre of games.



You have to master *game design* before you can master **LEARNING** *game design*.

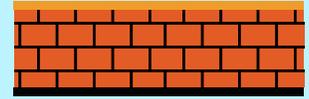
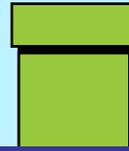


General characteristics of games include:

- **Goals** - Most, but not all, games have goals. (Sims and Sim City do not have goals; they are more about exploration and trying out different options to see what happens. A simulation that allows an employee to practice a skill may not have a goal – it could simply be practice and exploration.)
- **Length** - Most games have defined start and end points, but not all (World of Warcraft does not).
- **Decision Making** - Most, but not all, games involve decision making on the part of the players. (For example, the children's game, Candy Land, is completely random; it is 100% the luck of the draw.)
- **Rules** - Games have rules. These rules dictate what you can and cannot do in a game.

Whether you are designing an online game, a card game, or a board game, the fundamentals of game design are the same. You have to master game design before you can master LEARNING game design. With that in mind, let's review some basics of game design.





## Mastering the Jargon of Game Design (cont)

### Game Design

**Game design** is creating the content and rules of a game. **Good** game design creates goals that a player feels motivated to reach and rules that enable a player to make meaningful decisions in pursuit of game goals. Good **learning game design** creates a meaningful and memorable learning experience that also adheres to good game design.

Whether you are creating a casual game or a learning game, you need to think about things from the player's point of view – not your own. A player/learner is going to ask these questions:

- **What's this game about?**
- **How do I play?**
- **How do I win?**
- **Why do I want to play?**

## Rule to remember:

Unlike a lot of leader-led training programs or elearning courses, learning game design is a team-based endeavor – not the endeavor of a single instructional designer or trainer. This is because game design is a multi-disciplinary endeavor requiring a diverse set of skills. You need graphic design, instructional design, game design, and, if the game is an online one, multimedia programming skills.

### Game design elements

Again, pulling straight from *Challenges for Game Designers*, here's a summary of the different elements that are part of game design, though you won't have all of these in every single game:

- **World design:** Creation of the overall back story, setting, and theme of the game.
- **System design:** Creation of rules and patterns in a game.
- **Content design:** Creation of characters, items, puzzles, and missions.
- **Game writing:** Writing of dialogue, text, and story within the game world.
- **Level design:** Crafting levels in a game, including the layout of maps and placement of objects and challenges within those maps.
- **User interface design:** UI design consists of two things: how the player receives information and feedback, and how the player interacts with the game. All types of games have a UI, even non-digital ones. A game board, for example, has a user interface design.



## Mastering the Jargon of Game Design (cont)

### Core

The **core** is the point of the game - what game play is. In game design, when someone says “core,” the dynamic is typically what they are referring to. Common core dynamics, which can be combined so that more than one dynamic is part of a game, include:

- **Territory acquisition** (Risk or Monopoly)
- **Prediction** (Clue, Roulette, Rock/Paper/Scissors)
- **Spatial reasoning** (Puzzle games and games such as Bejeweled, Tic-Tac-Toe, Connect Four)
- **Survival** (Oregon Trail is about survival; your goal is to survive the passage with as many family members alive and well as possible.)
- **Destruction** (Battleship)
- **Building** (Sim City and Roller Coaster Tycoon)
- **Collection** (Backgammon is a collection game as is checkers. You are trying to collect all your opponent’s pieces. In Monopoly you collect \$\$ as well as property.)
- **Chasing or evading** (Pac-Man, though it is also about collecting, too!)
- **Trading** (An interesting dynamic as you have to cooperate and collaborate as well as compete. A very fun example of this dynamic is a game called Bohnanza\*, a game that is all about collecting, trading, and growing beans. Monopoly is another game that includes trading as one of its dynamics.)
- **Race to the end** - being first to finish. (Games featuring this dynamic are typically easy to design, build, and play; they are often used in children’s games. Life and Candy Land are examples of this core.)

\*[http://www.amazon.com/Rio-Grande-Games-RGG-155/dp/B00008URUS/ref=sr\\_1\\_1?ie=UTF8&qid=1315183646&sr=8-1](http://www.amazon.com/Rio-Grande-Games-RGG-155/dp/B00008URUS/ref=sr_1_1?ie=UTF8&qid=1315183646&sr=8-1)

### Game Mechanics

**Game mechanics** are the rules of play: how you move, what you can do on a turn, how you earn points, how you lose points, how you gain or lose resources, etc. Examples of game mechanics:

- You have to pass Go to collect \$200.
- The youngest player goes first.
- If you land on a Jail space, you go directly to Jail and don’t get to pass Go and collect \$200.



## Rule to remember:

Game mechanics hugely influence the quality of the play experience. One of the biggest ways to manipulate the “fun” factor in a game is to adjust game mechanics.





## Mastering the Jargon of Game Design (cont)

### Other Terms to Know

**Features List** - List that details key features or selling points of the game. In published games, this is the list you see on the back of the box.

**Brainstorming** - Generation of ideas. No idea is a bad one during a brainstorm. The hardest part of game design is getting started, so don't squelch ideas too early. As you brainstorm, more ideas will flow.

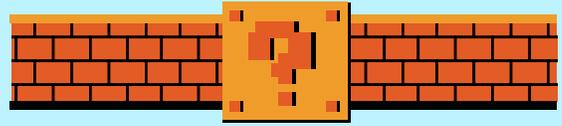
**Prototype** - Playable early version of a game or part of a game to help you understand and optimize the player experience. A prototype can exist on paper or it can be online.

**Balance** - Used to describe the state of a game's systems. When play is unbalanced, it is too easy, too hard, or optimal only for certain groups of players. When play is balanced, it provides a consistent challenge *for its target audience*.

**Dynamics** - Dynamics result when rules are put in motion. It's essentially the play action.

**System** - Collection of game mechanics that produce a given outcome within a larger game such as character creation, combat, casting spells, solving a puzzle to unlock something.

**Avatar** - Direct representation of a player. In Monopoly, it's the tokens. In Moneytopia, an online financial education game, it's a character that you choose and customize. In the elearning world, we tend to only think of avatars as online representations of learners. In the game world, an avatar does not have to be digital.



**Play Testing** - Systematic testing of game play, systems, balance, and interface to find all the errors, inconsistencies, or issues.

**Platform** - Console, device, or system upon which game is played.

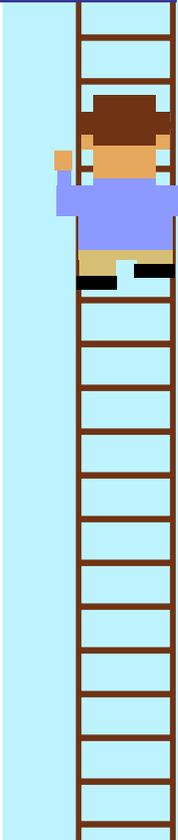
**Design Document** - Document that gives an overview of the game play experience as well as the learning goals of a proposed learning game. Learning game design documents we create contain:

- Learning goal and objectives being met by the game.
- Outline of content the game will include to meet those learning objectives.
- Paragraph explaining theme of game and the core dynamic.
- Demographic breakdown including target audience, genre, and intended platforms.
- Concept art – this could be an entire user interface or some key elements like a game map, game characters, what a level might look like, etc.
- Partial prototype (sometimes): working prototype of a specific element to help people visualize how things will work.





# What Makes for a Meaningful Game?



Knowing the terminology doesn't mean you can create a fun and meaningful learning game. Creating games is not rocket science, but it is something that improves with practice. One key skill is being able to create meaningful game decisions that challenge your players (at the right level to avoid frustration) and help them learn.

Good game design creates opportunities for players to make meaningful decisions **that affect the outcome of the game**. A few examples:

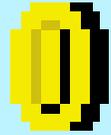
- Games like Tetris and Chess keep players' minds busy by forcing them to consider which one of several possible moves they want to take next. In taking these paths, players know they may be prolonging or completely screwing up the entire game.
- When we recently created a learning game on product formulation types, one key aspect was choosing which questions to ask the customer. Learners' decisions about which questions to ask directly affected their sales. Asking the wrong questions meant lost sales.
- A simple quiz-style game might reward people handsomely for answering correctly – but penalize them heavily for guessing. An obvious decision, then, is whether to guess or not.

Whenever you set up a rule that allows the player to make a choice in a game and that choice affects the game's outcome, you are creating **meaning**. As Carnegie Mellon's Trybus says in her white paper on learning games, "To progress in a game is to learn; when we are actively engaged with a game, our minds are experiencing the pleasure of grappling with (and coming to understand) a new system."

In order to create choice, there has to be another option the player could choose that has meaning as well. This concept of good game design correlates with the instructional design of good questions or learning activities: if you only have one viable option, then you have written a bad multiple-choice question or created a poor learning activity.

Bottom-Line Performance's *Dow Formulations game*



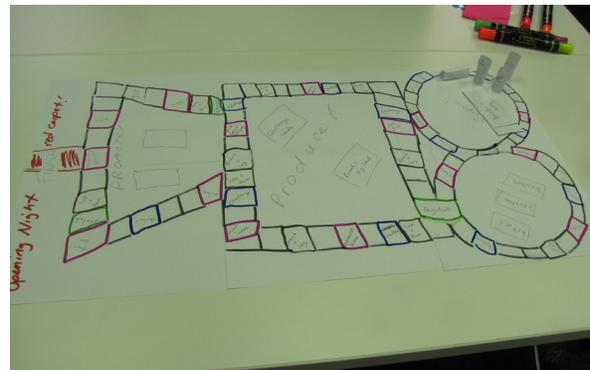


# Getting Started at Creating Games

You can create a fully-functioning simple game in an afternoon – though, admittedly, this would be a FIRST rendition of a game – not the final version. Here are two examples of games we created in the span of two hours:

Using *Challenges for Game Designers* as our idea generator, we've created games – just for fun – on a broad array of topics such as hand-washing, chickens crossing a road, auto collecting, etc. You can too – following a modification of the four-steps outlined in Brathwaite's book:

1. Start with a topic, an instructional goal and learning objectives.
2. Think of a theme. At this point, don't be super-critical. Brainstorm lots of different options before picking one to move forward with.
3. Select a core dynamic, and then
4. Start defining some simple rules of play.



## A Word about Themes

Themes can be ANYTHING – we had a recent team come up with a game whose theme revolved around Oscar night in Hollywood. In learning games, your themes are frequently contextual to the employee's job or the skills being learned in the game. A few years ago, we did a game called "The Global Coaching Challenge" for a pharmaceutical company and the theme was the launch of a new drug. The goal was to be the team that launched the product in the least number of years. Since the learning goal was to improve managers' skill in coaching employees from diverse cultures, players' success in handling a wide array of coaching situations dictated the length of time it took them to launch their drug. Every time they successfully handled a coaching situation, they gained months. When they handled a situation badly, they lost months on the timeline.





# Getting Ideas for Games

There are numerous ways to approach the design of a game and some can get pretty sophisticated. These are a few simple methods outlined by Brathwaite and Schreiber in their book:

**Blue-sky** - Explore lots of possibilities, apply no constraints. This is a form of brainstorming.

**Slow boil** - Given a theme and a setting (and possibly some constraints), designers go through research phase with limited direction. The design gradually emerges over time.

**Mechanic** - Pick the mechanic and then design a game to it.

**IP** - Games based on intellectual property such as Glee quiz game, Spider-Man, Jeopardy, Wheel of Fortune, etc. (Who hasn't created a Jeopardy game at some point?)

**Story** - Developing a game based on a story. One of our designers, for example, built an entire game around the story of Little Red Riding Hood.

**MDA (Mechanics-Dynamics-Aesthetics model)** - What feeling do you want to evoke? In this approach, you ask that question FIRST - and then select the dynamic and define the mechanics or rules you think will get you there. Here's a great example where the aesthetic - or feeling - aspect probably came first.

McKinney's *Spent game* is designed to raise awareness about homelessness and make you feel differently about it.

## BLP How BLP Approaches Game Design

We've used Brathwaite and Schreiber's "challenges" within their book to spark our ideas. We've learned that a two- to three-hour design meeting is an optimal way to spark design ideas for a game. We create small design teams of two to four people and give them the learning goal and objectives we need to meet, along with a representation of the kind of content we believe the game has to include.

From there we let them choose a core dynamic and a theme, then see what they can come up with in the span of a couple of hours. The end result is a paper prototype that we can play test as part of the meeting. We've gotten excellent results using this technique. We've even gotten brave enough to include clients in these sessions – and they love it.

# Constraints that Affect Design

Here are some of the big constraints that will influence design decisions.

## How much money can you spend?

If you want a virtual world with multiple levels of play and a degree of realism that rivals your actual work environment, you can spend quite a bit of money. The commercial video games such as World of Warcraft cost seven figures to create – and took years to build. However, realistic simulations of a task can be done for much less than that. We created a troubleshooting simulation for a hemodialysis machine for less than \$50K in the span of three months. A casual game – similar to the Hangman game shown here – can be done for \$10- 25K. Do not reject the idea of a game because you assume you cannot afford one. Consider, too, the ROI of a game. If the learner stays engaged – and retains the info and/or builds skill through the game – how much is that worth?

## How much time do you have?

If you need something more than a casual game (e.g. the Hangman game), you need at least a few months to develop it, depending on the complexity. You cannot build a successful game from a traditional testing approach, such as alpha, beta, final. You need multiple rounds of play testing and revision to ensure you get a great game. Very simple games (e.g. the Hangman game) can be done in a month or less. This Knowledge Guru™ game took us several hundred hours to evolve – even though it seems simple on its surface.



Bottom-Line Performance's  
*Responding to Alarms* course

Bottom-Line Performance's  
*Walk the Plank* game

Bottom-Line Performance's  
*The Knowledge Guru*

## Constraints that Affect Design (cont)

### If you want an online game, what platform(s) do you want the game to run on?

This decision can make you – and/or the game developers - crazy. Trying to figure out which – and how many platforms – to support is a major decision. Creating a game for a desktop or laptop means something very different than creating a mobile game for a tablet (which, in turn, is different than a game optimized for a phone). Your platform decisions can have an impact on your budget and your timeline. If you need to develop for multiple platforms, expect your timeline and budget to increase.

### Who's the target audience?

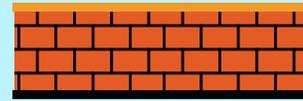
Is the target player someone experienced or new to games? Are they 20-somethings or 50-somethings? From experience, we've learned that 20-somethings don't need – or want – much direction. They want to immediately start playing, and they will figure things out as they go along. A 50-something might want a complete SECTION of directions and then want navigational cues throughout the game. Know your audience!

### What genre or category of game play are you looking for or are limited to?

Some clients want to avoid everything but the most vanilla game play experiences. They do not want to blow things up, kill people, or do anything that might be perceived as negative by anyone. You have to consider the corporate culture and figure out what is acceptable within it. Avoid, however, making judgments too quickly about what is acceptable and what is not.

### What features do you want?

Do you want people to be able to create their own avatar? Do you want a sound track? Do you want videos? Do you want a world with multiple levels and layers? These features all influence budget and timeline.

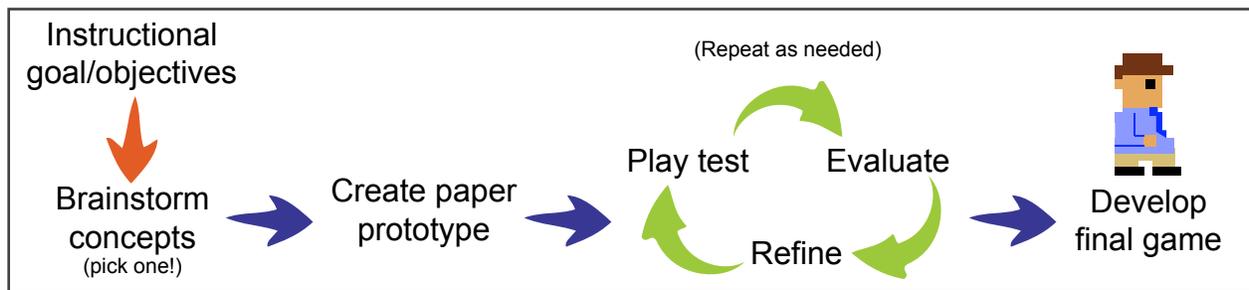


## Rule to remember:

Theme matters tremendously in the player's perception of the "fun factor" of a game. A simple hangman game can become exponentially more fun, for example, when we apply a "pirate" theme to it. Check out this example at:

Bottom-Line Performance's  
*Walk the Plank game*

# Play Testing Games – An Essential Step



You can definitely brainstorm a game idea in an afternoon and build a simple prototype. However, going from the rough idea to a polished game takes iterations and time. A great game requires lots of tweaking, modifying, and refining. Creating prototypes and play testing them is critical to designing good games. Play testing is the only way you can figure out whether your core dynamics and game mechanics work.

Game play dynamics – how players react to the game and the impact of various rules and feature sets don't emerge from your written design. They emerge as you play test, which is why you need to build prototypes. The cheapest and fastest way to play test is to start with paper prototypes. Even if you are ultimately creating an online game, first build it on paper (or perhaps in PowerPoint) to see if it works as you imagine it would. You can make changes much faster and cheaper when you haven't invested hundreds of hours building the first rendition of your game.

\* After initial play testing, you will create a design document. You will update the design after each iteration of play testing. This is a living document, not a one-time creation.

A creative design team can come up with a simple learning game design in a few hours – and build a rudimentary prototype in a bit more than that. Once a prototype is in place, you need people to play it and other people to watch them play. You debrief the experience, and you build another, more robust prototype. However, the second rendition is STILL a prototype with many things mocked up rather than refined (e.g. we may create the cards associated with a board game in a Word table and then print and cut them up for initial rounds of play). A game board might be printed as a series of PDF pages and taped together for initial rounds of play. We avoid going to a production version until we're confident we have the right user interface and play experience. Only after we are sure the cards are keepers do we invest the dollars in creating the polished version.

## Rule to remember:

You **cannot** tell how fun or effective a game will be from reading a written design document. **You have to play test.** Game design and development is an iterative process. Be prepared to play and revise, play and revise again.

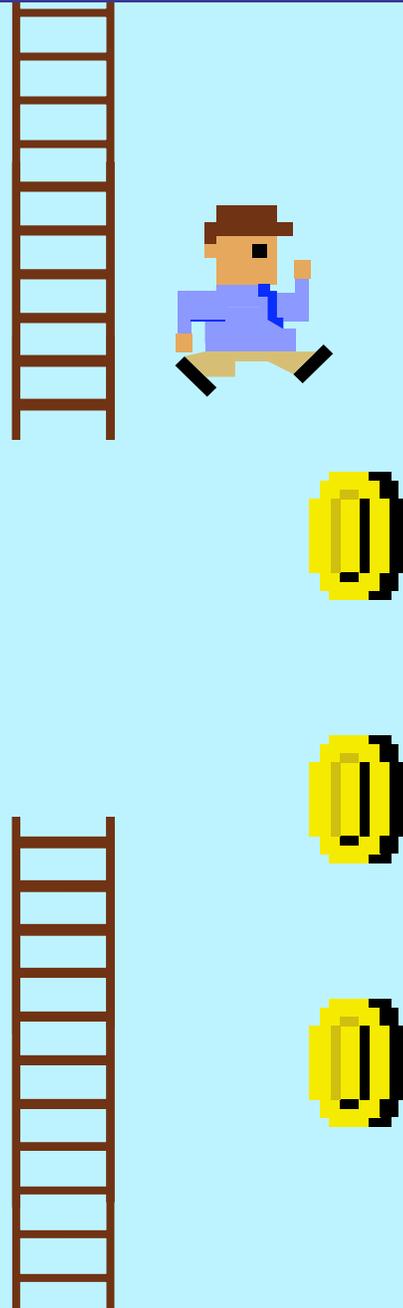
If the game is an online game, we may rough out animations and game mechanics in PowerPoint first or build one level and play it to see how we refine things before moving forward. True story: One of our biggest mistakes was with our Knowledge Guru™ game. We were so confident of our game design that we built an entire rendition of the game after documenting our initial design. Once we play tested, we found out our initial game mechanics didn't work (translation: game wasn't fun). We had to completely rebuild it. Ouch!

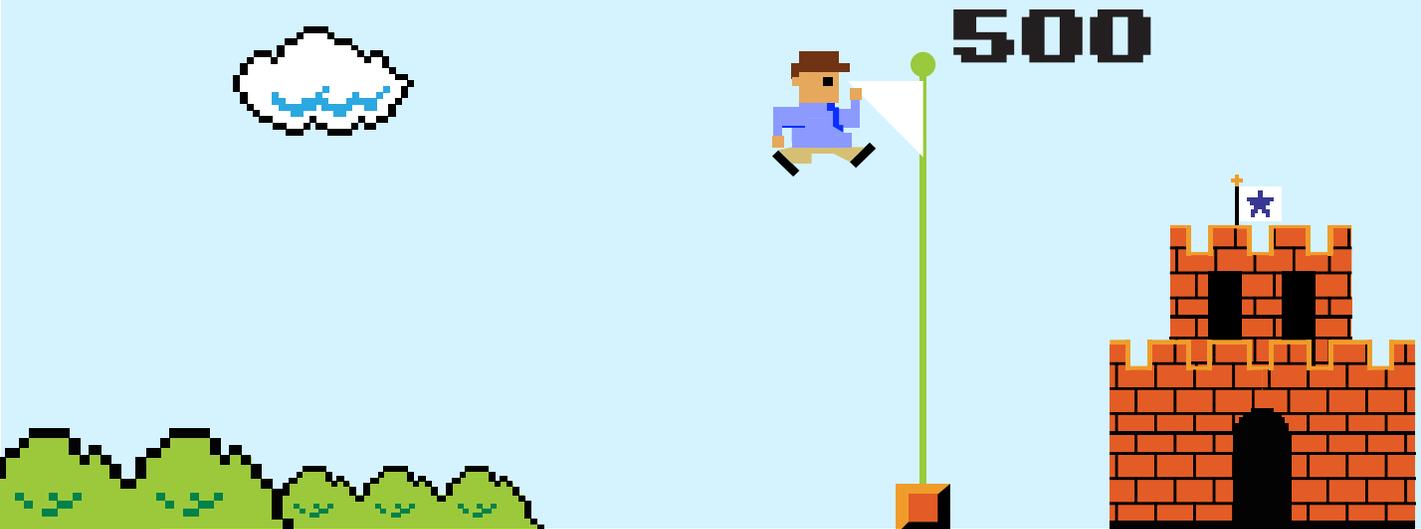


# When You Play Test... And You Find Out the Game Is Not Fun

When you play test early versions of your game, you WILL find out some things don't work as you envisioned. Perhaps the game is too hard – or too easy. Perhaps it takes too long to play. Perhaps some key learning isn't happening. Or, perhaps the rules are confusing. There are several things you can change to improve the game play experience. Some of these are pulled from the Brathwaite and Schreiber book. Others are gleaned from our own experience.

- Consider whether the user interface needs to be adjusted. Perhaps it's creating confusion or it's “snoresville” in design.
- Change how the scoring works – either by giving people more points or fewer points, or by establishing a major penalty that causes people to really think before moving forward.
- Allow players to affect game play of others.
- Mess with the play order or the game loop. (This only applies when you are playing a multi-player game, obviously. In Uno, you can lay a card down that forces the turn order to change. In Farmville, there is a sequence - or game loop - of things a player can do. Changing the order can affect the fun factor.)
- Get rid of a rule. In general, the fewer rules you have, the better you are. Note that there are exceptions to this. Example: Civilization is an extremely successful game that is very complex to learn.
- Make a resource limited (or unlimited).
- Get rid of - or add - a level or an entire round of play.
- Use the “rule of two” - take a game value and double it or divide it by two.





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### Games to play:

- Knowledge Guru:  
<http://www.TheKnowledgeGuru.com>
- Algebra game:  
<http://www.dimensionu.com/dimu/home/uvideos.aspx?ref=top%20menu%20dimu>
- Marketing game: “Getting the Glass:”  
<http://www.gettheglass.com/index2.html>
- Marketing game, “Get it Ripe” (Domino’s Pizza):  
<http://more.dominos.com/games/?game=tomato&fb=0>
- Social justice/awareness:  
<http://playspent.org/>
- Financial education: Moneytopia game:  
[http://www.dodcommunitybank.com/home/resources/military\\_saves/moneytopia](http://www.dodcommunitybank.com/home/resources/military_saves/moneytopia)
- IT Hangman  
[http://www.blptraining.com/blp\\_development/walk\\_the\\_plank](http://www.blptraining.com/blp_development/walk_the_plank)

### White papers and books to read:

- “Game-based Learning: What it is. Why it works. Where it is going.”  
<http://www.newmedia.org/game-based-learning--what-it-is-why-it-works-and-where-its-going.html>
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- *Challenges for Game Designers* by Brenda Brathwaite and Ian Schreiber, Course Technology, 2009

## Bottom-Line Performance, Inc.

BLP is an Indiana certified WBE that specializes in designing and developing e-learning courses, games and simulations, instructor-led training, and mobile learning.



Feel free to contact us with questions or ideas you'd like us to share out via our blog.

**Website:**

<http://www.bottomlineperformance.com>

**Address:**

P.O.Box 155  
New Palestine, IN 46163

**Phone:**

(317) 861-5935  
(317) 861-1839 Fax

**Email:**

[info@bottomlineperformance.com](mailto:info@bottomlineperformance.com)



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