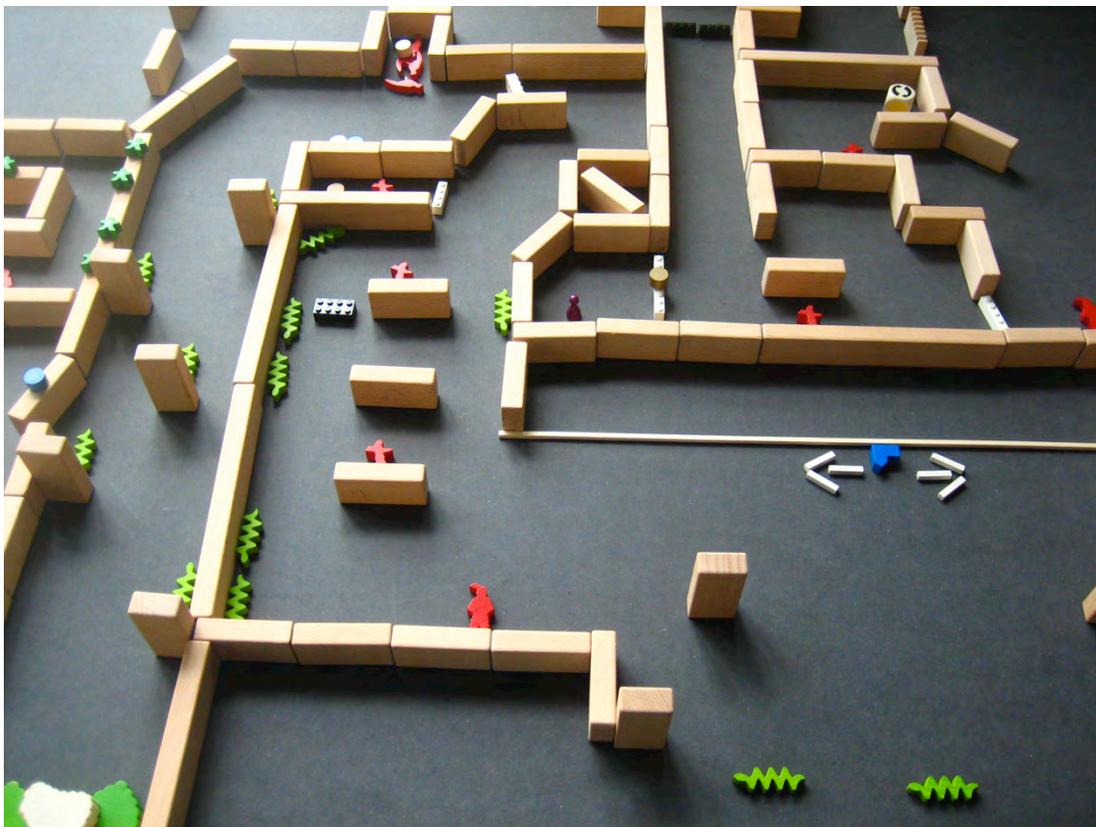




Introduction to Game Design

The creation of a simple game is a deeply satisfying experience. It involves problem-solving, brainstorming, creative trial and error, logic and joy: joy at having created an original and challenging game. One of the real beauties is that every age group understands how games work. So there isn't necessarily any content here—math or vocabulary or physics—that the students need to know in order to design a game. Everyone can do it if they are given the basic tools: the component parts, or the fundamental building blocks of a game.



Game Prototyping with Wooden Blocks & Pieces
Credit: [Iwan Gabonitch](#)

Game Design – The Component Parts

All Games Have:

- **Rules:** The formal structure of a game that establishes the game's goal and what can and cannot be done to achieve that goal. In some cases rules are fixed within the game system, for example with a

video game like *Super Mario Brothers*, where players have no control over the rules save through modifications to the game itself. In other cases, the rules can be more fluid and vary—to some degree—depending on the setting and/or players. This is particularly true for games in which the rules are agreed upon orally, for example with an impromptu game of *Hide & Seek*.

- **Goals:** Generally speaking, goals define the objectives of a game, or the end state players are trying to reach. For example, the goal in chess is to checkmate the opposing player's king. Games can also have multiple sub-goals within a larger goal. For example, in basketball, the ultimate goal is to score more points than the opposing team. Getting the ball through the hoop is a sub-goal, successfully moving the ball toward the basket, through dribbling and passing, are also sub-goals. Moreover, many games created in an educational context also have specific learning goals in mind—i.e. what the game is intended to teach the players as they play the game. These goals generally include learning specific content from a particular academic domain, such as history or mathematics.

Like rules, goals can vary to some degree depending on the game and the players. For example, sandbox-style video games (e.g. Minecraft) often have no ultimate end state or goal—it is up to the players themselves to decide on their own goals.

- **Obstacles:** This refers to the elements of a game that prevent the player from easily reaching the goal. Obstacles can be many things, from actual objects or game pieces to other players. For example, in a soccer match, the defense is the main obstacle for wingers and forwards trying to score.
- **Core Mechanism:** The core mechanic is the most important part of a game. **It is the main action of a game, what the player does most of the time in order to reach their goal(s).** Core mechanics include both player decisions and actions, and if they are fun to make, the game is fun. In basketball, the core mechanic involves dribbling, passing and shooting a basketball. In Monopoly, the core mechanic is amassing money so that you can buy properties and earn more money. In volleyball, the core mechanic is batting the ball over the net in no more than three tries. Since the core mechanic of a game defines what players will spend most of their time doing, it is important that it also supports any learning goals for the game, so that through repetition of this action (or set of actions), players are actively developing their knowledge of the desired subject area(s).

Carefully designing the core mechanic is the best way to clearly express your content.

Good Games Have:

- **Suspense:** An exciting quality of a game created by moments when an outcome is uncertain and an element of chance is in play. *I like the feeling of suspense when a fast ball pitcher is up against a long ball hitter.*
- **Forgiveness:** A game's learning curve; or a quality of the game that allows the player to learn to play by having partial successes or small victories while increasing her skills. *When I started playing soccer, I was good at dribbling and tackling, but I've only recently learned to shoot well. OR, when I started playing Words with Friends or Scrabble, I did not realize that one can play defensively by not setting up Triple Word and Letters for my opponent's next turn.* A good way to think about this is through the concept of *scaffolding*. Well-designed games incorporate higher levels of scaffolding at the outset, which is gradually reduced as players learn how to play.
- **Ritual:** Meaningful play within a game, a feeling that a game has significance and player actions and experiences are important. Also, any ceremonies or regular symbolic actions associated with a game. *I saw a Premier League soccer match where the players walked onto the pitch with children as a pregame ritual.*

Here is an illustration of the role of suspense, forgiveness and ritual in game design. We are looking at soccer:

No Suspense - Start with goal very large and shooter very close.

No Forgiveness - Next have shooter far away and goal very small.

Balance of Suspense and Forgiveness - Finally, over three tries move shooter back and narrow goal.

Ritual – Smell of grass, community, competition, etc. The question you want to answer, with regards to developing ‘ritual’ is: why does this feel good? Why do we want to do this?

Core Mechanic – Kicking a ball is fun.

Educational Game Design

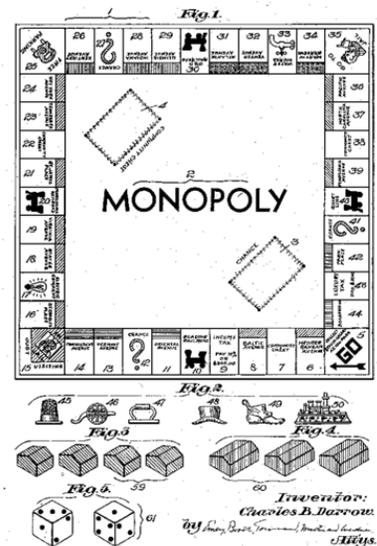
Part of the challenge in designing educational games is determining how to incorporate your specific learning goals in a game that is also fun to play. For Competition participants who are designing educational games, we recommend that, before you spend too much time thinking about your game’s components, you first start thinking about how your desired content or subject can be made fun. Once you have this down, designing a game around it is not so difficult.

Here “fun” doesn’t mean strictly fun in a comedy-sort of way. Every subject or individual lesson has—or should have— aspects of it that are interesting, exciting, or so obviously useful that students will want to learn them. You can also think of documentaries, great books, and art exhibits. Each of these can be both fun and entertaining, even if they can also make us uncomfortable at times, by encouraging us to explore challenging topics. We think the same is often true of great games.



Games as Systems

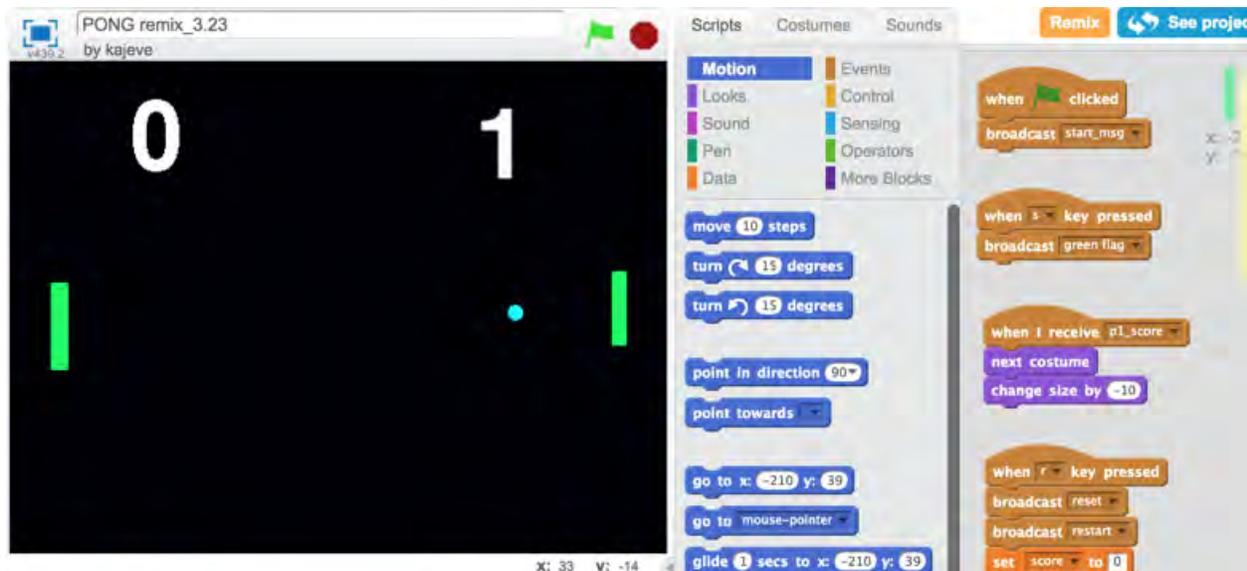
Remember: at their core, games are systems, where the component parts interact with one another to form complex behaviors and results. This fact can make games a natural fit for teaching specific types of content that are based on similar systems. For example, consider a physics game that demonstrates the relationships between mass, velocity, and force in motion. Here the game system is itself a simplified version of real physical systems, which can make abstract mathematical equations more understandable and intuitive to players. By making something interactive in this way, the dynamics naturally result in an effective hands-on learning experience. Games can be extremely powerful in this sense. Systems can also be found in nearly every field and content area, from biology and mathematics to economics and anthropology, and many—if not most— can be turned into a game.



Remixing Games

Monopoly Game System

A tried-and-true approach to classroom game design is to take a game your students already play and remix it by adding an educational component. Remixing an existing game can make the process significantly easier for students without prior game design experience, as they have a game system to start with. In general, it is easier to remix physical games—like board or deck-building games—than to remix a digital game. That said, there are quite a few digital game design platforms available that were designed with young learners in mind that simplify both the programming and design aspects (for more information, see our *Video Game Getting Started Guide*). Additionally, you can find examples of some classic digital games to remix in some of these platforms, like the “Pong” remix shown below from Scratch.



Pong Remix in Scratch

For physical games, you can also visit a website like BoardGameGeek.com to get a list of potential games to remix. For example, *Monopoly* could be made into a game designed to teach economic principles more clearly, and *RISK* could be modified to teach players about the American Civil War.

More information

For more information about designing games in an educational context, we recommend looking into the work of [Tracy Fullerton](http://TracyFullerton.com), and in particular, her wonderful book, *Game Design Workshop: A Playcentric Approach to Creating Innovative Games*, currently in its third edition (earlier versions of which may be available for free online).

Another great resource is Jeremy Gibson’s *Introduction to Game Design, Prototyping, and Development*, available here: <http://book.prototools.net/>

Finally, James P. Gee has written extensively on games and learning, and learning systems more generally. Many of his publications are available for free on his website: <http://www.jamespaulgee.com/>