Assessment 3

# Farber's Game-Based Learning Design Grammar

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## Play and Games

Game-based learning is more than just playing and fun. The point of game-based learning is to deliver instruction, not to become the instruction. Dr. Farber's Technology Leadership 2020 conference presentation will review how game mechanics can have a transformative change on how teaching is delivered (Northouse, 2013). He will review research that suggests how learning content should be matched with game mechanics.

Modern research about play and games date back to the early 20th Century, alongside the burgeoning fields of child psychology and human behaviorism. Almost all of the modern day discussions of games are rooted in the essays and observations from Joseph Huizinga and Roger Callois. Both were among the first to connect the significance of structured play to childhood development.

In 1938, Huizinga published *Homo Ludens*, Greek for "Man, the Player." Huizinga, a Dutch historian, wrote about play as a competitive act, as well as how play promotes socialization. He recognized that humans – like other animals – engage in playful activities. For example, cats hunt toys around people's homes as practice for tracking down live prey; moose battle one another with their antlers to practice combat skills. His treatise was more philosophical than psychological, discussing the process more than the need for play.

Huizinga introduced an important concept known as the "magic circle" – the place where play occurs. He wrote:

> The arena, the card-table, the magic circle, the temple, the stage, the screen, the tennis court, the court of justice, etc, are all in form and function playgrounds, i.e. forbidden spots, isolated, hedged round, hallowed, within which special rules obtain. All are temporary worlds within the ordinary world, dedicated to the performance of an act apart (1938, 1955 translation).

Sometimes known as a playspace, the magic circle is where people engage together in games. Basically, it is "where the game takes place" (Salen & Zimmerman, 2004, p. 95). It can be a game board, a field, a bridge table, or even a multi-user virtual environment. Game tokens, from the thimble in *Monopoly* to video game avatars, each serve to draw the player into the magic circle (Salen & Zimmerman, 2004, p. 96). The magic circle remains significant to developers of virtual worlds, discussion forums, and massive open online courses.

In 1961, French anthropologist Roger Callois wrote *Man, Play, and Games*. He defined four types of games: *agon,* representing pure competition; *alea*, where the player choice depends on random variables or luck; *mimicry* for acting, singing, and role-playing; *ilinx,* the thrill from being in motion. Callois described his four domains of play by drawing on everyday examples. He wrote, "One *plays* football, billiards, or chess (*agon*); roulette or a lottery (*alea*); pirate, Nero, or Hamlet (*mimicry*); or one produces in oneself, by a rapid whirling or falling movement, a state of dizziness or disorder (*ilinx*)" (1961, 2001 translation). In 1990 psychologist Mihaly Csikszentmihalyi posited that each of Callois' sets of game activities serve to keep people happy, fulfilled, and positively balanced. Csikszentmihalyi's theory of optimal psychology was influential in game – and learning – design.

Evolutionary psychologists suggest that humans are drawn to "risky play" as a survival mechanism. Perhaps this explains why children love amusement parks, hiding in clothing racks at department stores, running fast, and climbing trees. There are six types of dangerous activities that appeal to most children: "great heights, rapid speed, dangerous elements, rough and tumble, and disappearing/getting lost" (Sandseter &

Kennair, 2011, p. 257). Many successful games feature these fun mechanics that involve risk. Climbing and rough and tumble play seem more suited for physical education class than math or science; however, students can play educational games that involve risk. One example is the tablet game *Stride and Prejudice,* an "endless runner" set in – and on – text from Jane Austen's classic novel, *Pride and Prejudice*.

## Defining Game Mechanics

Clicking buttons on a game controller is not inherently fun; it is the hope of achieving success that compels players. Similarly, applying fun game mechanics can set the learning process, or journey, in motion to create students who are intrinsically engaged. Fun is primarily "about practicing and learning, not about exercising mastery" (Koster, 2005, p. 96). When players are considered an expert in a game, they have created a "mental model" about how to succeed in the magic circle (Boyan, 2009). Educational games, therefore, should be "designed in a way that provides complexity for students to engage in problem-solving tasks, with sufficient autonomy for students to make choices and attainable challenges to help them move closer to their intended goals" (Eseryel, et al, 2014).

Game mechanics, sometimes called core mechanics, pertain to the actions of play. Mechanics draw players into the magic circle – the interconnected system that is a game. Like physical mechanics (think: cogs, wheels, and sprockets in a watch), game mechanics set play in motion. It can be defined as "the essential play activity performed again and again in a game" (Salen & Zimmerman, 2004, p. 316). Mechanics include "anything a player can do in a game, such as moving, jumping, shooting, fighting, or driving" (Dunniway & Novak, 2007, p. 5). Rock-paper-scissors, for example, involves bluffing

and guessing. Different chess pieces have different properties; rooks and bishops are restricted in their movement across the board. The mechanic in baseball is hitting, throwing, and catching. Eating dots is the mechanic in *Pac-Man.* Farber's game mechanics that lend themselves to learning include: judging, arguing, voting, trading, guessing, time, and role-play simulation.

*MDA: A Formal Approach to Game Design and Game Research* was an influential paper published in 2004. In it, the authors compared games to other consumable media (e.g., books, theater, film). The "M" in is for "Mechanics – the particular components of the game, at the level of data representation and algorithms" (Hunicke, LeBlanc, & Zubek, 2004). (The "D" represents "Dynamics," or what changes in the system during play, and the "A" stands for "Aesthetics," the physical appearance of a game and its components.) Games often have multiple mechanics that overlap and require players to build certain skills. There are obvious parallels to Lev Vygotsky's zone of proximal development methodology, scaffolding and building skills until mastery is reached. Games allow students to balance skill and challenge in an engaging setting (Zhong-Zheng, Yuan-Bang, & Chen-Chung, 2013).

Farber's research observed how more effective games match the game mechanic to the content. The verbs should align to an activity. Implementing game mechanics, with appropriate educational objectives, can make learning more engaging. In these cases, games use the mechanic to deliver a message. *Pox* is a simple board game in which "infected," red poker chips need to be surrounded by "vaccinated," blue chips. *Pox's* mechanic teaches about vaccination circles. In this case, the mechanic can serve a dual role: as a player's actions and as a device to carry a message, similar to symbolism

in literature. After all, isn't it more effective to teach democracy with students voting in mock election than with a PowerPoint lecture?

Game mechanics, like Bloom's Taxonomy of Higher-Order Thinking, are designed using action verbs. Games are built on verbs, not nouns. Actions are based on player decisions; in a game, the participant is doing something. Taking an action that has consequences to the system and to other players. Educational game designers are different than their commercial counterparts. Rather than simply choosing a fun mechanic, like chasing or hiding, they must consider learning objectives.

Educational games have a reputation of being poorly designed. Many titles were rushed to market, placing content ahead of game mechanics. In "edu-tainment" games, the learning is presented as an obstacle for students to solve in order to progress. A game becomes "chocolate-covered broccoli" when the mechanic doesn't fit with the content. Not only does this turn an activity into a chore, but it also makes the learning into something the student has to – rather than wants to – do. They can be derivative in nature, with learning content sprinkled in. They may be engaging for a few minutes here and there, but not long-term. This is why teachers should be leery of large, comprehensive learning platforms that promise dozens of games for every content area. Answering velocity formula questions to shoot an alien seems more educationally straightforward than using *Angry Birds* or billiards to teach physics concepts in an authentic, situated setting (Lave & Wenger, 1991). Unfortunately, for some teachers and administrators, content-specific games seem like an easier sell. Farber's Game-Based Learning Design Grammar seeks to have a transformative effect on how mechanics can support learning goals.

## Game-Based Learning Design Grammar

Game design is about the player's experience. Farber's transformative work showed parallels to learning design, in which teaching is student-centered. He has found that it is essential to integrate game mechanics to student learning. Match a mechanic with a learning objective. Not every activity needs to be a game; however, every lesson should attempt to involve a game-like mechanic. Bring students into the equation, asking them which mechanics the teacher employed in a particular lesson – and why. This is a teachable moment to bring students in as co-designers, critical thinkers of how they learn.

Any experienced educator will tell you that there is no universal single way to teach everything. Google's Chief Game Designer, Noah Falstein recommended a "combined arms approach," using games, traditional lecture, and books (personal communication). Matching game mechanics with learning objectives, while mixing in books and teacher-led reflection, is a key to effective game-based learning.

## Reading As a Game Mechanic

This conference presentation will include hands-on activities. Participants will play a text-based game to illustrate how reading, cardinal directions, spelling and typing can become a mechanic of play. Interactive fiction situates reading into an authentic learning context – the story becomes the mechanic. The player is not reading from the first-person point-of-view; rather, he or she *is* the protagonist, making choices that have consequences. Interactive fiction challenges the participant to apply logic. The genre of interactive fiction, sometimes abbreviated as "IF," has a double meaning: interactive fiction and the logic command "if-then." Interactive fiction commands are written in verb-noun statements from players (e.g., "Open door.").

Farber co-designed an interactive fiction, text adventure game with Erin Hoffman, Lead Designer at GlassLab (developer of *SimCityEDU*). The title was entered into IndieCade, the International Festival of Independent Games. The hope was to transform the way content in delivered by sharing the project with as large of an audience as possible. The interactive fiction (or, in this case, interactive *historical* fiction), game was called, *Chronicles of the Time Society: Independence* (http://timesocietygame.com). The narrative took Farber's students back in time (virtually) to the signing of the Declaration of Independence. Hoffman set up a wiki for both to work asynchronously (she lives in California; Farber is based in New Jersey). Both spoke via Skype every Thursday afternoon. Below was the text adventure's original narrative frame:

> You are a member of the elite Time Society, a secret international organization that protects the timestream of the universe. In your time it is 2253, but you have been given a mission to travel back to the summer of 1776 and ensure that the Declaration of Independence is successfully signed. One of the signers has fallen ill, and you must take his place in history. Good luck, Inspector!

There were several considerations discussed with the project. For example, when in the year would Farber teach about the Declaration of Independence? How long would the whole experience be? It could run for multiple days or a single class. The initial conversations pertained to the major insights students should to come away with, and possibly any key figures they should encounter (e.g., Samuel Adam, Benjamin Franklin). Another issue were setback penalties for losing the game, also known as the "fail states." Feedback from making wrong choices can reinforce what the player needs to do the next time they play. A non-digital example of a fail state is the board game *Chutes and Ladders.* Losing causes the player to fall down a chute. Originally from India and called *Snakes and Ladders,* it reinforced tenets of Jainism and karma. The board was decorated

with more snakes than ladders to subtlety illustrate that it is more difficult to do good than evil.

## Using Game Mechanics to Drive Instruction

*Chronicles of the Time Society: Independence* serves to illustrate how mechanics, including fail states, can drive instruction. To prevent the activity from becoming a boring chore – like reading a typical history textbook – game mechanics were added to engage the student. In this case, the mechanics of being chased were added to give the participant a similar feeling that colonial Patriots had in British-occupied Boston.

Being chased or hiding may seem better suited for physical education than a social studies classroom; however, students can play educational games that involve risk. One ingenious example was *Darfur Is Dying,* the free, flash-based game from 2006. Conference participants will play this game, too. The objective was to forage for water without getting caught. In it, players took on the role of a refugee. Farber spoke again to Google's Noah Falstein, this time about how hiding and chasing can deliver a social awareness message. He explained:

> I think *Darfur Is Dying* is a brilliant example of a very simple game. It puts you into this life and situation, which was more like real life. I know with me, it helped me identify with more people in Darfur than any of the articles I read about until that point. *Darfur Is Dying* is a great example of a very simple game that doesn't take a lot of graphics or depth of gameplay to give you the sense of how helpless you can feel being hunted down in barren landscapes when all you're trying to do is get water. It's very direct that way (personal communication).

In a classroom, *Darfur Is Dying's* tension provided a compelling experience for students. The teacher's role is to facilitate discussion. Students can reflect on mechanics with a formative assessment. Examples include: Why was this game so hard to play?

What really happened in Darfur? Because the mechanics are perfectly aligned with the message, students should make the connection about struggling as a refugee in Darfur.

## Conclusion

Playtesting allowed Hoffman and Farber to not to lose sight of the conceptual takeaway. They initially noticed that students were spending a considerable amount of time exploring colonial Boston. The learning objective was intended to convey the frustration and helplessness colonists felt from being taxed by King George, not just a geography lesson. This was revealed because Farber surveyed students anonymously. Conference presentation attendees will playtest of the *Chronicles of the Time Society: Independence*. Participants will complete the same playtest form that the student testers used.

In the end, Farber and Hoffman designed separate missions, each to illustrate an emotion felt by colonists at the time. In the "headquarters," players can choose "canisters." The first mission, described in this section, was the "Chase Canister." An economic mission was later added to give students the feeling of frustration about being taxed without Parliamentary representation. The game would not have been iterated to if the designers did not playtest with the intended audience: students.

Learning is an iterative process. It should be a conversation. Students should be participatory co-designers, completing the feedback loop of learning. Student interest may pique further knowing a lesson, game, or project is being playtested and that his or her opinions count. As this presentation will show, it is okay to ask students if a lesson felt more like work than play. It can be easy to lose sight of mechanics.

This workshop will work best in the computer lab. If that facility is not available, participants can engage in the games via smart phones or tablets. The ubiquitousness of wireless Internet should be sufficient technology for everyone to take part in the activities.

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